



xSeries 225 Type 8647

Installation Guide

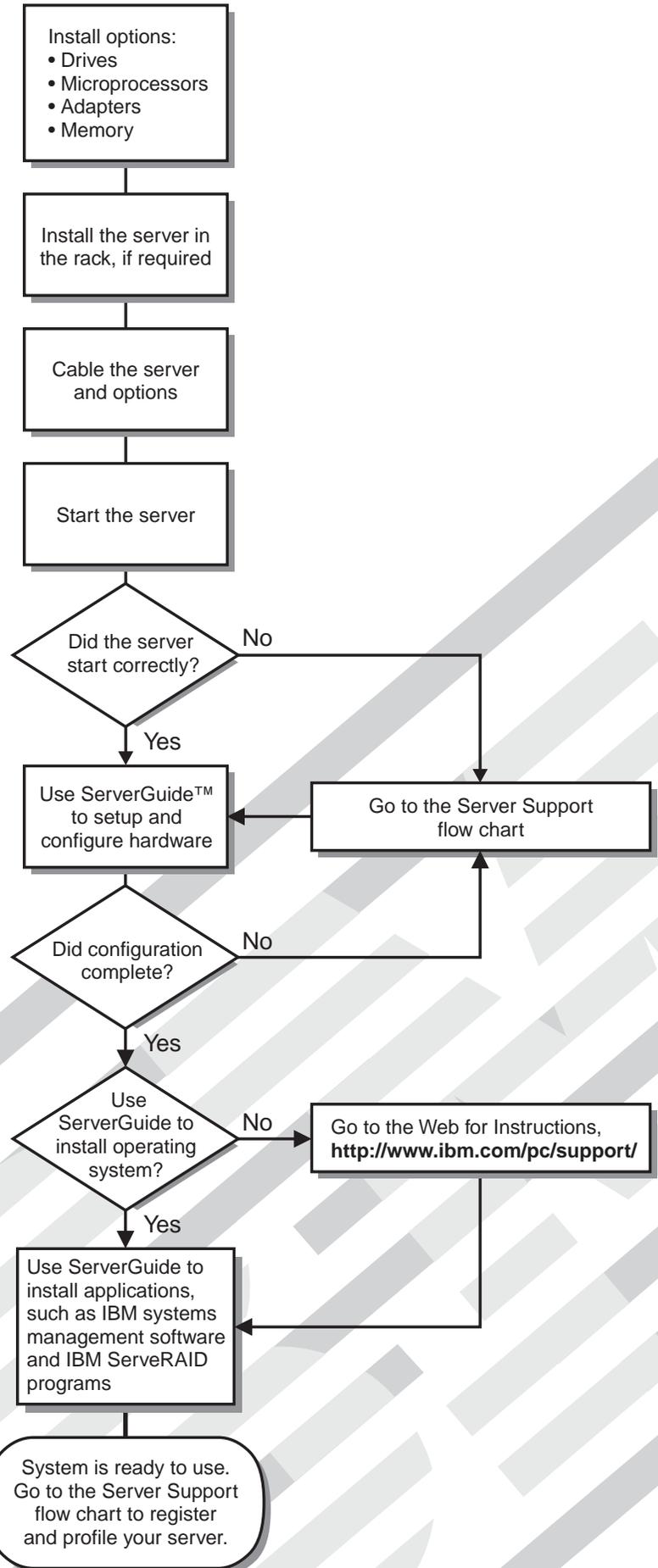
Welcome...

Thank you for buying an IBM xSeries server.

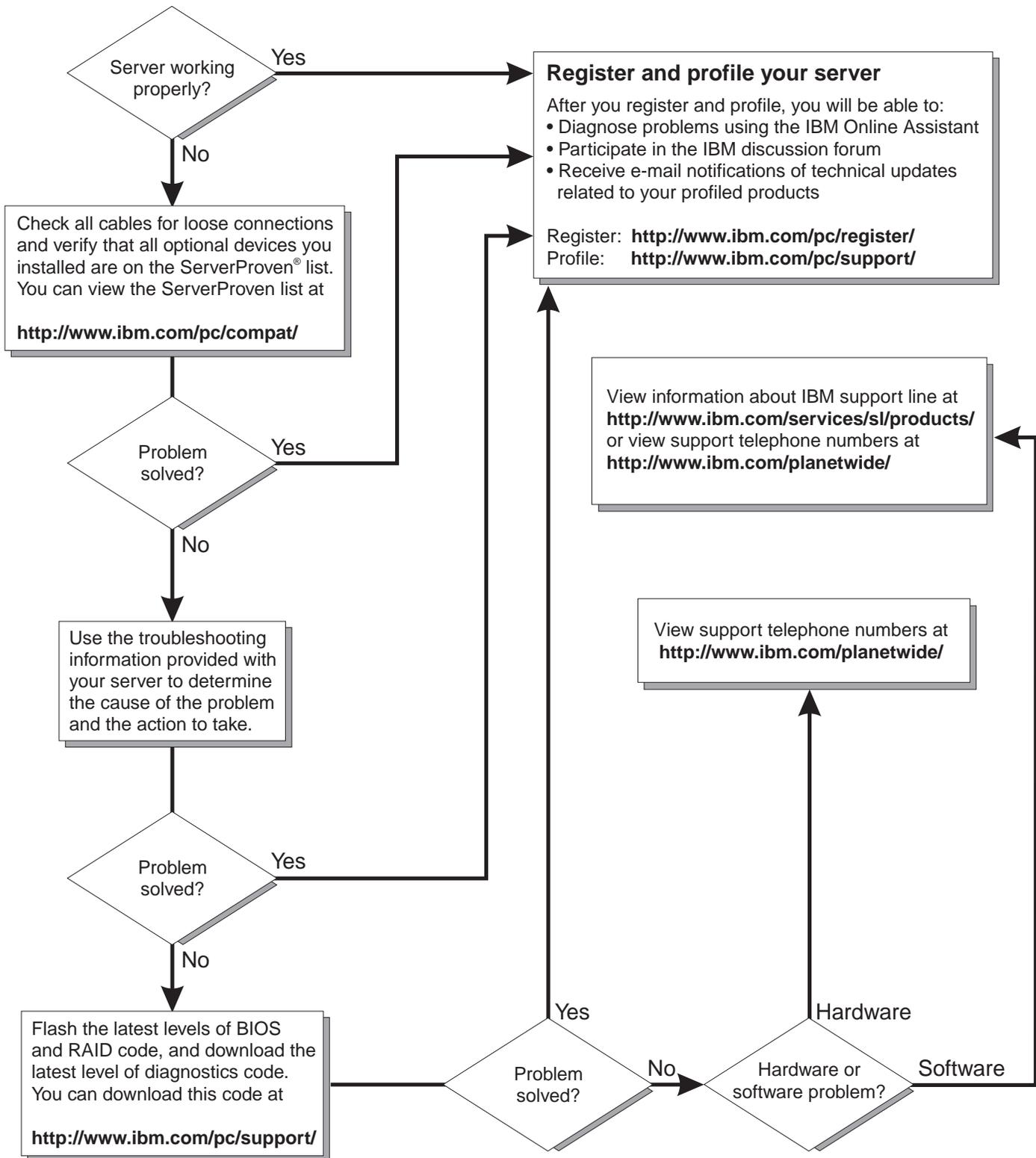
This server *Installation Guide* contains information for setting up and configuring your server.

For detailed information about your server, view the *User's Guide* on the Documentation CD.

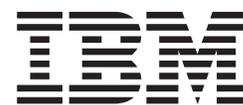
You can also find the most current information about your server on the IBM Web site at: <http://www.ibm.com/pc/support>



Server Support



IBM xSeries 225
Type 8647



Installation Guide

Note:

Before using this information and the product it supports, read the general information in Appendix B, "Warranty information" on page 63 and Appendix C, "Notices" on page 75.

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Contents

Safety	vii
Chapter 1. Introduction	1
About your documentation CD	2
System requirements	2
Starting the IBM Documentation Browser	2
Using the IBM Documentation Browser	2
Using the search feature	3
Features and specifications	4
Notices and statements used in this book	5
Major components of your server	6
System-board option connectors	7
System-board internal connectors	7
System-board external connectors	8
Chapter 2. Installing options	9
Installation guidelines	9
System reliability guidelines	9
Handling static-sensitive devices	10
Moving the stabilizing feet	10
Removing the side cover	11
Removing the bezel	12
Removing and installing the support bracket	13
Working with adapters	13
Adapter considerations	13
Installing an adapter	14
Cabling an optional SCSI adapter	17
Installing internal drives	18
Internal drive bays	18
Preinstallation steps	20
Installing a drive in bay 2	20
Installing a non-hot-swap hard disk drive	22
Power and signal cables for internal drives	25
Installing a hot-swap drive	26
SCSI IDs for hot-swap hard disk drives	27
Installing memory modules	28
Installing an additional microprocessor	30
Installing a security rope clip	33
Completing the installation	34
Replacing the bezel	34
Replacing the side cover	35
Cabling the server	36
Updating your server configuration	36
Chapter 3. Server controls, indicators, and power	37
Controls and indicators	37
Server power features	38
Turning on the server	38
Turning off the server	40
Chapter 4. Configuring your server	41
Using the ServerGuide Setup and Installation CD	41
Using the Configuration/Setup Utility program	42

Using ServeRAID Manager	42
Using ServeRAID Manager in startable-CD mode	43
Viewing your configuration.	47
Getting assistance	48
Using the LSI Logic Configuration Utility program	49
Chapter 5. Installing IBM Director updates	51
Chapter 6. Solving problems	53
Diagnostic tools overview	53
Power-on self-test (POST).	54
POST beep codes	54
POST error messages	54
ServerGuide problems	55
Troubleshooting charts	56
CD-ROM drive problems	56
Diskette drive problems.	56
Hard disk drive problems	56
Keyboard, mouse, or pointing-device problems	57
Memory problems	57
Microprocessor problems	57
Monitor problems	58
Power problems	59
System-board error LEDs	59
Appendix A. Getting help and technical assistance	61
Before you call	61
Using the documentation	61
Getting help and information from the World Wide Web	61
Software service and support	62
Hardware service and support	62
Appendix B. Warranty information	63
Warranty period	63
Problem determination	63
Warranty service and support	64
International Warranty Service	64
Purchasing additional services	65
IBM Statement of Limited Warranty Z125-4753-06 8/2000	66
Part 1 - General Terms	66
Part 2 - Country-unique Terms	68
Appendix C. Notices	75
Edition notice	75
Trademarks	76
Important notes.	76
Electronic emission notices	77
Federal Communications Commission (FCC) statement	77
Industry Canada Class A emission compliance statement	77
Australia and New Zealand Class A statement	78
United Kingdom telecommunications safety requirement.	78
European Union EMC Directive conformance statement.	78
Taiwan electrical emission statement	78
Japanese Voluntary Control Council for Interference (VCCI) statement	79
Power cords	79

Index 81

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1



<p>Danger</p> <p>Electrical current from power, telephone, and communication cables is hazardous.</p> <p>To avoid a shock hazard:</p> <ul style="list-style-type: none">• 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.
--

<p>To connect:</p> <ol style="list-style-type: none">1. Turn everything OFF.2. First, attach all cables to devices.3. Attach signal cables to connectors.4. Attach power cords to outlet.5. Turn device ON.	<p>To disconnect:</p> <ol style="list-style-type: none">1. Turn everything OFF.2. First, remove power cords from outlet.3. Remove signal cables from connectors.4. Remove all cables from devices.
---	---

Statement 2



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

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

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

Statement 3



CAUTION:

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

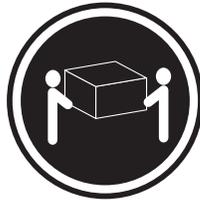
- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation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



Danger

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

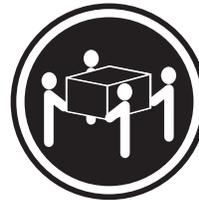
Statement 4



≥18 kg (39.7 lb)



≥32 kg (70.5 lb)



≥55 kg (121.2 lb)

CAUTION:

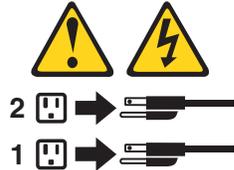
Use safe practices when lifting.

Statement 5



CAUTION:

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



Statement 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 15



CAUTION:

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

Statement 23



CAUTION:

Do not place any object weighing more than 50 kg (110 lb) on top of rack-mounted devices.



>50 kg (110 lb)

Declaración 23



PRECAUCIÓN:

No coloque ningún objeto que pese más de 50 kg (110 libras) encima de los dispositivos montados en bastidor.



>50 kg (110 libras)

Hinweis 23



ACHTUNG:

Keine Gegenstände, die mehr als 50 kg wiegen, auf Rack-Einheiten ablegen.



>50 kg

Notice n° 23



ATTENTION:

Ne posez pas d'objet dont le poids dépasse 50 kg sur les unités montées en armoire.



>50 kg

Varningsmeddelande 23



WARNING:

Placera inte något föremål som väger mer än 50 kg ovanpå rackmonterade enheter.



>50 kg

Merknad 23



ADVARSEL:

Ikke sett gjenstander som veier mer enn 50 kg oppå enheter som er montert i et kabinett.



>50 kg

Avviso 23



ATTENZIONE:

Non poggiare oggetti che pesano più di 50 kg sulla parte superiore delle unità montate in rack.



>50 kg

Turvaohje 23



Varoitus:

Telineeseen asennettujen laitteiden päälle ei saa asettaa yli 50 kilon painoista esinettä.



>50 kg

Voorschrift 23



WAARSCHUWING:

Plaats geen objecten die meer dan 50 kg wegen op apparaten die in het rek zijn gemonteerd.



>50 kg

Forskrift 23



Pas på!:

Anbring ikke genstande, der vejer mere end 50 kg, oven på enheder, der er monteret i rack.



>50 kg

Instrução 23



CUIDADO:

Não coloque nenhum objeto com peso superior a 50 kg (110 lbs.) sobre dispositivos montados em rack.



>50 kg (110 lbs)

عبارة ٢٣



تنبيه :

لا تضع أي عنصر يزن أكثر من ٥٠ كيلوجرام (١١٠ رطل) أعلى سطح الأجهزة.



أكبر من ٥٠ كيلوجرام (١١٠ رطل)

• Izjava br. 23



OPREZ:

Ne postavljajte predmete teže od 50 kg (110 funti) na ormar u koji su ugrađeni uređaji.



> 50 kg (110 lbs)

Δήλωση 23



ΠΡΟΣΟΧΗ:

Μην τοποθετείτε οποιοδήποτε αντικείμενο με βάρος μεγαλύτερο από 50 kg επάνω σε συσκευές που έχουν προσαρμοσθεί σε ικρίωμα (rack).



> 50 kg

הודעה 23



זהירות:

אל תניחו שום חפץ שמשקלו יותר מ-50 ק"ג על גבי התקנים המורכבים על מסדי מרשימים.



50 ק"ג

- 23. ismertető



FIGYELEM:

Keretszerelésű eszközök tetejére ne helyezzen olyan tárgyat, melynek súlya több, mint 50 kg (110 lbs.).



> 50 kg (110 lbs)

注意

ラック・モデルのサーバーの上に 50 Kg 以上の物を置かないでください。



> 50 Kg

경고문 23



주의:

서랍형 모델의 장치 상단에 50 kg(110 lbs.)이 넘는 물체를 올려 놓지 마십시오.



> 50 kg (110 lbs)

Instrukcja 23



ZAGROŻENIE:

Nie należy umieszczać przedmiotów cięższych niż 50 kg (110 funtów.)



> 50 kg (110 funtów)

· Положение 23



ОСТОРОЖНО:

Не ставьте предметы весом более 50 кг на верхнюю крышку устройств, смонтированных на выдвижных полках.



> 50 кг

声明 23



警告:

机柜安装的设备上面不能放置重于 50kg (110 磅) 的物品。



> 50 kg (110 磅)

· Príkaz 23



VÝSTRAHA:

Neumiestňujte žiadny predmet vážiaci viac ako 50 kg (110 lbs.) na vrch zariadenia montovaného do stojana.



> 50 kg (110 lbs)

· Navedba 23



SVARILO:

Ne postavljajte nobenega predmeta, ki je težji od 50 kg, na vrh naprav, montiranih v stojala.



> 50 kg (110 lbs)

聲明 23



注意：

請勿將任何重量超過 50 公斤 (110 磅) 的物品置於已安裝機架的裝置上方。



> 50 公斤 (110 磅)

Instrukce 23



POZOR:

Neumíst'ujte nic s hmotností vyšší než 50 kg navrch zařízení namontovaných do stojanu.



>50 kg (110 lbs)

▪ Инструкција 23



ПРЕДУПРЕДУВАЊЕ:

Не поставувајте предмети потешки од 50 кг. (110 lbs.) над уредите кои се монтирани во ормари.



>50 kg (110 lbs)

Instrução 23



CUIDADO:

Não coloque nenhum objeto com peso superior a 50 kg (110 lbs.) sobre dispositivos montados em rack.



>50 kg (110 lbs)

Chapter 1. Introduction

This *Installation Guide* contains instructions for setting up your IBM® @server xSeries™ 225 Type 8647 server and basic instructions for installing some options. More detailed instructions for installing options are in the *Option Installation Guide* on the IBM xSeries Documentation CD, which comes with your server. This publication contains information about:

- Setting up and cabling your server
- Starting and configuring your server
- Installing your operating system

The latest version of this publication is available from the IBM Web site. Go to <http://www.ibm.com/> and click **Support & downloads**. In the **Technical support** keyword search field, type 8647 and click **Go**. A list of publications for your server is displayed.

Your server comes with an IBM *ServerGuide™ Setup and Installation CD* to help you configure the hardware, install device drivers, and install the operating system.

