



xSeries 346
Type 8840

Installation Guide

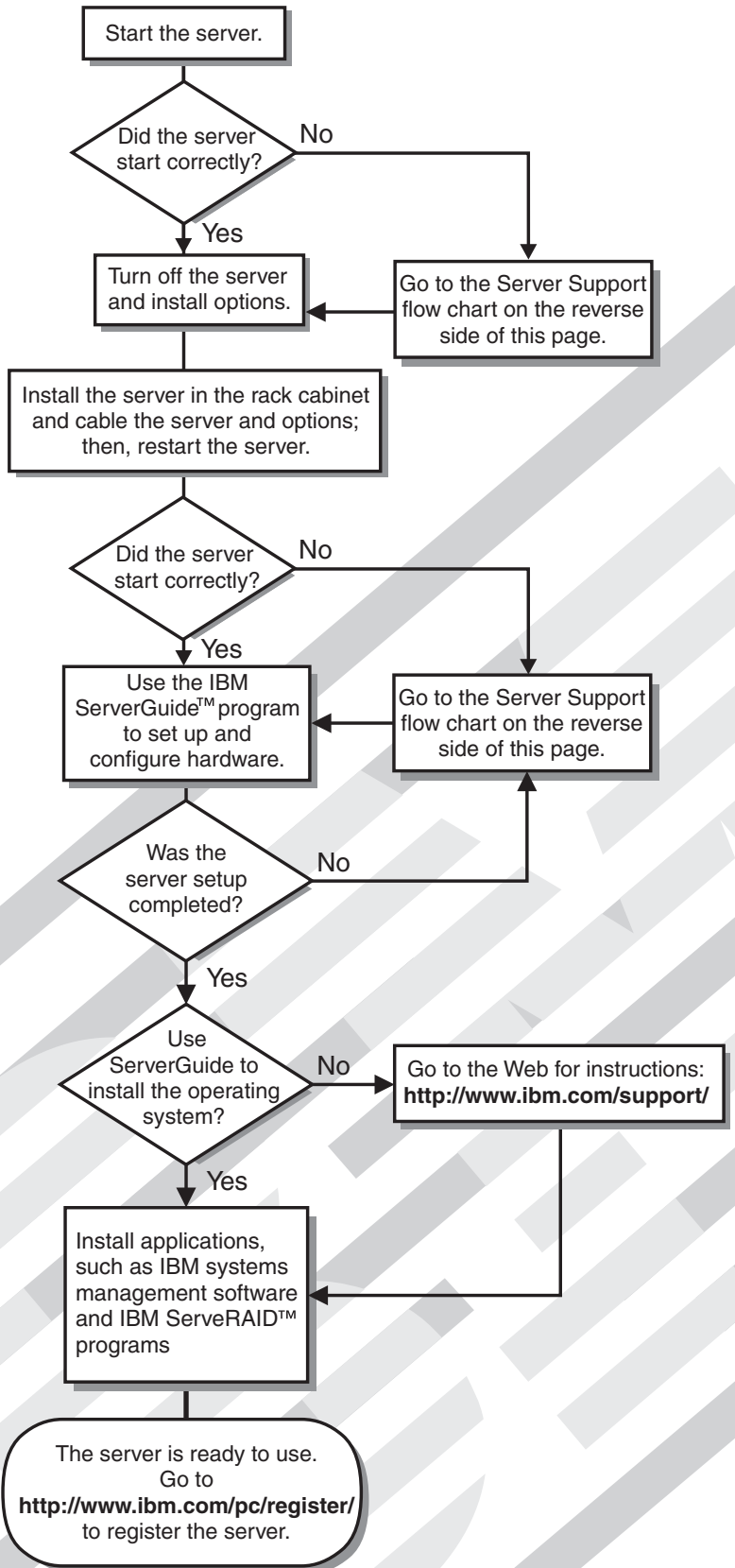
Welcome.

Thank you for buying an IBM xSeries server. Your server is based on the X-Architecture™ technology, and it features superior performance, availability, and scalability.