Your server comes with a limited warranty. If you have access to the World Wide Web, you can obtain up-to-date information about your server and other IBM server products at <http://www.ibm.com/eserver/xseries/>.

Record information about your server in the following table. You will need this information when you register your server with IBM.

Product name	IBM @server xSeries 225 server
Machine type	8647
Model number	_____
Serial number	_____
Key serial number	_____
Key manufacturer	_____
Key phone number	_____

Your server serial number and model number are on labels on the bottom of the server and on the front of the server near the bottom of the bezel behind the door. The information label containing the serial number, machine type, model number, and agency marks for your server is on the bottom of the server.

Important: Your server keys cannot be duplicated by a locksmith. If you lose them, order replacement keys from the key manufacturer. The key serial number and the telephone number of the manufacturer are on a tag attached to the keys.

If you plan to install your server in a rack, you need to purchase a *Tower-to-Rack Kit* conversion kit. For a list of supported options for your server, see the ServerProven® list at <http://www.ibm.com/pc/compat/>.

About your documentation CD

Your server comes with a documentation CD, which contains documentation for your server in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

System requirements

To run the documentation CD, your system must have the following minimum hardware and software:

- Microsoft® Windows NT® 4.0 (with Service Pack 3 or later), Windows® 98, Windows 2000, or Windows XP Professional.
- 100 MHz Intel Pentium® microprocessor.
- 32 MB RAM.
- Adobe Acrobat Reader 3.0 or later. Adobe Acrobat Reader software is included on the documentation CD, and you can install it when you run the IBM Documentation Browser.

Starting the IBM Documentation Browser

Use one of the following procedures to start the Documentation Browser:

- If Autostart is enabled, insert the documentation CD into your CD-ROM drive. The Documentation Browser will start automatically.
- If Autostart is disabled, insert the documentation CD into your CD-ROM drive; then, click **Start --> Run**. In the **Open** field, type

```
e:\win32.bat
```

where *e* is the drive letter of your CD-ROM drive, and click **OK**.

Using the IBM Documentation Browser

Use the IBM Documentation Browser to browse the contents of the documentation CD, select from a list of available topics, see brief descriptions of the selected topics, and view selected topics using Adobe Acrobat Reader. The Documentation Browser automatically detects the regional settings in use on your system and presents the information in the language for that region (if available). If a topic is not available in the language for that region, the English version is displayed.

Click **Help** for detailed information about using the IBM Documentation Browser.

Complete the following steps to use the Documentation Browser:

1. Select your product from the **Product** drop-down list.
The **Topics** list appears. It lists all topics that pertain to the selected product. Topics are in folders or under other topics. A plus sign (+) appears beside each folder or topic that has additional topics under it. Click the plus sign to display the additional topics.
2. Click a topic to select it.
When you select a topic, a description of the topic contents appears in the **Description** field.

Note: To select multiple topics, press and hold down the Ctrl key while selecting your topics.
3. View selected topics.
Click **View Book**. Adobe Acrobat Reader starts, and the selected topics are displayed.

Using the search feature

Complete the following steps to use the Documentation Browser search feature:

1. Type a key word in the **Search** field.
2. Click **Search**. The topics containing the search word are listed in order based on the number of occurrences.
3. Click a file to open it.
4. Press Ctrl+F and use the Adobe Acrobat search function to search within the file.

Features and specifications

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

You can use the Configuration/Setup Utility program in your server to determine the specific type of microprocessor that is on the system board.

Table 1. Features and specifications

<p>Microprocessor:</p> <ul style="list-style-type: none"> • Intel Xeon™ Processor • 512 KB Level-2 cache • 400 MHz or 533 MHz front-side bus (FSB) • Support for up to two microprocessors <p>Memory:</p> <ul style="list-style-type: none"> • Minimum: 256 MB • Maximum: 8 GB • Type: PC2100, double-data-rate (DDR) • Connectors: four dual inline memory module (DIMM) connectors, two-way interleaved <p>Drives standard:</p> <ul style="list-style-type: none"> • Diskette: 1.44 MB (two mode) • CD-ROM: IDE <p>Expansion bays:</p> <ul style="list-style-type: none"> • Six open hot-swap, slim-high, 3.5-inch drive bays (some models) • Four slim-high, 3.5-inch drive bays with one hard disk drive installed (some models) • Two 5.25-inch bays (CD-ROM drive installed in one bay) • One 3.5-inch removable-media drive bay (diskette drive installed) <p>PCI expansion slots:</p> <ul style="list-style-type: none"> • Four PCI-X 100 MHz/64-bit • One PCI 33 MHz/32-bit <p>Cooling:</p> <p>Three speed-controlled fans</p> <p>Upgradeable microcode:</p> <p>BIOS upgrades (when available) can update EEPROMs on the system board</p>	<p>Integrated functions:</p> <ul style="list-style-type: none"> • Support for IBM Remote Supervisor Adapter • Broadcom 5703 10/100/1000 Ethernet controller on the system board with RJ-45 Ethernet port • Two serial ports • One parallel port • Integrated SCSI controller with RAID capabilities and two Ultra320 SCSI ports (one internal, one optional external) • Four Universal Serial Bus (USB) v2.0 ports (two on front and two on rear of enclosure) • Keyboard port • Mouse port • Audio ports (rear) <ul style="list-style-type: none"> – Line out – Mic – Line in • ATA-100 dual-channel IDE controller • ATI Rage XL video (mini-PCI) <ul style="list-style-type: none"> – Compatible with SVGA and VGA – 8 MB video memory <p>Failure LEDs:</p> <ul style="list-style-type: none"> • Fans • Memory • Microprocessors <p>Power supplies:</p> <ul style="list-style-type: none"> • Hot-swap (some models) <ul style="list-style-type: none"> Standard: Two 350 watt output (115-230 V ac) for redundancy • Non-hot-swap (some models) <ul style="list-style-type: none"> Standard: One 425 watt output (115-230 V ac) 	<p>Electrical input:</p> <ul style="list-style-type: none"> • Sine-wave input (50 or 60 Hz) required • Input voltage and frequency ranges automatically selected • Input voltage low range: <ul style="list-style-type: none"> – Minimum: 100 V ac – Maximum: 127 V ac • Input voltage high range: <ul style="list-style-type: none"> – Minimum: 200 V ac – Maximum: 240 V ac • Input kilovolt-amperes (kVA) approximately: <ul style="list-style-type: none"> – Minimum: 0.15 kVA (all models) – Maximum: 0.80 kVA with standard power supply, 0.62 kVA with optional redundant hot-swap power supplies <p>Heat output:</p> <p>Approximate heat output in British thermal units (Btu) per hour</p> <ul style="list-style-type: none"> • Minimum configuration: 341 Btu/hour (100 watts) • Maximum configuration: 2455 Btu/hour (720 watts) with standard power supply, 1910 Btu/hour (560 watts) with optional redundant hot-swap power supplies <p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – Server on: 10° to 35°C (50° to 95°F) Altitude: 0 to 2134 m (7000 ft) – Server off: -40° to +60°C (-40° to 140°F) Maximum altitude: 2133 m (7000 ft) • Humidity (operating and storage): 8% to 80% <p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> • Sound power, idle: 5.3 bel maximum • Sound power, operating: 5.6 bel maximum <p>Size:</p> <ul style="list-style-type: none"> • Height: 440 mm (18.4 in.) • Depth: 660 mm (26 in.) • Width: 217 mm (8.6 in.) • Weight: 20 kg (44 lb) to 25.8 kg (57 lb) depending upon configuration
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Notices and statements used in this book

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

The following notices and statements are used in the documentation:

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

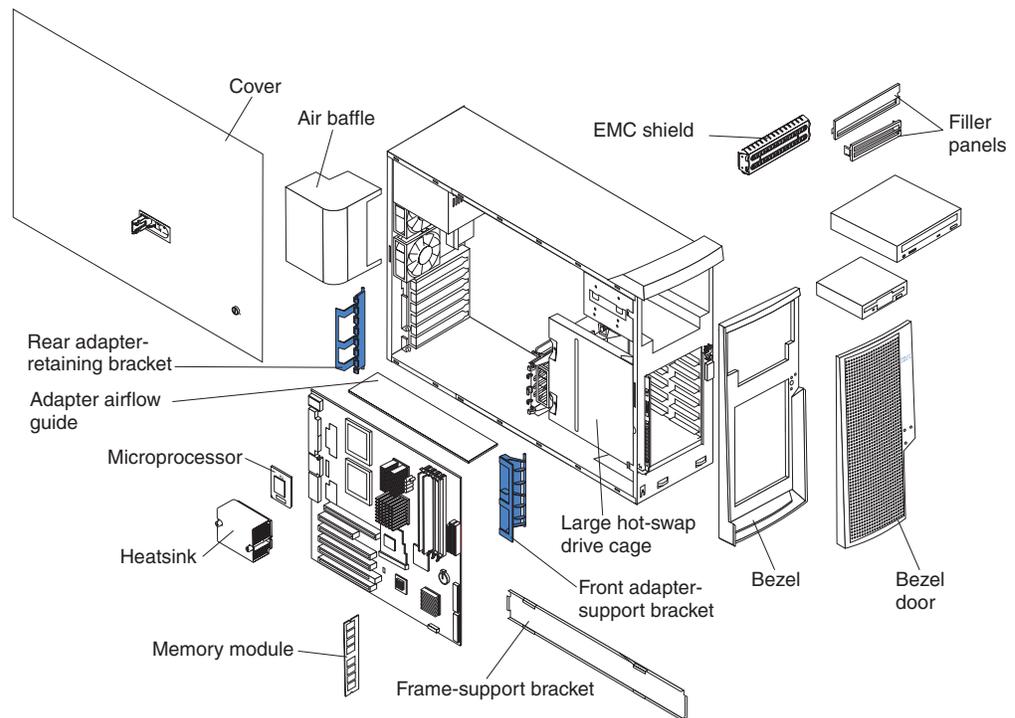
Major components of your server

The orange color on components and labels in your server identifies hot-swap or hot-plug components. You can install or remove these components while the server is running, provided that the server is configured to support hot-swap and hot-plug features. For complete details about installing or removing a hot-swap or hot-plug component, see the information in Chapter 2, "Installing options" on page 9.

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

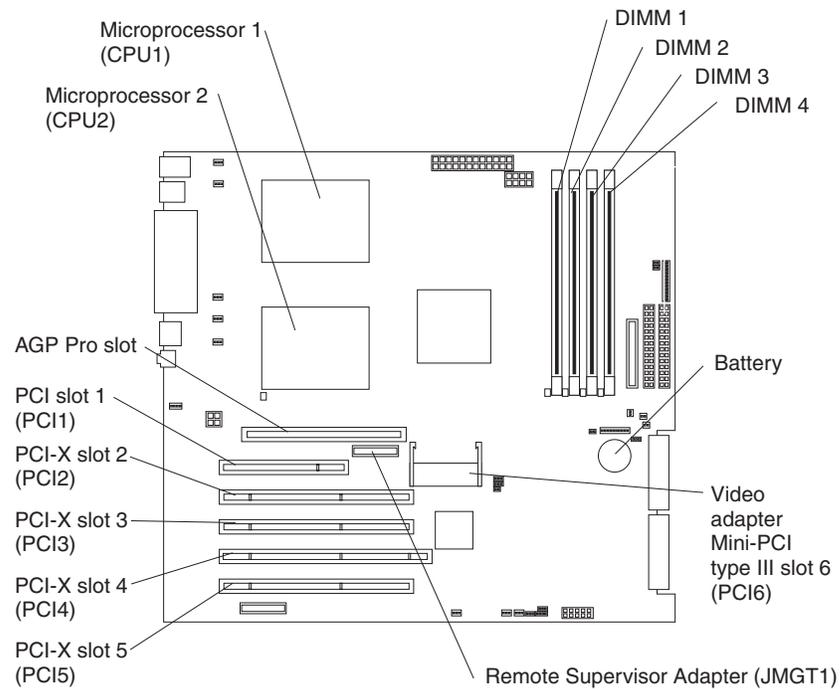
The following illustration shows the major components in the server.

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



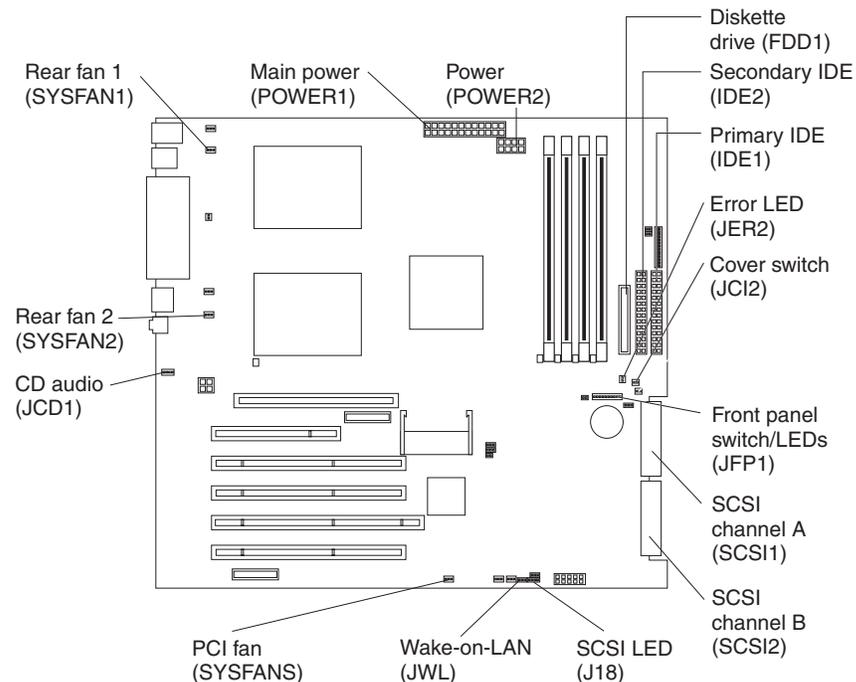
System-board option connectors

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



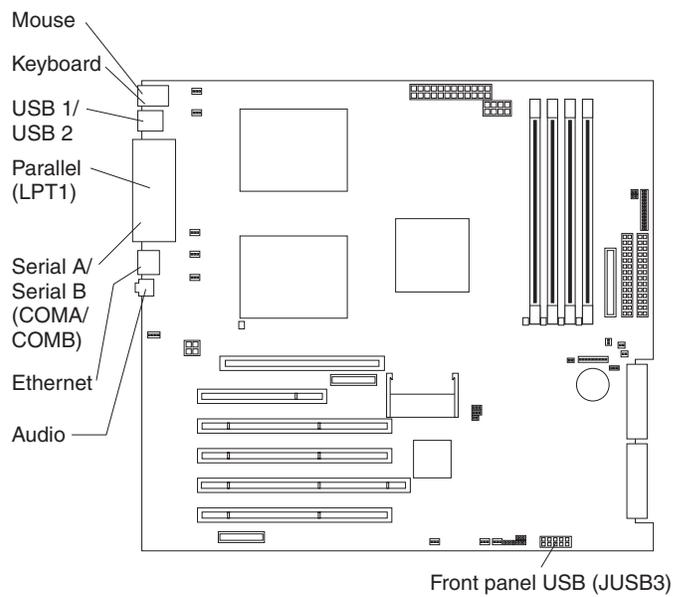
System-board internal connectors

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



System-board external connectors

The following illustration shows the external input/output port connectors on the system board.



Chapter 2. Installing options

This chapter provides basic instructions for installing hardware options in your server. These instructions are intended for users who are experienced with setting up IBM server hardware. If you need more detailed instructions, see the *Option Installation Guide* on the IBM *xSeries Documentation CD*.

Installation guidelines

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

- Review the safety information beginning on page vii and the guidelines in “Handling static-sensitive devices” on page 10. This information will help you work safely with your server and options.
- When you need to access the inside of the server to install options, you might find it easier to lay the server on its side. If your server has stabilizing feet that rotate, before laying the server on its side, rotate the stabilizing feet a quarter turn inward toward the server, so that they do not break. Before returning the server to an upright position, rotate the stabilizing feet a quarter turn outward from the server. See “Moving the stabilizing feet” on page 10 for more information.
- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and other devices that you will connect to the server.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- You do not need to turn off the server to install or replace hot-swap power supplies, hot-swap drives, or hot-plug Universal Serial Bus (USB) devices.
- The blue color on components and labels identifies touch points, where you can grip a component, move a latch, and so on.
- For a list of supported options for your server, go to <http://www.ibm.com/pc/us/compat/> on the World Wide Web.

System reliability guidelines

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

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- If the server has redundant power, each of the power-supply bays has a power supply installed in it.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2 in.) of open space around the front and rear of the server. Do not place objects in front of the fans. For proper cooling and airflow, replace the server cover before turning on the server. Operating the server for extended periods of time (over 30 minutes) with the server cover removed might damage server components.

When installing the server in a rack, make sure that space is available around the server to enable the server cooling system to work properly. See the documentation that comes with the rack for additional information.

- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan as soon as possible.
- You replace a hot-swap drive within 2 minutes of its removal.

- You do not remove the air baffle when the server is operational. Operating the server without the air baffle might cause the microprocessor to overheat.
- Microprocessor socket 2 always contains either a microprocessor baffle or a microprocessor and heat sink.

Handling static-sensitive devices

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

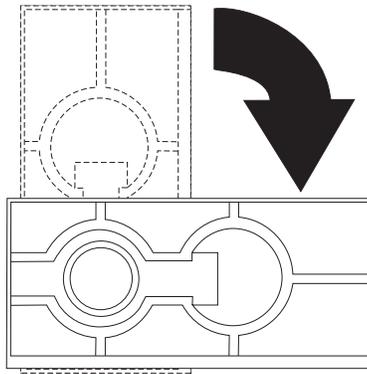
To reduce the possibility of electrostatic discharge, observe the following precautions:

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

Moving the stabilizing feet

On some server models, the four feet on the bottom of the server rotate 90 degrees to provide additional stability.

When installing options in the server, you might find it easier to lay the server on its side. If you do so, rotate the feet inward toward the server, so that they do not break.

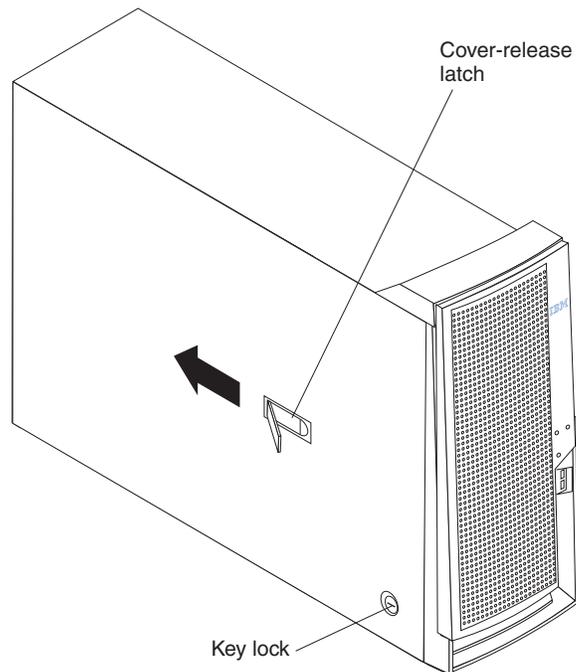


Removing the side cover

To remove the side cover, you might find it easier to lay the server on its side. If you do, and your server has stabilizing feet that rotate, move the stabilizing feet so that they do not break (see “Moving the stabilizing feet” on page 10).

Complete the following steps to remove the side cover of the server:

1. Review the “Installation guidelines” on page 9.
2. Turn off the server and all attached devices (see “Turning off the server” on page 40); then, disconnect all power cords and external cables.
3. Unlock the side cover; then, pull the cover-release latch away from the server, and push the cover toward the rear of the server. Lift the side cover off the server and set it aside.



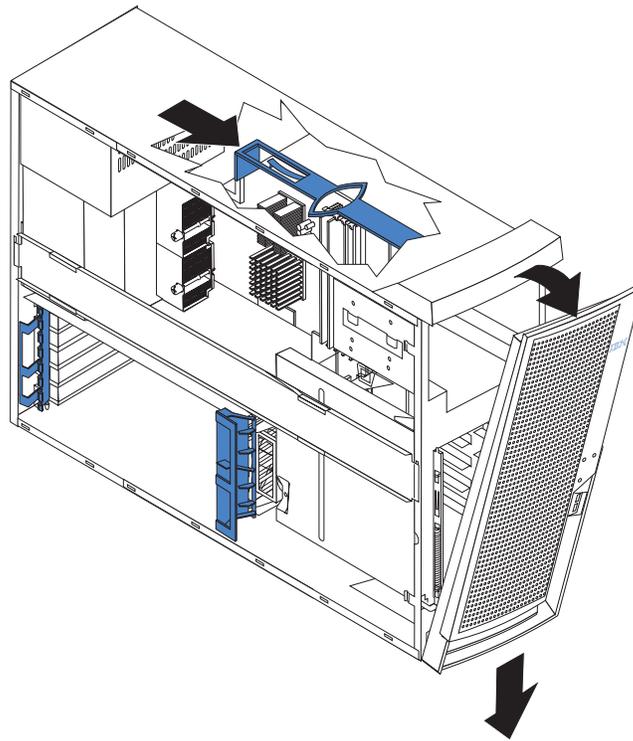
Attention: For proper cooling and airflow, replace the cover before turning on the server. Operating the server with the cover removed might damage server components.

Removing the bezel

When working with some devices, such as additional optical drives, you must first remove the bezel to access the device.

Complete the following steps to remove the bezel:

1. Remove the side cover (see “Removing the side cover” on page 11).
2. For hot-swap hard disk drive models:
 - a. Open the server door.
 - b. Rotate the hot-swap lock bar forward and remove it from the bezel (see the illustration on page 26). If the hot-swap lock bar will not rotate, press the top of the hot-swap lock bar to release the lock mechanism.
3. Locate the bezel-release lever; then, press the bezel-release lever toward the front of the server.
4. Pull the top of the bezel away from the chassis; then, push the bezel down to disengage the bottom tabs.
5. Remove the bezel from the server and store the bezel in a safe place.

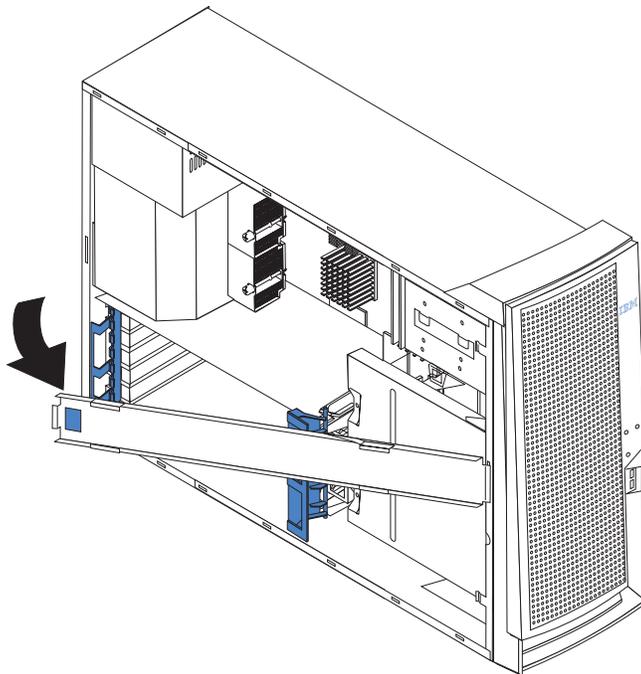


Removing and installing the support bracket

When working with some devices, such as hard disk drives, adapters, and memory modules, you must first remove the support bracket to access the device.

Complete the following steps to remove the support bracket:

1. Remove the side cover (“Removing the side cover” on page 11).
2. Pull out on the rear end of the support bracket approximately 150 mm (6 in.).
3. Disengage the front end of the support bracket from the server and set the bracket aside.



To reinstall the support bracket, reverse the previous steps.

Working with adapters

Your server comes with adapter connectors or *slots*. The standard video adapter is installed in mini-PCI slot 6 (PCI6). You can install up to five additional optional adapters in PCI slot 1 (PCI1) and PCI-X slots 2 through 5 (PCI2 through PCI5).

See “System-board option connectors” on page 7 for the locations of expansion slots on the system board.

Adapter considerations

Before you install an adapter, review the following information:

- Read the documentation that comes with your operating system.
- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this chapter. If you need to change the switch or jumper settings on your adapter, follow the instructions that come with the adapter.
- Installation of an AGP video adapter in the AGP slot is not supported.

- You can install a only 32-bit adapter in the 32-bit PCI slot 1 and 64-bit adapters in the 64-bit PCI-X slots 2 through 5.
- You can install full-length adapters in all five expansion slots. None of the expansion slots are hot-plug.
- The 32-bit PCI slot 1 supports 5.0 V signaling PCI adapters; it does not support 3.3 V signaling adapters or 64-bit adapters.
- The 64-bit PCI-X slots 2 through 5 support 3.3 V signaling PCI or PCI-X adapters; they do not support 5.0 V signaling adapters.
- The PCI bus configuration is as follows:
 - The 32-bit PCI slot 1 and mini-PCI slot 6 (video adapter) are on the 33 MHz PCI bus.

Note: Do not install any adapters other than the standard video adapter in mini-PCI slot 6. Other adapter types are not supported.

- The 64-bit PCI-X slots 2 and 3 and the integrated Ethernet controller are on the 100 MHz PCI-X bus, channel A.
- The 64-bit PCI-X slots 4 and 5 and the integrated SCSI controller with RAID capabilities are on the 100 MHz PCI bus, channel B. If an optional ServeRAID™-5i controller is installed, it overrides the standard functionality of the integrated SCSI controller with RAID capabilities and forces PCI-X slots 4 and 5 to 66 MHz.
- The optional IBM Remote Supervisor Adapter can be installed only in PCI slot 1. Use the ribbon cable that comes with this adapter to connect it to the Remote Supervisor Adapter connector (JMGT1) on the system board.
- The optional ServeRAID-5i controller can be installed only in PCI-X slot 4 and must use the 3-U bracket that comes preinstalled on the controller.
- To provide failover protection, an optional Ethernet adapter can be installed only in PCI-X slots 2 through 5.
- The server scans the AGP slot, mini-PCI slot 6, PCI expansion slot 1, and PCI-X expansion slots 2 through 5 to assign system resources. Then, the server starts the PCI devices in the following order, if you have not changed the default startup sequence: AGP slot, mini-PCI slot 6, PCI expansion slot 1, system-board integrated drive electronics (IDE) or SCSI devices (including optional ServeRAID-5i controller), and then PCI-X expansion slots 2 through 5.
- For a list of supported options for your server, go to <http://www.ibm.com/pc/support/> on the World Wide Web.

Installing an adapter

Note: You can install an optional ServeRAID-5i controller only in PCI-X slot 4. Slot 4 is the only PCI-X slot that supports the ServeRAID-5i controller requirements. Install the ServeRAID-5i controller using the 3-U bracket that comes preinstalled on the controller. See the documentation that comes with the ServeRAID-5i controller for additional information.

Complete the following steps to install an adapter in your server:

1. Review the “Installation guidelines” on page 9 and “Handling static-sensitive devices” on page 10.
2. Remove the side cover (see “Removing the side cover” on page 11).
3. Determine which slot you will use for the adapter. Check the instructions that come with the adapter for any requirements, restrictions, or cabling instructions. It might be easier to route cables before you install the adapter.

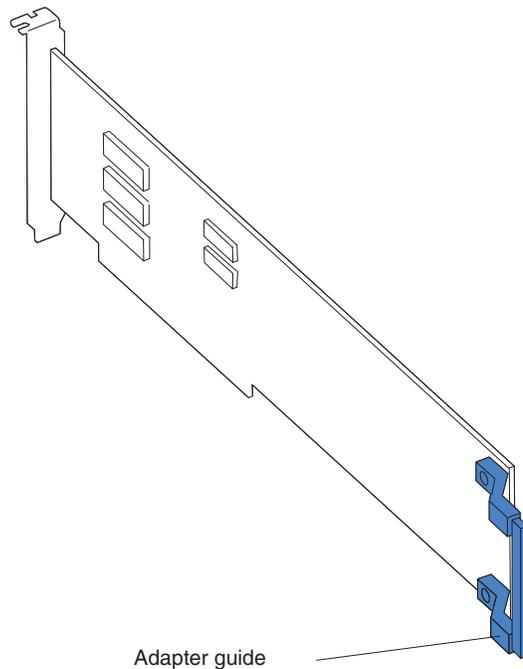
4. Rotate the rear adapter-retention bracket to the open (unlocked) position and remove it from the server. Rotate the front adapter-retention bracket to the open position. If you are installing a smaller adapter, remove only the rear adapter-retention bracket.
5. Remove the expansion-slot cover. From the rear of the server, press on the slot cover. Grasp it and pull it out of the expansion slot. Store it in a safe place for future use.

Note: Expansion-slot covers must be installed on all vacant slots. This maintains the electronic emissions standards of the server and ensures proper ventilation of server components.

6. Set any jumpers or switches on the adapter or system board according to the documentation that comes with the adapter.

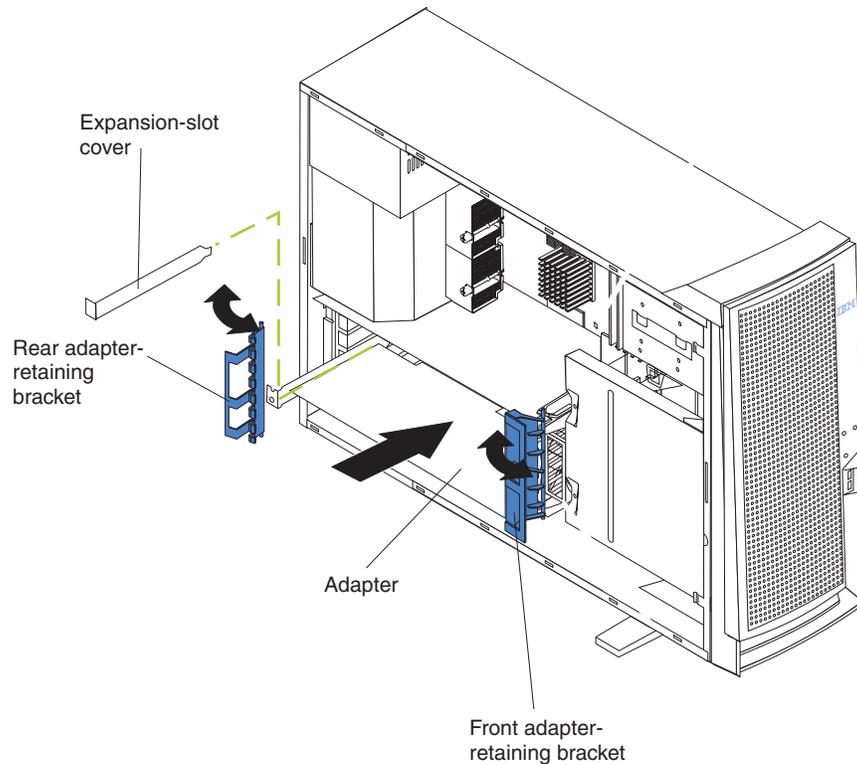
Attention: Avoid touching the components and gold-edge connectors on the adapter.

7. If you are installing a full-length adapter, remove the blue adapter guide (if any) from the end of the adapter.



Attention: Be certain that the adapter is correctly seated in the expansion slot before you turn on the server. Incomplete installation of an adapter might damage the system board or the adapter.

- Carefully grasp the adapter by the top edge or upper corners, and align it with the expansion slot guides; then, press the adapter *firmly* into the expansion slot. Move the adapter directly from the static-protective package to the adapter slot.



- Connect required cables to the adapter. Route cables so that they do not block the flow of air from the fans. If you are installing an optional SCSI adapter, see “Cabling an optional SCSI adapter” on page 17 for additional information.
- If you have another adapter to install, repeat steps 3 through 9.
- If you have installed a full-length adapter, rotate the front adapter-support bracket to the closed (locked) position.
- Reinstall the rear adapter-retention bracket; then, rotate the bracket to the closed (locked) position.

Note: If any adapters in your server are large or have heavy cables attached to them, you can remove the rear adapter-retention bracket and secure all of the adapters with expansion-slot screws. The expansion-slot screws are stored on the back of the server next to slot 1.

- If you have other options to install, do so now; otherwise, go to “Completing the installation” on page 34.

Cabling an optional SCSI adapter

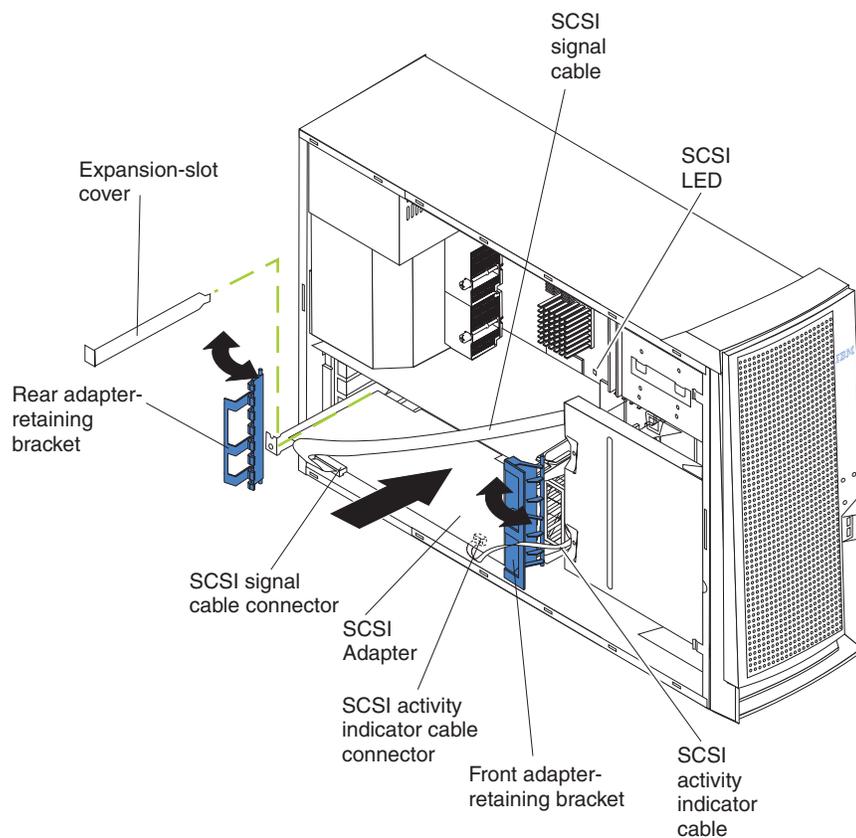
You can install an optional SCSI adapter in your server to control the internal hard disk drives. With a SCSI adapter installed, you can configure the internal hard disk drives into disk arrays. You can also cable a SCSI adapter to external hard disk drives. See your SCSI adapter option documentation for complete instructions for installing a SCSI adapter in your server and for additional information about SCSI adapters.

Notes:

1. This information in this section does not apply to the ServerRAID-5i controller, which uses the integrated SCSI controller with RAID capabilities on the system board.
2. An optional SCSI adapter or cable option is required to connect external SCSI devices.