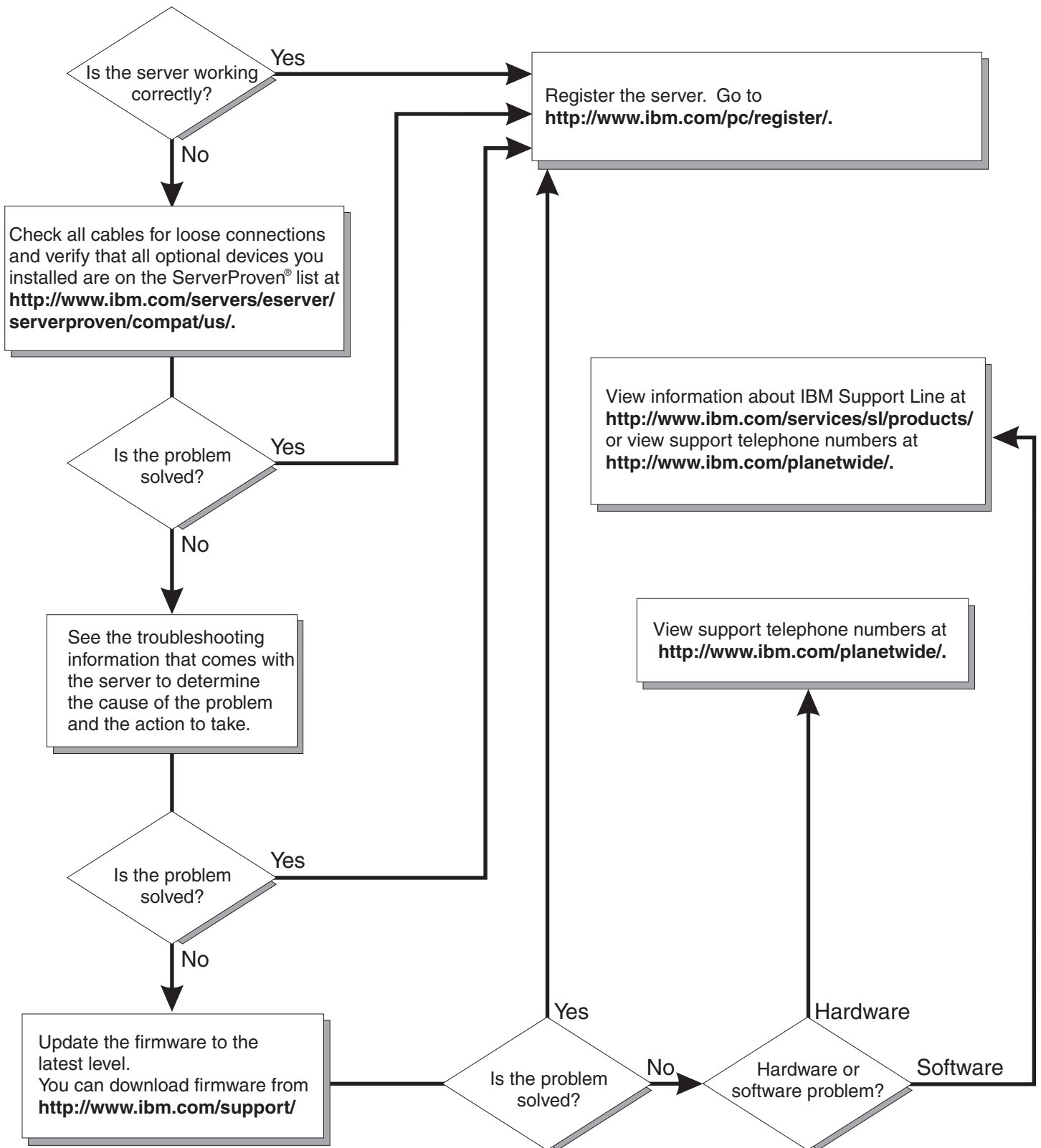
This server *Installation Guide* contains information for setting up and configuring your server.

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

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



Server Support



IBM xSeries 346
Type 8840



Installation Guide

Note:

Before using this information and the product it supports, read the general information in Appendix B, "IBM Statement of Limited Warranty Z125-4753-08 04/2004," on page 65, and Appendix C, "Notices," on page 83.

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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.

Important:

All caution and danger statements in this documentation begin with a number. This number is used to cross reference an English caution or danger statement with translated versions of the caution or danger statement in the *IBM Safety Information* book.

For example, if a caution statement begins with a number 1, translations for that caution statement appear in the *IBM Safety Information* book under statement 1.

Be sure to read all caution and danger statements in this documentation before performing the instructions. Read any additional safety information that comes with your server or optional device before you install the device.