Complete the following steps to cable an optional SCSI adapter:

1. Install the SCSI adapter (see “Installing an adapter” on page 14).
2. Connect the SCSI signal cable to the adapter and to one or more of the signal-cable connectors to the rear of the SCSI devices.
3. Connect the SCSI-activity-indicator cable to the adapter and to the SCSI-LED connector (J18) on the system board. See “System-board internal connectors” on page 7 for the location of the SCSI-LED connector.



4. Complete the installation of the optional SCSI adapter.

Installing internal drives

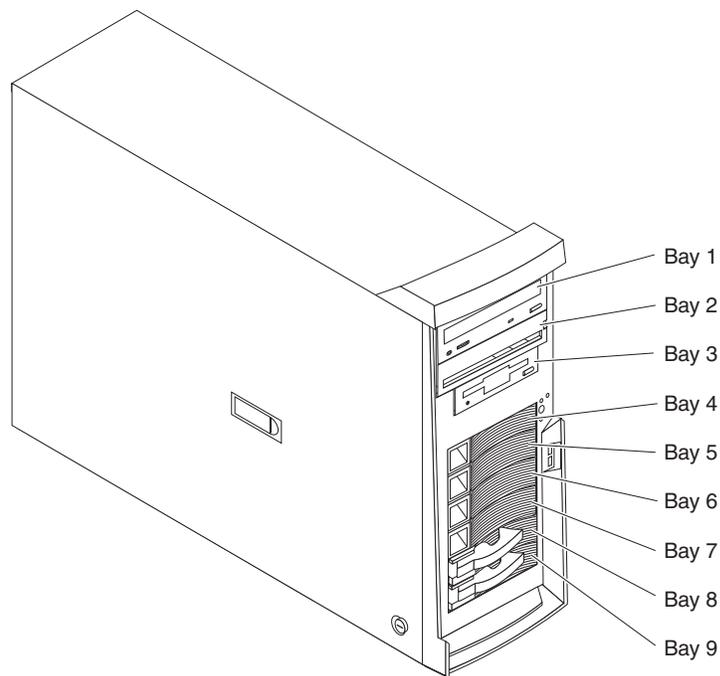
Depending on your server model, you might have one or more of the following drives installed:

- Diskette
- Hard disk
- CD-ROM

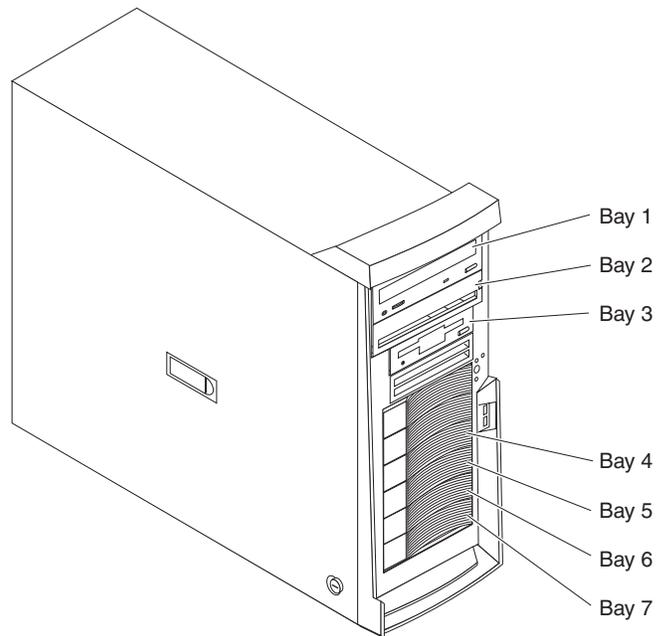
Internal drive bays

Some server models come with an IDE CD-ROM drive in bay 1, a 3.5-in., 1.44 MB diskette drive in bay 3, and six hot-swap hard disk drive bays. Other server models come with an IDE CD-ROM drive in bay 1, a 3.5-in., 1.44 MB diskette drive in bay 3, and a hard disk drive in bay 7.

Server with hot-swap hard disk drives



Server with non-hot-swap hard disk drives



Notes:

1. Diskette drives, tape drives, CD-ROM, DVD/CD-RW, and DVD-ROM drives are examples of removable-media drives. You can install removable-media drives in bays 1, 2, and 3 only.
2. The integrated IDE controller in your server supports the connection of up to four IDE devices.
3. You can install a 3.5-in. slim-high or 5.25-in. half-high removable-media drive, such as a tape backup drive, CD-RW, or DVD drive, in bay 2.
4. The server supports only one diskette drive.
5. To install a 3.5-in. drive in a 5.25-in. bay, you must use the 5.25-in. conversion kit, supplied with the option.
6. The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all bays and PCI slots covered or occupied. When you install a drive or PCI adapter, save the EMC shield and filler panel from the bay or the PCI adapter slot cover in the event you later remove the option.
7. For a complete list of supported options for your server, go to <http://www.ibm.com/pc/support/> on the World Wide Web.

Preinstallation steps

Some of these steps are required only the first time a drive is installed in a specific bay:

1. Review the safety information beginning on page vii, “Installation guidelines” on page 9, and the documentation that comes with your drive.
2. Verify that you have all the cables and other equipment specified in the documentation that comes with the drive.
3. Choose the bay in which you want to install the drive.
4. Check the instructions that come with the drive to see if you need to set any switches or jumpers on the drive. If you are installing a SCSI device, be sure to set the SCSI ID for that device.

Installing a drive in bay 2

Complete the following steps to install a drive in bay 2:

1. Follow the instructions in “Preinstallation steps” on page 20.
2. Remove the side cover (see “Removing the side cover” on page 11).
3. Remove the bezel (see “Removing the bezel” on page 12).
4. Remove the support bracket (see “Removing and installing the support bracket” on page 13).
5. Use a screwdriver to pry the filler panel and EMC shield away from the server.

Note: If you are installing a drive that contains a laser, observe the following safety precaution.

Statement 3



CAUTION:

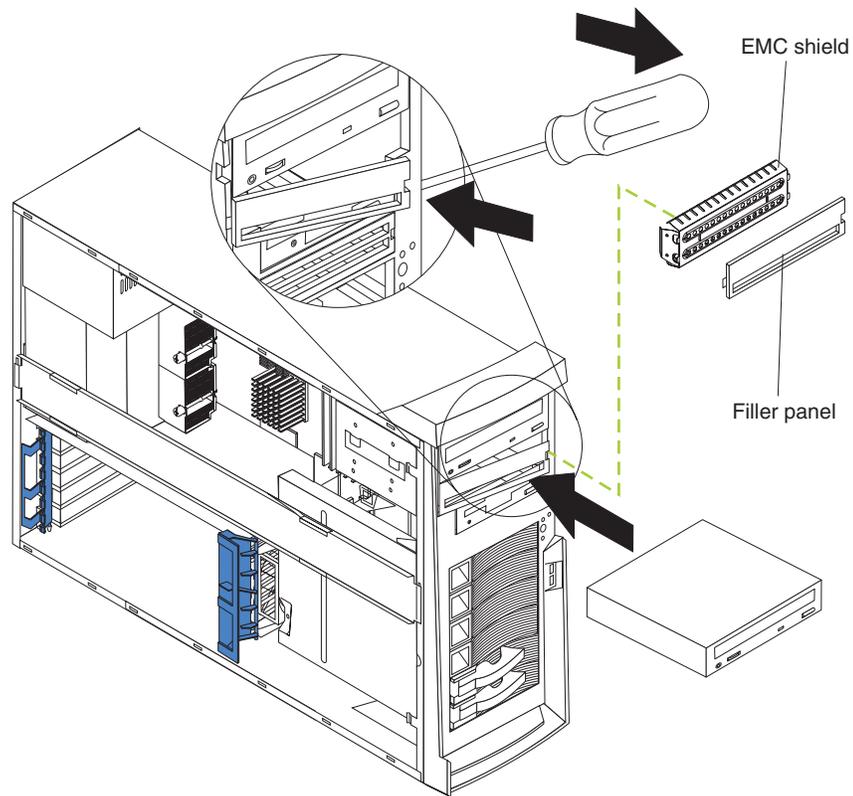
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

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



Danger

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



6. Touch the static-protective package containing the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
7. Set any jumpers or switches on the drive according to the documentation that comes with the drive.

Note: You might find it easier to install the new drive into the appropriate opening on the front, and then attach the cables.

8. If you are installing a 5.25-in. drive in bay 2, push the drive into the bay; then, use the two screws to attach the drive to the drive cage. If you are installing a 3.5-in. drive in bay 2, you must attach the 5.25-in. conversion kit, supplied with the option, to the 3.5-in. drive.
9. Determine whether the drive is an IDE or SCSI device; then, connect one end of the appropriate signal cable into the back of the drive and make sure that the other end of this cable is connected into the appropriate IDE or SCSI connector on the system board.
 - If you are installing a SCSI removable-media drive, use the one-drop SCSI cable that comes with the drive and connect it to SCSI channel B (SCSI2). See “Power and signal cables for internal drives” on page 25 for additional information about cabling drives and “System-board internal connectors” on page 7 for the location of IDE and SCSI connectors on the system board.
 - If there are open connectors on the cables connecting an existing IDE drive, this cable can be used to connect the new drive. The 4-connector SCSI cable that comes with non-hot-swap model servers cannot be used to connect a SCSI drive in bay 2.
10. Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor and memory.

11. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.
12. If you have other options to install or remove, do so now; otherwise replace the support bracket and then go to “Completing the installation” on page 34.

Installing a non-hot-swap hard disk drive

Some server models come with non-hot-swap hard disk drives. Non-hot swap hard disk drives are in the drive cage in bays 4, 5, 6, and 7. The drive cage is behind the front of the adapter-support bracket. Drives are installed starting at the bottom in bay 7. Additional drives are then installed in bays 6, 5, and 4.

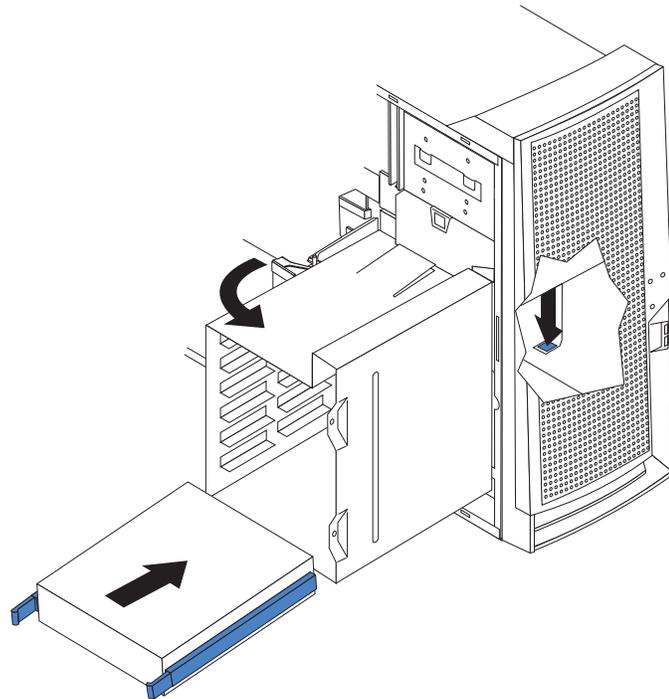
Notes:

1. You can install up to four non-hot-swap hard disk drives in your server. The additional space in the drive cage above bay 4 is not designed to accommodate any additional drives.
2. When installing non-hot-swap hard disk drives, you might find it easier to lay the server on its side. If you do so, and your server has stabilizing feet that rotate, move the feet inward toward the server, so that they do not break.

Complete the following steps to install a non-hot-swap hard disk drive in bay 4, 5, 6, or 7:

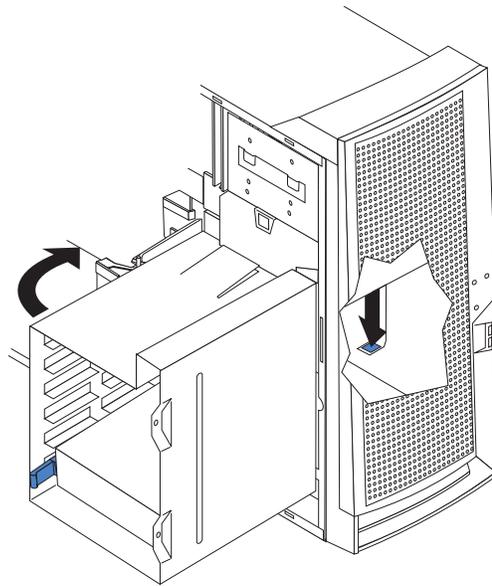
1. Follow the instructions in “Preinstallation steps” on page 20.
2. Remove the side cover (see “Removing the side cover” on page 11).
3. Remove the support bracket (see “Removing and installing the support bracket” on page 13).

4. Press the drive cage release lever down and then rotate the cage out of the server until the drive-cage retention tab locks into place and the open ends of the drive slots and installed drives are facing you. Ensure that the drive cage locks into place over the drive-cage retention tab by rotating the drive cage all the way out of the server.



5. Attach the blue guide rails to the side of the drive using the screws that are provided.
6. Slide the drive into the drive cage until the plastic tabs on the drive guide rails lock into place in the drive cage. Clear any cables that might impede the replacement of the drive cage.
7. Connect one end of the SCSI signal cable into the back of the drive and make sure that the other end of this cable is connected into the SCSI connector on the system board. See “Power and signal cables for internal drives” on page 25 for additional information about cabling drives and “System-board internal connectors” on page 7 for the location of the SCSI connectors on the system board. If there are open connectors on the cables connecting existing SCSI drives, these cables can be used to connect the new drive.
8. Route the signal cable so that it does not block the air flow to the rear of the drives or over the microprocessor and memory.
9. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.

10. Push the drive cage outward, and press in on the drive-cage release tab; then, rotate the cage back into the server.



11. If you have other options to install or remove, do so now; otherwise, replace the support bracket (see “Removing and installing the support bracket” on page 13) and then go to “Completing the installation” on page 34.

Power and signal cables for internal drives

Your server uses cables to connect IDE and SCSI devices to the power supply and to the system board. (See “System-board internal connectors” on page 7 for the location of system-board connectors.) Review the following information before connecting power and signal cables to internal drives:

- The drives that are preinstalled in your server come with power and signal cables attached. If you replace any drives, remember which cable is attached to which drive.
- When you install a drive, ensure that one of the drive connectors of the signal cable is connected to the drive and that the connector at the other end of the signal cable is connected to the system board.
- The server has two IDE buses, primary and secondary. Each of these buses supports up to two IDE devices. The primary IDE bus uses connector IDE1 on the system board and the secondary IDE bus uses connector IDE2.
- If you have only one IDE device on a cable, it must be set as a master device.
- If two IDE devices are used on a single cable, one must be designated as the master device and the other as the subordinate device; otherwise, the server might not recognize some of the IDE devices. The master and subordinate designation is determined by switch or jumper settings on each IDE device.

The following cables are provided:

- **Power cables:** Four-wire power cables connect the drives to the power supply. At the end of these cables are plastic connectors that can be attached to different drives; these connectors vary in size.
- **Signal cables:** Signal cables are typically flat cables, also called ribbon cables, that connect IDE, SCSI, and diskette drives to the system board. Two or three types of signal cable come with your server:
 - **IDE:** The wider IDE signal cable has three connectors. One of these connectors is attached to the drive, one is a spare, and the third is attached to the primary or secondary IDE connector on the system board. The spare connector can be used to connect an additional IDE drive to your server.
The CD-ROM drive is attached to an ATA 100 signal cable. ATA 100 signal cables are color-coded. The blue connector is attached to the system board. The black connector is attached to the master IDE device. The gray middle connector is attached to the subordinate IDE device.
 - **Diskette drive:** The narrower signal cable has two connectors. One is attached to the diskette drive, and the other is attached to the connector (FDD1) on the system board.
 - **SCSI:** A round SCSI cable connects SCSI devices to the integrated SCSI controller with RAID capabilities on the system board. For hot-swap models, the maximum cable length that supports Ultra320 SCSI hard disk drives is 16 inches. For more information about connecting SCSI devices, see the SCSI documentation.

Installing a hot-swap drive

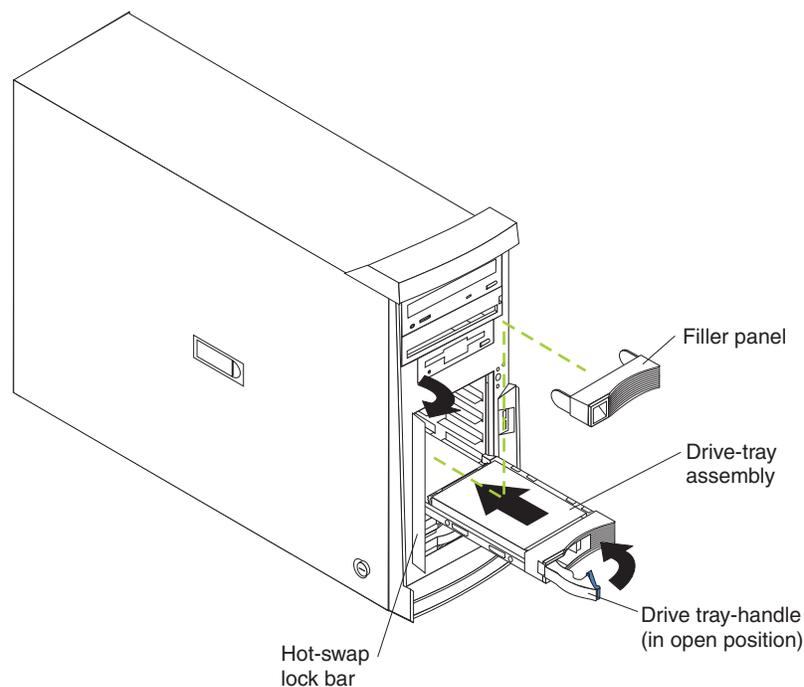
Some server models support a maximum of six 1-inch (26 mm) slim-high, 3.5-inch, hot-swap hard disk drives in the standard hot-swap bays. The hot-swap bays are arranged vertically in the standard hard disk drive cage; the bay numbers are 4 through 9 (from top to bottom) with SCSI IDs of 0 through 5 (from bottom to top). The hot-swap bays are below the removable-media drive bays.

For increased security, the hot-swap drives and filler panels are locked in the server by the hot-swap lock bar. The hot-swap lock bar cannot be released, allowing installation and removal of the hot-swap drives and filler panels, unless the key lock on the server side cover is unlocked.

Notes:

1. All hot-swap drives being used in the server should have the same speed rating; mixing speed ratings will cause all drives to operate at the lower speed.
2. You do not have to turn off the server to install hot-swap drives in the hot-swap drive bays. However, you must turn off the server when performing any steps that involve installing or removing cables.
3. The SCSI ID for each hot-swap hard disk drive is printed on the hot-swap lock bar.

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.

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 “Installation guidelines” on page 9, and “Handling static-sensitive devices” on page 10.
2. Open the server door.

3. Remove the hot-swap lock bar:
 - a. Unlock the side-cover lock.
 - b. Rotate the hot-swap lock bar forward and remove it from the bezel. If the hot-swap lock bar will not rotate, press the top of the hot-swap lock bar to release the lock mechanism.
4. Remove the filler panel from one of the empty hot-swap bays by inserting your finger into the depression at the left side of the filler panel and pulling it away from the server.
5. Install the hard disk drive in the hot-swap bay:
 - a. Ensure that the tray handle is open (that is, perpendicular to the drive).
 - b. Align the drive assembly with the guide rails in the bay.
 - c. Gently push the drive assembly into the bay until the drive stops.
 - d. Push the tray handle to the closed (locked) position.
 - e. Check the hard disk drive status indicator to verify that the hard disk drive is operating properly.

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

Note: If your server is configured for RAID operation using the integrated SCSI controller with RAID capabilities or an optional ServeRAID controller, you might need to reconfigure your disk arrays after installing hard disk drives. See the ServeRAID documentation on the *IBM ServeRAID Support* CD for additional information about RAID operation and complete instructions for using ServeRAID Manager.
6. If you are installing additional hot-swap hard disk drives, do so now; otherwise, replace the hot-swap lock bar.
7. If you have other options to install or remove, do so now; otherwise go to “Completing the installation” on page 34.

SCSI IDs for hot-swap hard disk drives

The hot-swap-drive backplane controls the SCSI IDs for the internal hot-swap drive bays. The SCSI ID for each hot-swap hard disk drive is printed on the hot-swap lock bar. Table 2 lists the SCSI IDs for the hard disk drives and backplane that are connected to one channel in hot-swap hard disk drive models. In the typical configuration, the standard hard disk drives and backplane are connected to channel A.

Table 2. SCSI IDs for standard hot-swap hard disk drives and backplane

Device	SCSI ID
Drive bay 9	0
Drive bay 8	1
Drive bay 7	2
Drive bay 6	3
Drive bay 5	4
Drive bay 4	5
Backplane	8

Installing memory modules

You can increase the amount of memory in your server by installing memory modules. Your server uses industry-standard PC2100 double-data-rate (DDR) dual inline memory modules (DIMMs).

Notes:

1. The system board contains four DIMM connectors and supports two-way memory interleaving.
2. The DIMM options available for your server are 128 MB, 256 MB, 512 MB, 1 GB, and 2 GB. Your server supports a minimum of 256 MB and a maximum of 8 GB of system memory.
3. The amount of usable memory will be reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. The BIOS will display the total amount of installed memory and the amount of configured memory.
4. Your server comes with two 256 MB or 512 MB DIMMs (for a total of 512 MB or 1024 MB) installed in the DIMM 3 and DIMM 4 memory connectors. When you install additional DIMMs, be sure to install them as a pair in DIMM connectors 1 and 2.
5. DIMMs must be installed in matched pairs. The first pair of DIMMs you install in DIMM 3 and DIMM 4 memory connectors must be the same size, speed, type, and technology. You can mix compatible DIMMs from various manufacturers. If you install a second pair of DIMMs in DIMM 1 and DIMM 2 memory connectors, they do not have to be the same size, speed, type, and technology as the DIMMs you installed in DIMM 3 and DIMM 4 memory connectors. However, the size, speed, type, and technology of the DIMMs you install in DIMM 1 and DIMM 2 memory connectors must match each other.
6. Install only 133 MHz (memory bus), 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 SDRAM Registered DIMM specification. For a list of supported options for your server, go to <http://www.ibm.com/us/compat/> on the World Wide Web.
7. Your server supports Chipkill™ memory if the DIMMs are all type x4 and are 256 MB or larger. Using any 128 MB DIMMs or DIMMs that are not type x4 on your server disables Chipkill memory.

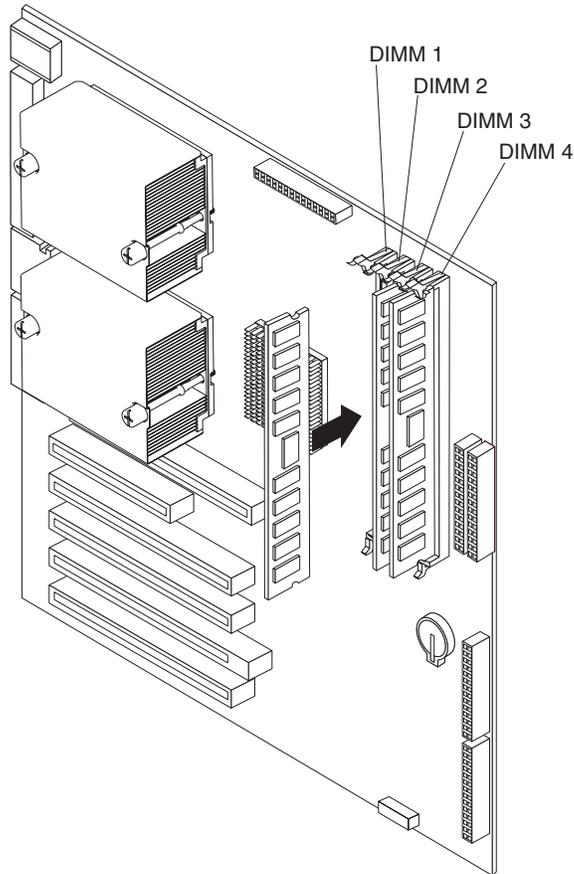
Complete the following steps to install a DIMM:

1. Review the safety information beginning on page vii, “Installation guidelines” on page 9, and “Handling static-sensitive devices” on page 10.
2. Remove the side cover (see “Removing the side cover” on page 11).
3. Remove the support bracket (see “Removing and installing the support bracket” on page 13).
4. Locate the DIMM connectors on the system board. Determine the connectors into which you will install the DIMMs. Install the DIMMs in the order shown in the following table.

Table 3. DIMM installation sequence

Installation order	DIMM connectors	Diagnostic reference
First	DIMM 3 and DIMM 4	Bank 2
Second	DIMM 1 and DIMM 2	Bank 1

5. Open the retaining clips and, if necessary, remove any existing DIMM.
6. Touch the static-protective package containing the DIMM to any unpainted metal surface on the server. Then remove the new DIMM from the package.
7. Gently open the retaining clip on each end of the DIMM slot. Turn the DIMM so that the pins align correctly with the connector.
8. Insert the DIMM into the connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. Open the retaining clips, remove the DIMM, and then reinsert it.



9. If you have other options to install or remove, do so now; otherwise, replace the support bracket (see “Removing and installing the support bracket” on page 13) and go to “Completing the installation” on page 34.

Installing an additional microprocessor

Your server comes with one microprocessor installed on the system board. Your server supports up to two microprocessors. With two microprocessors, your server can operate as a symmetric multiprocessing (SMP) server. With SMP, certain operating systems and application programs can distribute the processing load among the microprocessors.

Before you begin:

- Thoroughly review the documentation that comes with the microprocessor to determine the required BIOS update. The latest level of BIOS code for your server is available from the World Wide Web. See the *User's Guide* on the IBM *xSeries Documentation* CD for the World Wide Web addresses.
- (Optional) Obtain an SMP-capable operating system. For a list of supported operating systems and other options, go to <http://www.ibm.com/pc/us/compat/> on the World Wide Web.

Attention: 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. You can use the Configuration/Setup Utility program in your server to determine the specific type of microprocessor on your system board.

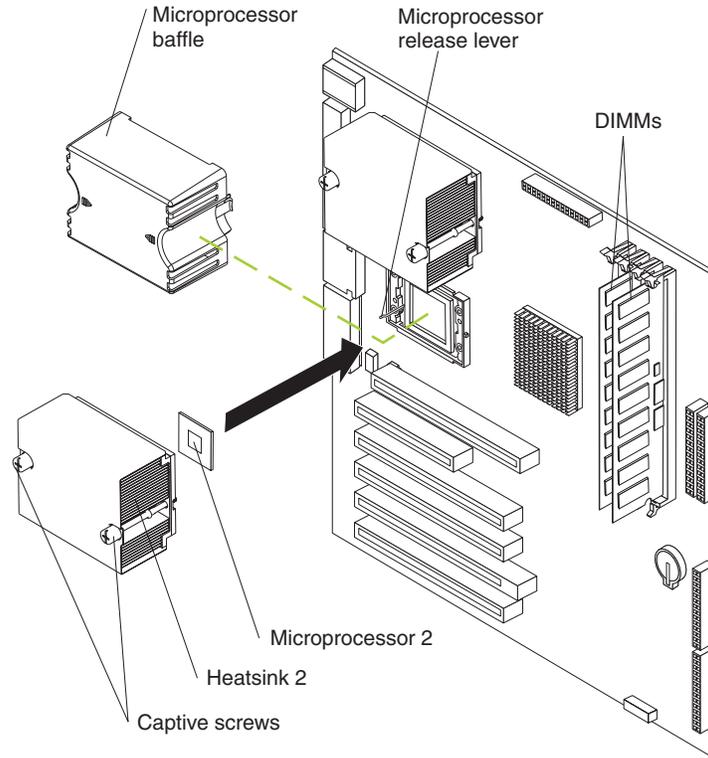
Important: A microprocessor must always be installed in socket CPU1 of the system board.

Notes:

1. To order additional microprocessor options, contact your IBM marketing representative or authorized reseller.
2. Terminator cards are not required for empty microprocessor sockets. However, for airflow, an empty microprocessor socket must contain a microprocessor baffle.
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.
5. For additional illustrations of the system-board components, see "System-board option connectors" on page 7.

Some operating systems need to be configured to support an additional microprocessor. See the *Option Installation Guide* on the IBM *xSeries Documentation* CD for instructions.

The following illustration shows how to install an additional microprocessor.

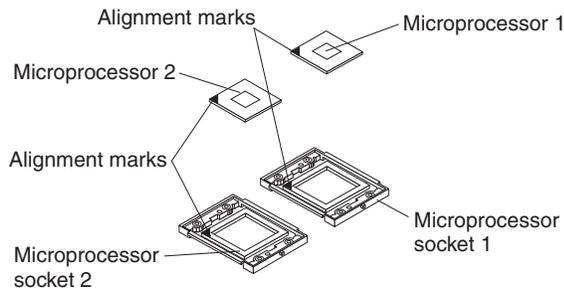


Complete the following steps to install an additional microprocessor:

1. Review the “Installation guidelines” on page 9 and “Handling static-sensitive devices” on page 10.
2. Remove the side cover (see “Removing the side cover” on page 11).
3. Remove the support bracket (“Removing and installing the support bracket” on page 13).
4. Remove the adapter airflow guide:
 - a. Rotate the front and rear adapter-retention brackets to the open (unlocked) position.
 - b. Slide the adapter airflow guide out of the guides on the air baffle and front adapter-support bracket; then, remove it from the chassis.
5. Remove the air baffle by unhooking it from its retaining tabs and lifting it off the chassis.
6. Locate the second microprocessor socket (connector CPU2) on the system board.
7. Remove the microprocessor baffle from the second microprocessor socket.
8. If the second microprocessor socket is covered with protective film, peel and remove the film.
9. Install the microprocessor:
 - a. Touch the static-protective package containing the new microprocessor to any *unpainted* metal surface on the server; then, remove the microprocessor from the package.

Attention:

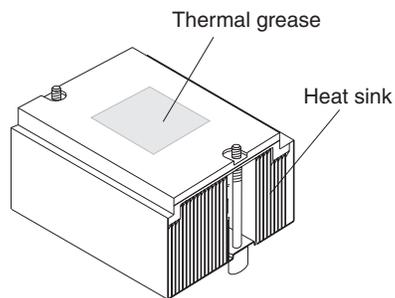
- 1) Do not use excessive force when pressing the microprocessor into the socket.
- 2) Make sure that the microprocessor is oriented and aligned correctly with pin number 1 in the socket before you try to close the microprocessor-release lever. The following illustration shows the alignment marks for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



- b. Pull out and lift up on the microprocessor-release lever to unlock the microprocessor socket.
- c. 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.
- d. Carefully close the microprocessor-release lever to secure the microprocessor in the socket.

Attention: Do not set the heat sink down after you remove the plastic cover and 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.

10. Install the heat sink on the microprocessor.



- a. Remove the plastic cover from the bottom of the heat sink.
- b. Align and place the heat sink on top of the microprocessor, grease side down, in the retention bracket. Press firmly on the heat sink.

Attention: Alternate the tightening of the two captive screws to prevent damage to the microprocessor. Ensure that the screws are completely tightened (until they stop); otherwise, damage to the microprocessor will occur.

- 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.

11. Install the air baffle.

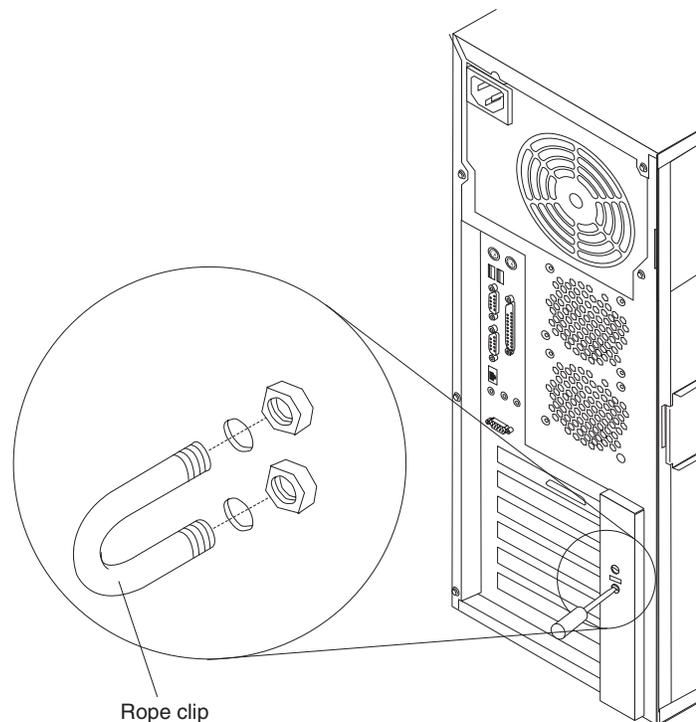
12. Install the adapter airflow guide:
 - a. Rotate the front and rear adapter-retention brackets to the open (unlocked) position.
 - b. Slide the adapter airflow guide into the guides on the air baffle and front adapter-support bracket; then, push it into place, using care to not damage any cables.
 - c. Rotate the front and rear adapter-retention brackets to the closed (locked) position.
13. If you have other options to install or remove, do so now; otherwise, replace the support bracket and go to “Completing the installation” on page 34.

Installing a security rope clip

To help prevent theft, you can add a security rope clip and cable to your server.

Complete the following steps to install a rope clip:

1. Remove the side cover (see “Removing the side cover” on page 11).
2. Use a screwdriver to remove the two metal knockouts.
3. Insert the rope clip through the rear panel; then, attach and tighten the nuts.
4. Thread a cable through the rope clip and around an object that is not part of or permanently secured to the building structure or foundation, and from which the cable cannot be removed. Fasten the cable ends together with a lock. After you add the security cable, be certain it does not interfere with other cables connected to the server.



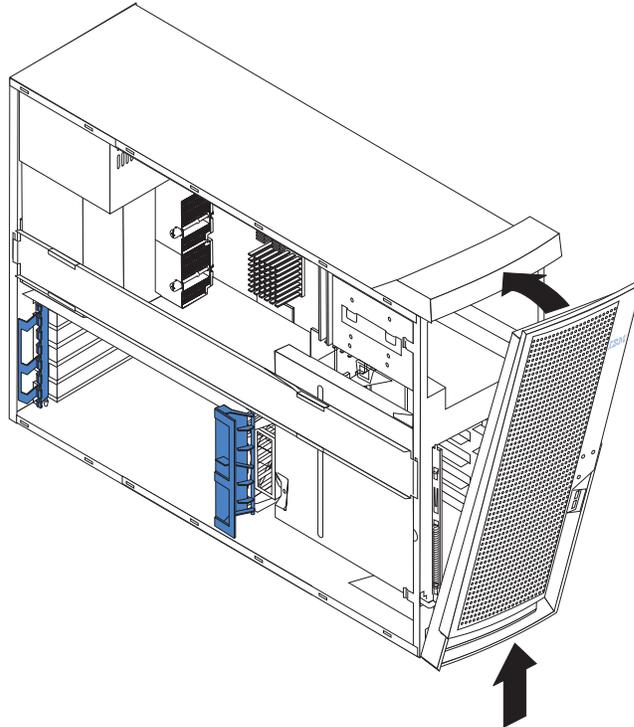
5. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation”.

Completing the installation

To complete your installation, you must reinstall the bezel, reinstall the side cover, connect all the cables and, for certain options, run the Configuration/Setup Utility program. Follow the instructions in this section.

Replacing the bezel

The following illustration shows how to install the bezel on the server.



Complete the following steps to replace the bezel:

1. Insert the two tabs on the bottom of the bezel into the matching holes on the server chassis.
2. Push the top of the bezel toward the server until the two tabs at the top of the bezel snap into place.
3. For hot-swap hard disk drive models, make sure the side cover is unlocked; then, insert the hot-swap lock bar into the slots on the bezel and rotate it to the locked position. The hot-swap lock bar locks when you lock the side cover key lock.

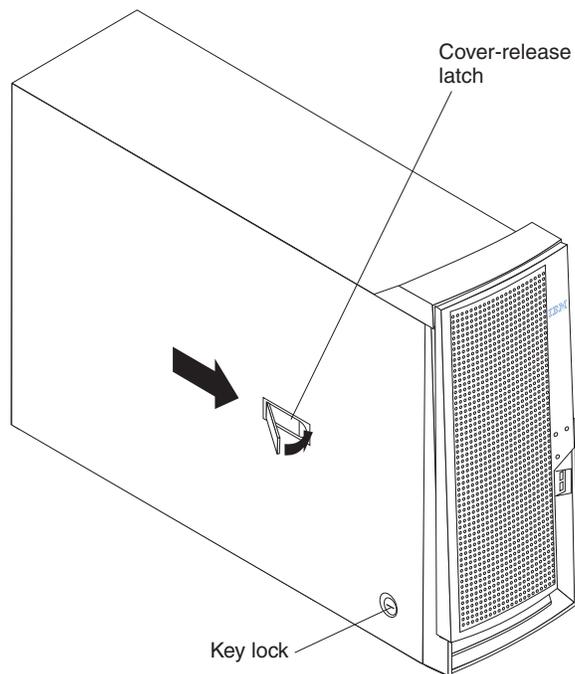
Replacing the side cover

If you removed the support bracket or bezel, reinstall it before you replace the side cover. See “Removing and installing the support bracket” on page 13 and “Replacing the bezel” on page 34.

Note: The rear adapter retaining bracket rests against the server side cover. You might find it easier to lay the server on its side to replace the side cover.

Complete the following steps to replace the side cover:

1. Before installing the cover, check that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
2. Place the bottom lip of the side cover over the bottom edge of the server chassis.
3. Rotate the side cover to a vertical position, inserting the tabs at the top of the side cover into the matching slots in the server chassis.
4. Slide the side cover forward until it locks in place. Press down on the cover-release-latch button as you close the cover-release latch to lock the side cover.



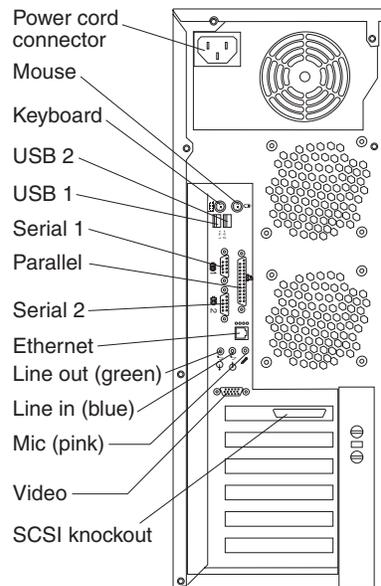
5. For hot-swap hard disk drive models, open the server door and hold the hot-swap lock bar in the closed position, lock the side cover key lock, and close the server door.
6. If your server has stabilizing feet that rotate, make sure that the four stabilizing feet are rotated outward so that they properly support the server. Rotate each foot outward 90 degrees (see “Moving the stabilizing feet” on page 10).

Cabling the server

If your server cables and connector panel have color-coded connections, match the color of the cable end with the color of the connector. For example, match a blue cable end with a blue panel connector, a red cable end with a red connector, and so on.

Attention: To prevent damage to equipment, connect the power cords last.

The following illustration shows the input/output (I/O) connectors on the rear of the server.



Updating your server configuration

When you start your server for the first time after you add or remove an internal option or an external SCSI device, you might see a message telling you that the configuration has changed. The Configuration/Setup Utility program automatically starts so that you can save the new configuration information. See Chapter 4, “Configuring your server” on page 41 for additional information.

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

Your server comes with one microprocessor installed on the system board. If you have installed an additional microprocessor, your server can now operate as an SMP server. Therefore, you might need to upgrade your operating system to support SMP. See the *User's Guide* on the IBM *xSeries Documentation* CD and your operating-system documentation for additional information.

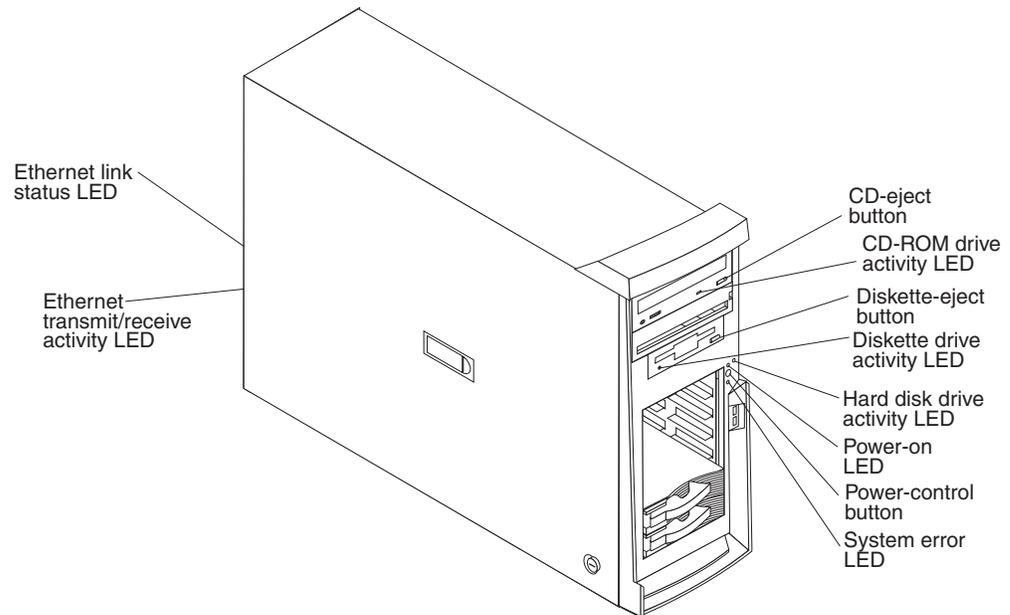
If your server has a RAID configuration using the integrated SCSI controller with RAID capabilities or has a ServeRAID controller installed and you have installed or removed a hard disk drive, see the ServeRAID documentation that comes with your server for information about reconfiguring your disk arrays.

Chapter 3. Server controls, indicators, and power

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

Controls and indicators

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



AC power LED

This LED is on each hot-swap power supply on the back of some server models. During typical operation, both the ac and dc power LEDs are on. For any other combination of LEDs, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

CD-eject button

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

CD-ROM drive activity LED

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

DC power LED

This LED is on each hot-swap power supply on the back of some server models. During typical operation, both the ac and dc power LEDs are on. For any other combination of LEDs, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

Diskette-eject button

Press this button to release a diskette from the diskette drive.

Diskette drive activity LED

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

Ethernet link status LED

This LED is on the Ethernet connector on the back of the server. When this LED is lit, it indicates that there is an active connection on the Ethernet port.

Ethernet transmit/receive activity LED

This LED is on the Ethernet connector on the back of the server. When this LED is lit, it indicates that there is activity between the server and the network.

Hard disk drive activity LED

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

Hot-swap hard disk drive activity LED

On some server models, each hot-swap drive has a hard disk drive activity LED. When this green LED is flashing, it indicates that the drive is in use.

Hot-swap hard disk drive status LED

On some server models, each hot-swap drive has a hard disk drive status LED. When this amber LED is lit, it indicates that the drive has failed. If an optional IBM ServeRAID controller 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.

Power-control button

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

Power-on LED

When this LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server is off and still connected to an ac power source (standby mode).

System-error LED

When this LED is lit, it indicates that a system error has occurred. An LED on the system board might also be lit to help isolate the error. See Chapter 6, "Solving problems" on page 53 for additional information. Detailed troubleshooting information is in the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

Server power features

When the server is connected to an ac power source but is not turned on, the operating system does not run, and all core logic is shut down; however, the server can respond to remote requests to turn on the server. The power-on LED flashes to indicate that the server is connected to an ac power source but is not turned on (standby mode).

Turning on the server

Notes:

1. Turn on all external devices, such as the monitor, before turning on the server.
2. The power-on LED on the front of the server is lit when the server is on and while it is powering-up.
3. 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.

Approximately 20 seconds after the server is connected to ac power, the power-control button becomes active, and you can turn on the server and start the operating system by pressing the power-control button. The server can also be turned on in any of the following ways:

- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.
- If the server is connected to an ASM interconnect network that contains at least one server with an optional Remote Supervisor Adapter installed, the server can be turned on from the Remote Supervisor Adapter user interface.
- If an optional Remote Supervisor Adapter is installed in the server, the server can be turned on from the Remote Supervisor Adapter user interface.
- When you plug in your server for the first time, the Wake on LAN[®] feature can turn on the server. If your server was previously turned on, it must be properly turned off for the Wake on LAN feature to turn on the server.

Note: When 4 GB or more of memory (physical or logical) is installed, some memory is reserved for various system resources and is unavailable to the operating system. The amount of memory that is reserved for system resources depends on the operating system, the configuration of the server, and the configured PCI options.

Turning off the server

When you turn off the server and leave it connected to ac power, the server can respond to remote requests to turn on the server. To remove all power from the server, you must disconnect it from the power source.

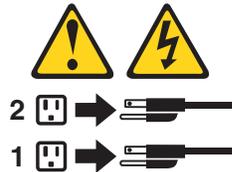
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

Statement 5



CAUTION:

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



Note: After turning off the server, wait at least 5 seconds before you press the power-control button to turn on the server again.

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

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

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- and parallel-connector assignments, change the drive startup sequence, set the date and time, and set passwords. For more information about how to start this utility, see “Using the Configuration/Setup Utility program” on page 42.

- **ServeRAID Manager**

The ServeRAID programs come with your server. If your server has a ServeRAID controller installed, you must use the ServeRAID Configuration program to define and configure your disk-array subsystem *before* you install your operating system. See “Using ServeRAID Manager” on page 42 for more information.

- **LSI Logic Configuration Utility**

With the built-in LSI Logic Configuration Utility program, you can configure the integrated SCSI controller and the devices that are attached to it. For information about how to start this utility, see “Using the LSI Logic Configuration Utility program” on page 49.

This section provides the instructions for starting the utility programs. See the *User's Guide* on the IBM *xSeries Documentation* CD for detailed instructions for using the configuration programs and *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 you install your operating system. For information about the supported operating-system versions, see the label on the CD.

1. Insert the *ServerGuide Setup and Installation* CD, and restart the server. If the CD does not start, see “ServerGuide problems” on page 55.
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.

Using the Configuration/Setup Utility program

The Configuration/Setup Utility program is part of the BIOS code. You can use it to:

- Change interrupt request (IRQ) settings
- Change the startup drive sequence
- Configure serial port assignments
- 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 and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1. If an administrator password has been set, you must type the administrator password to access the full Configuration/Setup Utility menu.
3. Follow the instructions on the screen.

See the *User's Guide* on the *IBM xSeries Documentation CD* for more detailed information about the Configuration/Setup Utility.

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 to factory-default settings, erasing all data
- View your RAID configuration and associated devices
- Monitor operation of your RAID controllers

You can run ServeRAID Manager in startable-CD mode from the *IBM ServeRAID Support CD* or as an installed program. For information about installing ServeRAID Manager, see the documentation on the CD.

The following sections provide instructions for running ServeRAID Manager in startable-CD mode to configure your integrated SCSI controller with RAID capabilities and perform an initial RAID configuration on your server. See the ServeRAID documentation on the *IBM ServeRAID Support CD* for additional information about RAID technology and instructions for using ServeRAID Manager to configure your integrated SCSI controller with RAID capabilities.

Notes:

1. The integrated SCSI controller with RAID capabilities in your server supports only RAID level 1. Installing an optional ServeRAID-5i controller provides additional RAID levels.
2. If you install a different type of RAID adapter in your server, use the configuration method supplied with the RAID adapter to view or change SCSI settings for attached devices.

Before you install your operating system, you must configure the controller that is attached to the hard disk drives. You must use the configuration program on the

IBM ServeRAID Support CD to configure the integrated SCSI controller with RAID capabilities or to configure an optional IBM ServeRAID controller.

Notes:

1. You cannot use the *ServerGuide Setup and Installation CD* to configure the optional controllers.
2. To update the firmware and BIOS for an optional ServeRAID controller, you must use the *IBM ServeRAID Support CD* that comes with the ServeRAID option.

Using ServeRAID Manager in startable-CD mode

The information in this section focuses on using the ServeRAID Manager program in startable-CD mode to configure your controller. For information about installing ServeRAID Manager, see the documentation on the *IBM ServeRAID Support CD*.

When you run the ServeRAID Manager program from the startable *IBM ServeRAID Support CD*, you are using startable-CD mode, in which you can configure your controller *before* you install your operating system.

To run the ServeRAID Manager program in startable-CD mode, turn on the server; then, insert the *IBM ServeRAID Support CD* into the CD-ROM drive. If the ServeRAID Manager program detects an unconfigured controller and ready drives, the program automatically starts the Configuration wizard, and a window similar to that shown in Figure 1 opens.

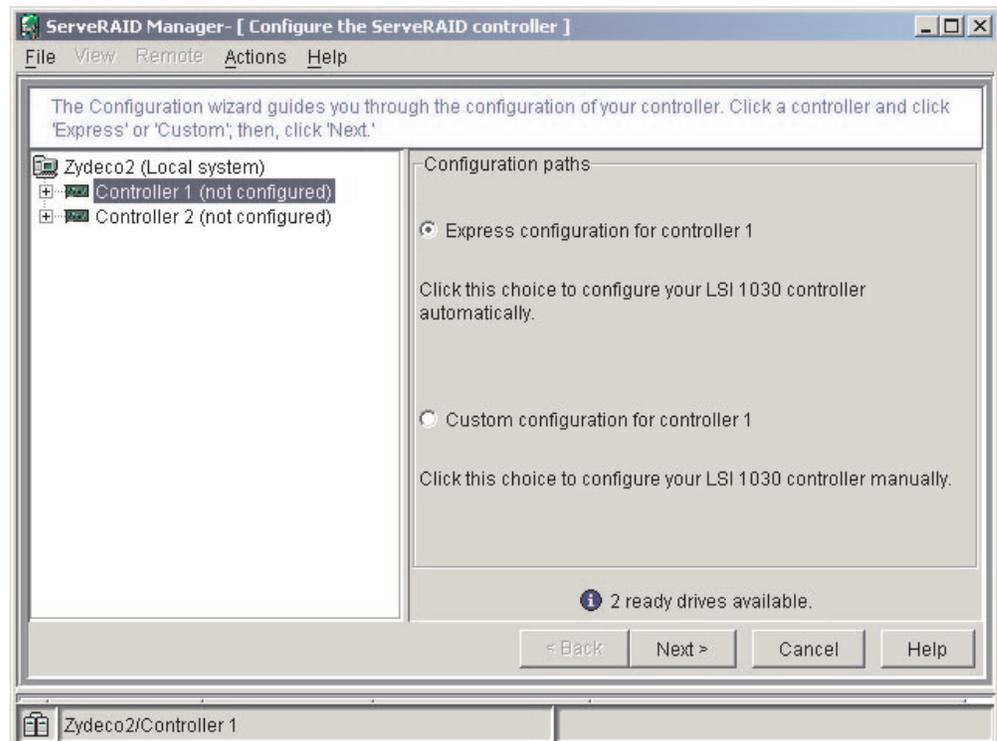


Figure 1. “Configuration wizard” window

Configuring the controller

You can use the Configuration wizard to configure your controller. The Configuration wizard provides two configuration options: Express and Custom. Express

configuration automatically configures your controller, and you can use Custom configuration to configure your controller manually.

Note: If the integrated RAID controller has two channels, it will appear in the ServeRAID Manager tree as two controller objects. However, you can configure only one array and one RAID level-1 logical drive.

Using Express configuration: Express configuration automatically configures your controller. It creates an array by grouping together the first two physical drives that appear in the ServeRAID Manager tree, and it creates a RAID level-1 logical drive.

Complete the following steps to use Express configuration:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Express configuration**.
3. Click **Next**. The “Configuration summary” window opens.
4. Review the information that is displayed in the “Configuration summary” window. To change the configuration, click **Modify arrays**.

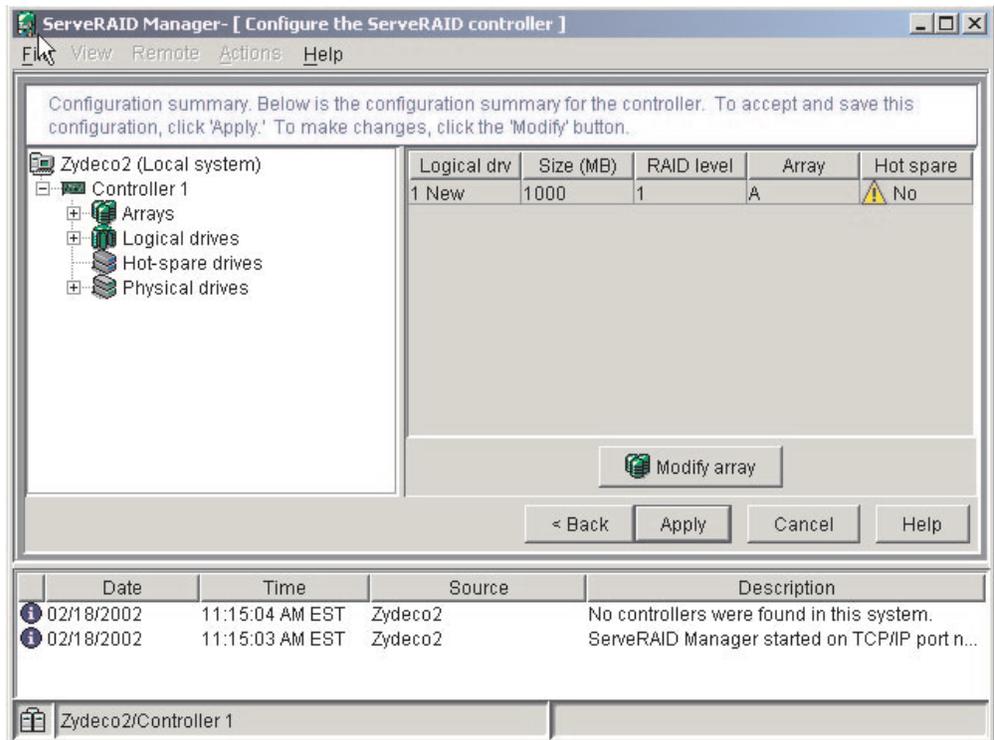


Figure 2. “Configuration summary” window

5. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.
6. Exit from the ServeRAID Manager program and remove the CD from the CD-ROM drive.
7. Restart the server.

Using Custom configuration: To configure your controller manually, select Custom configuration. Using Custom configuration, you can select which two physical drives you want to configure and create a hot-spare drive.

Complete the following steps to use Custom configuration:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Custom configuration**.
3. Click **Next**. The “Create arrays” window opens.

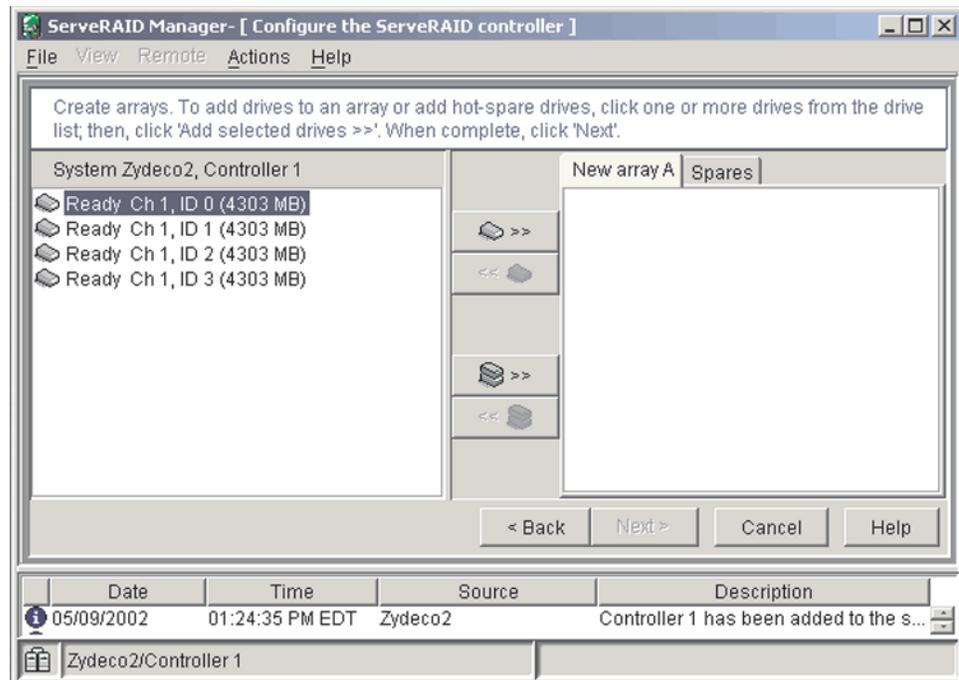


Figure 3. “Create arrays” window

4. From the list of ready drives, select the two drives you want to move to the array.
5. Click  **>>** (Add selected drives) to add the drives to the array.
6. Complete the following steps if you want to configure a hot-spare drive:
 - a. Click the **Spares** tab.
 - b. Select the physical drive you want to designate as the hot-spare drive; then, click  **>>** (Add selected drives).

7. Click **Next**. The “Configuration summary” window opens.

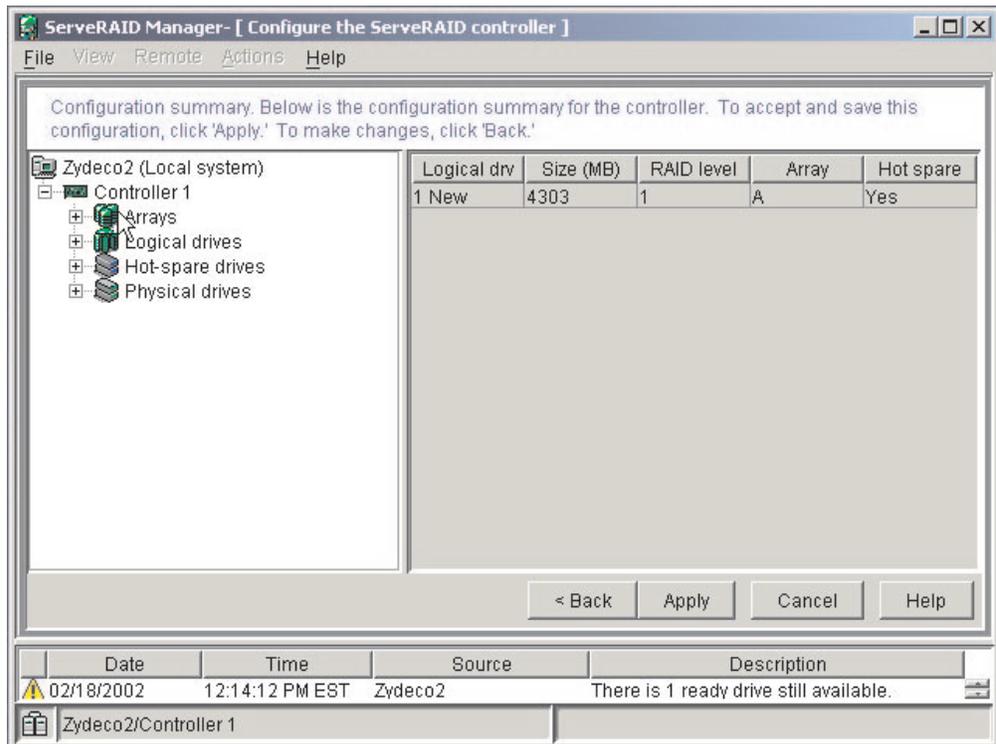


Figure 4. “Configuration summary” window

8. Review the information that is displayed in the “Configuration summary” window. To change the configuration, click **Back**.
9. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.
10. Exit from the ServeRAID Manager program, and remove the CD from the CD-ROM drive.
11. Restart the server.

Viewing your configuration

You can use ServeRAID Manager to view information about RAID controllers and the RAID subsystem (such as arrays, logical drives, hot-spare drives, and physical drives).

To view information, expand the ServeRAID Manager tree; then, click the relevant tree object. Detailed information about the selected device appears in the right pane.

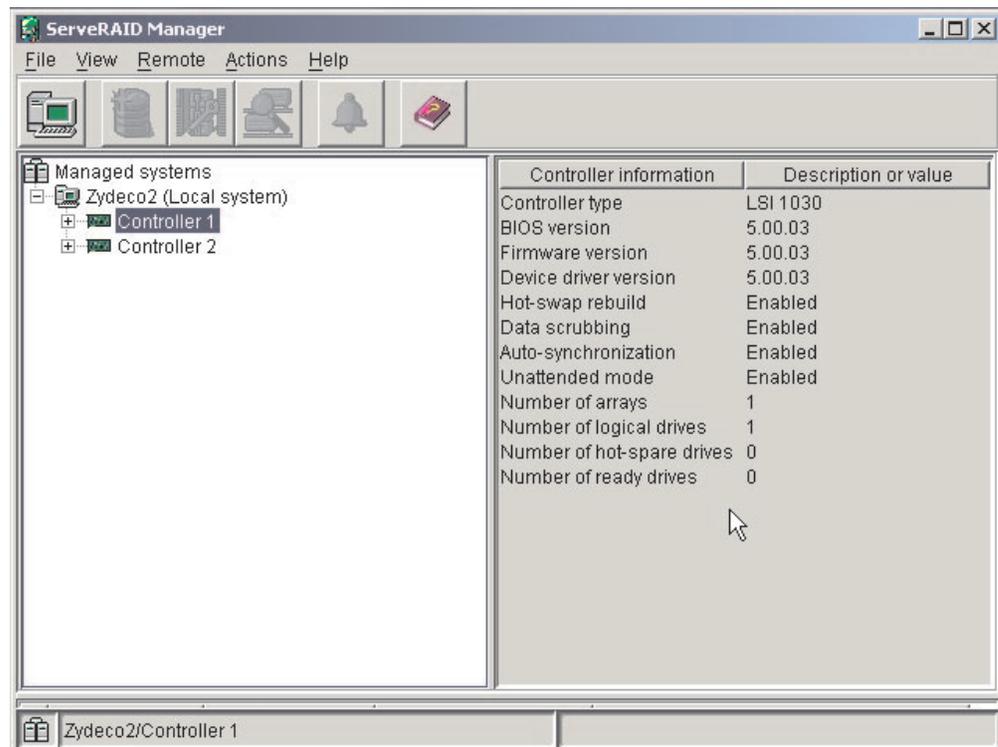


Figure 5. ServeRAID Manager window

To display available actions for an item, click the item in the ServeRAID Manager tree and click **Actions**.

Getting assistance

For more information about ServeRAID Manager, see the online help system. To start the help system, either click  (Information about this window) on the toolbar or select an item from the **Help** menu.

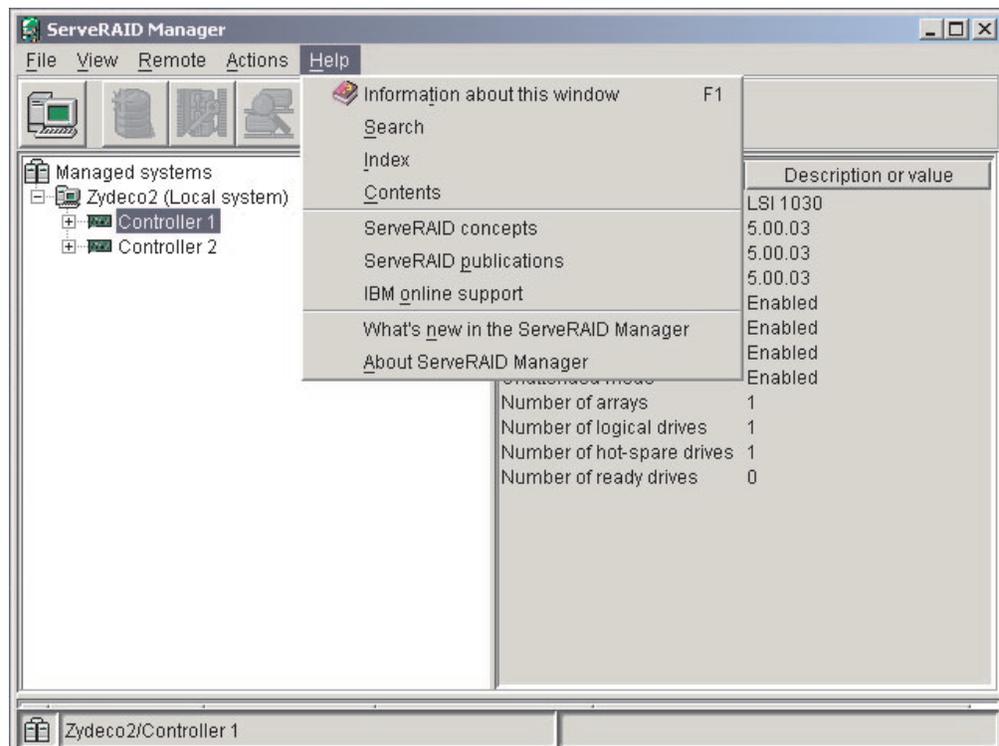


Figure 6. ServeRAID Manager help menu

The help system (ServeRAID Assist) will open within the ServeRAID Manager interface.

To learn more about the ServeRAID Manager tree objects and the actions that apply to them, select a tree object and click **Actions** → **Hints and tips**. ServeRAID Assist will start, and information about the tree object will appear in the right pane of ServeRAID Manager.

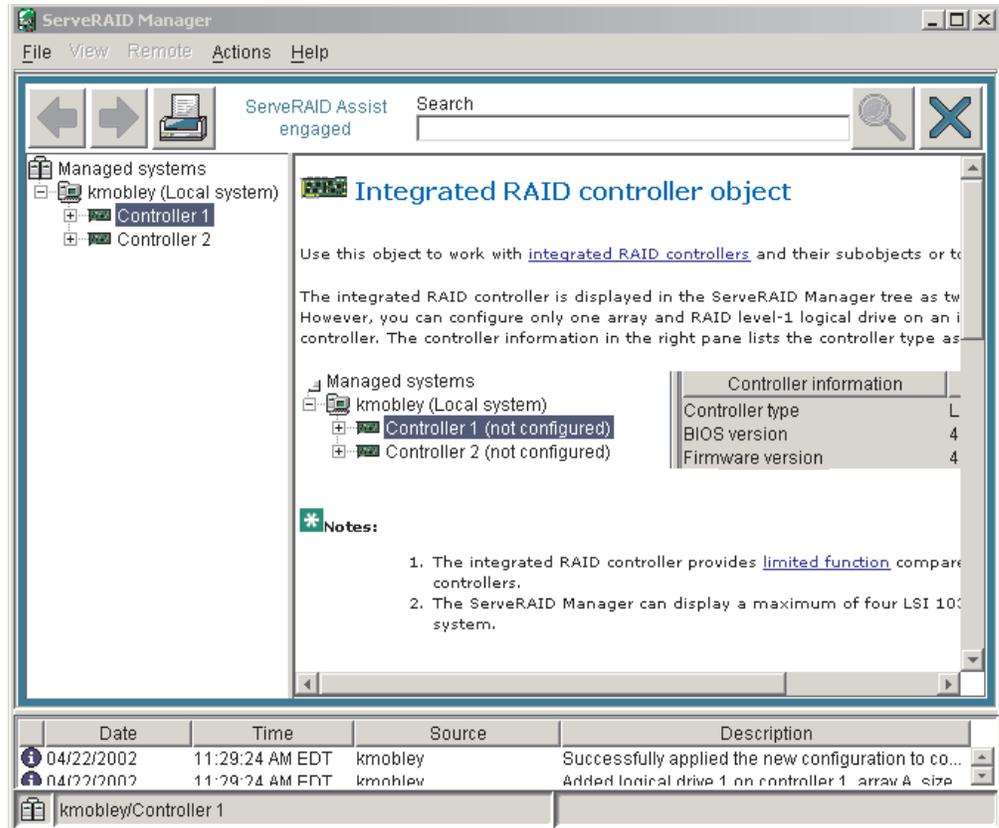


Figure 7. Hints and tips feature

Using the LSI Logic Configuration Utility program

Use the LSI Logic Configuration Utility to:

- Perform a low-level format on a SCSI hard disk drive
- View or change SCSI IDs for attached devices
- Set SCSI protocol parameters on SCSI hard disk drives

Notes:

1. The integrated SCSI controller with RAID capabilities in your server supports redundant array of independent disks (RAID). You can use the LSI Logic Configuration Utility program to configure RAID level 1 for a single pair of attached devices.
2. If your server has a RAID adapter installed, use the configuration method supplied with the RAID adapter 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.
2. When the prompt <<< Press <CTRL><C> to start LSI Logic Configuration Utility >>> appears, press Ctrl+C. If you have set an administrator password you are prompted to type the password.
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. The **Device Properties** and **Mirroring Properties** choices produce additional screens of parameters to review or change.

See the *User's Guide* on the IBM *xSeries Documentation* CD for more detailed information about the LSI Logic Configuration Utility.

Chapter 5. Installing IBM Director updates

If you plan to use IBM Director to manage your server, you must install the applicable IBM Director updates, which could include a Service Pack for your release of IBM Director, individual emergency fixes (eFixes), and a Director System Support Package (DSSP) for this server.

Note: For Automatic Server Restart (ASR) support and environmental-sensor support, you must install version 4.1 of IBM Director.

To install the IBM Director updates, complete the following steps, in order:

1. If you plan to enable the Automatic Server Restart (ASR) feature, install the ASR device driver, which is available from the IBM Web site:
 - a. Go to the IBM Web site at <http://www.ibm.com>.
 - b. Click **Support & downloads**.
 - c. In the **Technical support** keyword search field, type Advanced System Management 8647 and click **Go**.
 - d. From the next page, click **IBM Advanced System Management Device Driver Diskette for Microsoft Windows 2000 and Windows NT 4.0 Version 2.07** (or a later version, if it is available).
 - e. From the next page, download the executable file and follow the instructions in the readme file to install the device driver.
2. Install the IBM Director application.
3. If the IBM Director CD that comes with your server includes the IBM Director Service Pack, install the Service Pack. If the CD does not contain the Service Pack, check the IBM Web site to see if a Service Pack is available. If it is, download and install the Service Pack according to the instructions in its readme file.
4. Install any applicable eFixes, DSSPs, and additional updates for your server from the IBM Web site.

Complete the following steps to obtain and install eFixes, DSSPs, or other updates:

1. Go to the IBM Web site at <http://www.ibm.com>.
2. Click **Support & downloads**.
3. In the **Technical support** keyword search field, type Director 8647 and click **Go**.
4. From the next page, click the eFix, DSSP, or update that you want to download.
5. From the next page, download the executable file and follow the instructions in the readme file to install the update.

Chapter 6. Solving problems

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

If you cannot locate and correct the problem using the information in this section, see Appendix A, “Getting help and technical assistance” on page 61, the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD, and the “Server Support” flowchart in the front of this book.

Diagnostic tools overview

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

- **POST beep codes and error messages**

The power-on self-test (POST) indicates the detection of a problem. See “Power-on self-test (POST)” on page 54.

- **Diagnostic programs and error messages**

The diagnostic programs are provided on the *IBM Enhanced Diagnostics* CD. These programs test the major components of your server.

Note: See “Solving problems” in the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries® Documentation CD for information about the diagnostic programs.

- **ServerGuide problems**

This chart lists problem symptoms and steps to correct problems when using the *ServerGuide Setup and Installation* CD. See the “ServerGuide problems” on page 55 for information.

- **Troubleshooting charts**

These charts list problem symptoms and steps to correct the problems. See the “Troubleshooting charts” on page 56 for information.

- **System-board error LEDs**

An LED on the system board might also be lit to help isolate an error indicated by the system error LED on the front of the server. See the “System-board error LEDs” on page 59 for more information.

Power-on self-test (POST)

When you turn on the server, the power-on self-test (POST) performs a series of tests to check the operation of system components and some of the installed options.

If POST finishes without detecting any problems, the first window of your operating system or application program appears.

If POST detects a problem, more than one beep might sound, an error message might appear on your screen, or both.

Notes:

1. If you have a user password set, you must type the password and press Enter, when prompted, before the operating system will load.
2. A single problem might cause several error messages. When this occurs, work to correct the cause of the first error message. After you correct the cause of the first error message, the other error messages typically will resolve the next time you run the test.

POST beep codes

The possible types of beep codes are:

No beeps

No beep codes indicates that your server successfully completed POST without finding any errors.

Continuous beep

Your startup (boot) microprocessor has failed, or your system board or speaker subsystem might contain a failing component. If the system continues through POST with no errors, call for service. If no video appears, the startup processor has failed.

Beep codes for specific failures

Beep codes indicating specific system problems are listed in the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

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.

POST message	Failing device or problem found	Suggested action
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.

POST message	Failing device or problem found	Suggested action
201	Memory error	Verify that your memory is fully seated and installed properly.
289	Failing DIMM was disabled	Verify that your memory is correct for your server and that it is installed properly.
301 and 303	Keyboard and keyboard controller	Ensure that the keyboard cable is connected and nothing is resting on the keyboard keys.
11xx	Serial port error	Verify that the serial cable is connected correctly.
1162	Serial port configuration error	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 and 2462	Video adapter and memory	Call for service.
00180xxx	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.
012980xx and 012981xx	Data for microprocessor	Download and install the latest level of system BIOS code.
I9990305	POST could not find an operating system	Install your operating system.

ServerGuide problems

The following table lists problem symptoms and suggested solutions.

Table 4. ServerGuide Setup and Installation CD

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

Troubleshooting charts

The following table lists problem symptoms and suggested solutions. See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD for more detailed troubleshooting charts. 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.

CD-ROM drive problems

CD-ROM Drive symptom	Suggested action
CD-ROM drive is not recognized.	Verify that: <ul style="list-style-type: none">• The IDE channel to which the CD-ROM drive is attached (primary or secondary) is enabled in the Configuration/Setup Utility program.• All cables and jumpers are installed correctly.• The correct device driver is installed for the CD-ROM drive. If the problem remains, call for service.
CD is not working properly.	Clean the CD. If the problem remains, call for service.
CD-ROM drive tray is not working. (The server must be turned on.)	Insert the end of a straightened paper clip into the manual tray-release opening. If the problem remains, call for service.

Diskette drive problems

Diskette drive symptom	Suggested action
Diskette drive activity LED stays on, or the system bypasses the diskette drive.	<ol style="list-style-type: none">1. If there is a diskette in the drive, verify that:<ul style="list-style-type: none">• 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 is inserted correctly in the drive.• The diskette contains the necessary files to start the server.• The software program is working properly.• The cable is installed correctly (in the proper orientation).2. To prevent diskette drive read/write errors, be sure the distance between monitors and diskette drives is at least 76 mm (3 in.). If the problem remains, call for service.

Hard disk drive problems

Hard disk drive symptom	Suggested action
Not all drives are recognized by the hard disk drive diagnostic test (Fixed Disk test).	<ol style="list-style-type: none">1. Remove the first drive not recognized and try the hard disk drive diagnostic test again.2. If the remaining drives are recognized, replace the drive you removed with a new one. If the problem remains, call for service.

Keyboard, mouse, or pointing-device problems

Keyboard, mouse, or pointing-device symptom	Suggested action
All or some keys on the keyboard do not work.	<p>Verify that:</p> <ul style="list-style-type: none"> • The keyboard cable is securely connected to the system, and the keyboard and mouse cables are not reversed. • Both the server and the monitor are turned on. • Try using another keyboard. <p>If the problem remains, call for service.</p>
The mouse or pointing device does not work.	<p>Verify that:</p> <ul style="list-style-type: none"> • The mouse or pointing-device cable is securely connected, and that the keyboard and mouse cables are not reversed. • The mouse device drivers are installed correctly. • Both the server and the monitor are turned on. • Try using another mouse or pointing device. <p>If the problem remains, call for service.</p>

Memory problems

Memory symptom	Suggested action
The amount of system memory displayed is less than the amount of physical memory installed.	<ol style="list-style-type: none"> 1. Verify that: <ul style="list-style-type: none"> • 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. 2. Check POST error log for error message 289: <ul style="list-style-type: none"> • If the DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. • If the DIMM was disabled by the user or by POST: <ol style="list-style-type: none"> a. Start the Configuration/Setup Utility program. b. Enable the DIMM. c. Save the configuration and restart the server. <p>If the problem remains, call for service.</p>

Microprocessor problems

Microprocessor symptom	Suggested action
The server emits a continuous tone during POST. (The startup (boot) microprocessor is not working properly.)	Call for service.

Monitor problems

Monitor symptom	Suggested action
The screen is blank.	<p>Verify that:</p> <ul style="list-style-type: none"> • 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 the servers are C2T chained together, verify that: <ul style="list-style-type: none"> – The C2T chain cables are securely connected to the servers. – The C2T breakout cable is connected properly. – A server that is turned on is selected. <p>Important: In some memory configurations, the 3-3-3 beep code might sound during POST followed by a blank display screen. If this occurs and the Boot Fail Count feature in the Start Options of the Configuration/Setup Utility program is set to Enabled (its default setting), you must restart the server three times to force the system BIOS code to reset the CMOS values to the default configuration (memory connector or bank of connectors enabled).</p> <p>If the problem remains, call for service.</p>
Only the cursor appears.	Call for service.
The screen is wavy, unreadable, rolling, distorted, or has screen jitter.	<p>If the monitor self-tests show the monitor is working properly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. To prevent diskette drive read/write errors, be sure the distance between monitors and diskette drives is at least 76 mm (3 in.). 2. Non-IBM monitor cables might cause unpredictable problems. 3. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. For information about the enhanced monitor cable, contact your IBM reseller or IBM marketing representative. <p>If the problem remains, call for service.</p>
Wrong characters appear on the screen.	<p>If the wrong language is displayed, update the BIOS code with the correct language.</p> <p>If the problem remains, call for service.</p>
No video.	<ol style="list-style-type: none"> 1. Make sure the correct machine is selected, if applicable. 2. Make sure all cables are locked down. <p>If the problem remains, call for service.</p>

Power problems

Power symptom	Suggested action
The server does not turn on.	Verify that: <ul style="list-style-type: none"> • The power cords 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.

System-board error LEDs

The following illustration shows the LEDs on the system board. You might need to refer to this illustration when solving problems with the server.

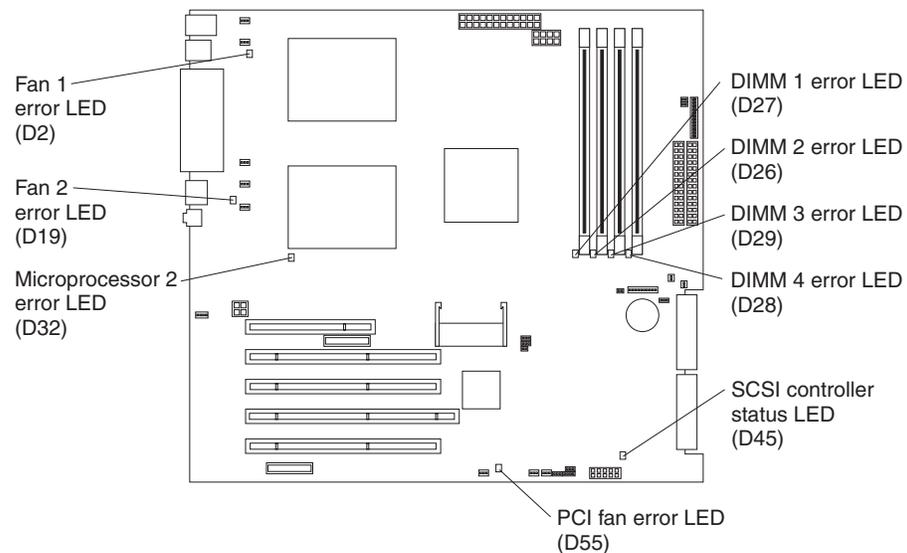


Table 5. Error LEDs

Error LED	Without optional Remote Supervisor Adapter	With optional Remote Supervisor Adapter
DIMM error (D26, D27, D28, D29)	Memory problem (also turns on system error LED on the front bezel)	Memory problem (also turns on system error LED on the front bezel)
Microprocessor 2 error (D32)	Microprocessor 2 problem (also turns on system error LED on the front bezel)	Microprocessor 2 problem (also turns on system error LED on the front bezel)
Fan error (D2, D19, D55)	No function	Fan failure
Hard disk error (LEDs on hot-swap hard disk drives)	Hot-swap hard disk drive failure	Hot-swap hard disk drive failure

Each error LED is lit to indicate a problem with a specific component. After a problem is corrected, its LED will not be lit the next time the server is restarted; if the problem remains, the LED will be lit again. See the *User's Guide* on the IBM *xSeries Documentation CD* for additional information.

Appendix A. 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 appendix 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.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 or region, 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 B. 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.

This paragraph applies only to products with a warranty period of 3 years on parts and 1 year on labor. 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 225 Type 8647

Country or region	Warranty period	Service delivery method
Worldwide	Parts - 1 year, labor - 1 year	On-site

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 XXXXXXXX.
- 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.

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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 C. Notices

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FlashCopy	Update Connector
HelpWare	Wake on LAN
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Important notes

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

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

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

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

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

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

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

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

Electronic emission notices

Federal Communications Commission (FCC) statement

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

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. 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 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

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

Japanese Voluntary Control Council for Interference (VCCI) statement

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Power cords

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

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

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

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

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

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

IBM power cord part number	Used in these countries and regions
13F9940	Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa
13F9979	Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, China (Macau S.A.R.), Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe
13F9997	Denmark
14F0015	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka

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

Index

A

- AC power LED 37
- acoustical noise emissions 4
- adapter
 - considerations 13
 - full length 14
 - installing 14
 - PCI 13
 - PCI bus 14
 - PCI bus, identification 14
 - retention bracket 6
 - SCSI 17
 - specifications 4
 - support bracket 6
- air-baffle assembly, illustration 6
- attention notices 5

B

- battery connector 7
- bay identification, hot-swap drive 26
- bays, filler panel 20
- beep codes 54
- bezel
 - installing 34
 - removing 12
 - replacing 34

C

- cable, connectors 7, 8
- cables
 - internal drives 25
 - power 25
 - power and signal 25
 - signal 25
- cabling
 - connectors on back 36
 - SCSI adapter 17
 - system-board external connectors 8
 - system-board internal connectors 7
- caution statements 5
- CD-ROM drive
 - activity LED 37
 - eject button 37
 - installing 18
 - problems 56
 - specifications 4
- Class A electronic emission notice 77
- components
 - major 6
 - system board 7
- configuration
 - custom 45
 - fine-tuning 47
 - ServeRAID programs 41
 - summary window 46

- configuration (*continued*)
 - updating 36
- Configuration/Setup Utility 42
- configuring your server 41
- connectors
 - adapter 7
 - battery 7
 - cable 7
 - external port 8
 - internal cable 7
 - memory 7
 - microprocessor 7
 - port 8
 - system board 7
 - VRM 7
- controller, SCSI 17
- controls 37
- controls and indicators 37
- cooling 4
- cover
 - removing 11
 - replacing 35
- custom configuration 45

D

- danger statements 5
- DC power LED 37
- diagnostic tools 53
- DIMM connector
 - installing memory 28
 - locations 28
- DIMM retaining clips 29
- diskette drive
 - activity LED 37
 - installing 18, 20, 22
 - problem 56
 - specifications 4
- diskette eject button 37
- drive
 - bay filler panel 20
 - hot-swap
 - bay identification 26
 - installing 26
 - support 26
 - installation 20, 22
 - preinstallation 20
- drives, installing 18

E

- eject button
 - CD-ROM 37
 - diskette 37
- electrical input 4
- electrical safety information x
- electronic emission Class A notice 77

- environment 4
- error LED 59
- error messages 54
- Ethernet
 - activity LED 38
 - link status LED 37

F

- FCC Class A notice 77
- features, server 4
- filler panel 20
- filler panel, hard disk drive bay 27

H

- handling static-sensitive devices 10
- hard disk drive
 - activity LED 38
 - installing 18
 - status LED 38
- heat output 4
- hot-swap and hot-plug devices
 - drives 6, 26
 - fans 6
- hot-swap drive
 - bay identification 26
 - installing 26
 - specifications 4

I

- IBM Director 51
- important notices 5
- indicators 37
- information label 1
- installation order, memory modules 28
- installing
 - adapters 14
 - bezel 34
 - cover 35
 - drives in bays 5, 6, or 7 22
 - hot-swap drive 26
 - internal drives 18
 - memory modules 28
 - microprocessor 30
 - options 9
 - security rope clip 33
- integrated RAID controller
 - configuring 43
 - using ServeRAID Manager 43
- internal
 - drive bays 18
 - drives, installing 18

K

- keyboard problems 57

L

- LEDs
 - AC power 37
 - DC power 37
 - error 59
 - hard disk drive activity 38
 - hard disk drive status 38
- LSI Logic Configuration Utility 41
 - starting 49

M

- major components 6
- memory
 - installing 28
 - modules 28
 - problems 57
 - specifications 4
- memory module
 - order of installation 28
 - specifications 4
 - supported 28
- microprocessor
 - heat sink 32
 - installing 30
 - problems 57
 - specifications 4
- mouse problems 57

N

- notes 5
- notes, important 76
- notices
 - electronic emission 77
 - FCC, Class A 77
- notices and statements 5

O

- options, installing 9
- order of installation, memory modules 28

P

- PCI
 - adapters 13
 - bus A 14
 - bus B 14
 - expansion slots 13
- PCI expansion slots 4
- pointing device problems 57
- port, connectors 8
- POST 54
 - beep codes 54
 - error messages 54
- power control-button 38
- power cords 79
- power problems 59
- power supply specifications 4

- power switch 38
- power-control-button shield 38
- power-on LED 38
- power-on self-test (POST) 54
- power-on self-test (POST) beep codes 53
- problems
 - CD-ROM drive 56
 - diskette drive 56
 - keyboard 57
 - memory 57
 - microprocessor 57
 - mouse 57
 - pointing device 57
 - power 59
 - solving 53

R

- removable media drives, installing 18
- removing
 - bezel 12
 - side cover 11
 - support bracket 13
- replace
 - bezel 34
 - cover 35
- retaining clips, DIMM 29

S

- safety information
 - electrical viii, x
 - laser ix, 20
 - lifting ix
- SCSI connector location 7
- SCSI controller cabling 17
- SCSI, IDs 27
- security, U-bolt 33
- server, keys 1
- ServeRAID Manager 47
 - Configuration wizard 43
 - (illus.) 43
 - Custom configuration 44
 - description 42
 - Express configuration 43
 - online help 48
 - overview 42
 - startable-CD mode 42
- ServeRAID programs 41
- ServerGuide
 - CDs 41
 - error symptoms 55
- shield, power-control button 38
- side cover, removing 11

- size 4
- solving problems 53
- specifications 4
- startable-CD mode 42
- starting
 - LSI Logic Configuration Utility 49
 - the server 39
- statements and notices 5
- static electricity 10
- static-sensitive devices, handling 10
- status LEDs 37
- support bracket, removing 13
- system board
 - connectors
 - external port 8
 - internal cable 7
 - SCSI 7
 - LEDs 59
- system error LED 38
- system reliability 9

T

- tape drive, installing 18
- temperature 4
- thermal material, heat sink 32
- trademarks 76
- troubleshooting chart 56
- turning on the server 39

U

- United States electronic emission Class A notice 77
- United States FCC Class A notice 77
- utility
 - Configuration/Setup 42
 - ServeRAID Manager 42

V

- video 4
- video controller 4

W

- Web site
 - compatible options 9
 - DIMM specification 28
- weight 4

X

- xSeries, Web address 1



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