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:

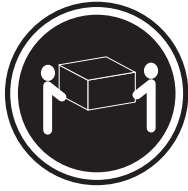
- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation 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 14



CAUTION:

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



Statement 15



CAUTION:

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

Statement 16



CAUTION:

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

Statement 17



CAUTION:

The following label indicates moving parts nearby.



WARNING: Handling the cord on this product or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. ***Wash hands after handling.***

ADVERTENCIA: El contacto con el cable de este producto o con cables de accesorios que se venden junto con este producto, pueden exponerle al plomo, un elemento químico que en el estado de California de los Estados Unidos está considerado como un causante de cancer y de defectos congénitos, además de otros riesgos reproductivos. ***Lávese las manos después de usar el producto.***

Chapter 1. Introduction

This *Installation Guide* contains instructions for setting up your IBM® @server™ xSeries® 346 Type 8840 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 document contains information about:

- Setting up and cabling your server
- Starting and configuring your server
- Installing some options
- Solving problems

The server might have features that are not described in the documentation that you received with the server. The documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the server documentation. These updates are available from the IBM Web site. To check for updated documentation and technical updates, complete the following steps:

Note: Changes are made periodically to the IBM Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to <http://www.ibm.com/support/>.
2. Under **Search technical support** type, **xSeries 346** and click **Search**.

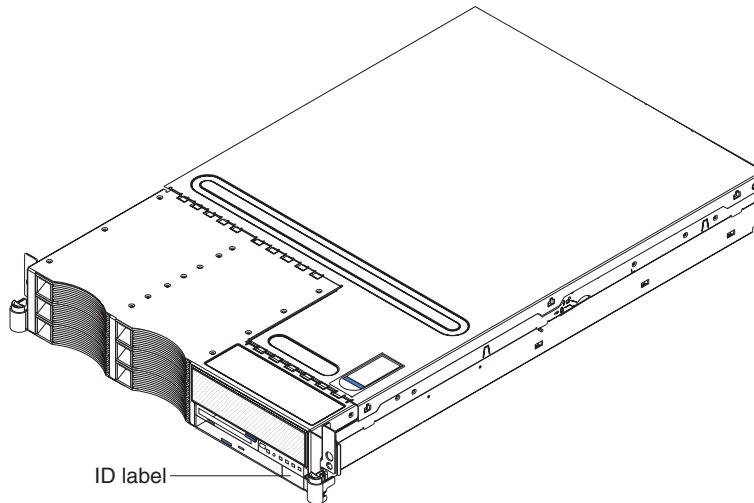
Your server comes with an IBM *ServerGuide™ Setup and Installation CD* to help you configure the hardware, install device drivers, and install the operating system.

Your server comes with a limited warranty. 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 the server with IBM.

Product name	IBM @server xSeries 346 server
Machine type	8840
Model number	_____
Serial number	_____

The model number and serial number are on the ID label on the lower-right front of the server, as shown in the following illustration.



For a list of supported options for your server, go to the ServerProven® Web site at <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

See the *Rack Installation Instructions* document for complete rack installation and removal instructions.

The IBM xSeries Documentation CD

The IBM *xSeries Documentation* CD contains documentation for your server in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

Hardware and software requirements

The IBM *xSeries Documentation* CD requires the following minimum hardware and software:

- Microsoft® Windows NT® 4.0 (with Service Pack 3 or later), Windows® 2000, or Red Hat Linux®.
- 100 MHz microprocessor.
- 32 MB of RAM.
- Adobe Acrobat Reader 3.0 (or later) or Xpdf, which comes with Linux operating systems. Acrobat Reader software is included on the CD, and you can install it when you run the Documentation Browser.

Using the Documentation Browser

Use the Documentation Browser to browse the contents of the CD, read brief descriptions of the documents, and view documents using Adobe Acrobat Reader or Xpdf. The Documentation Browser automatically detects the regional settings in use in your system and displays the documents in the language for that region (if available). If a document is not available in the language for that region, the English version is displayed.

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

- If Autostart is enabled, insert the CD into your CD-ROM drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users, use one of the following procedures:

- If you are using a Windows operating system, insert the CD into your CD-ROM drive and click **Start --> Run**. In the **Open** field, type
`e:\win32.bat`

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

- If you are using Red Hat Linux, insert the CD into your CD-ROM drive; then, run the following command from the `/mnt/cdrom` directory:
`sh runlinux.sh`

Select your server from the **Product** menu. The **Available Topics** list displays all the documents for your server. Some documents might be in folders. A plus sign (+) indicates each folder or document that has additional documents under it. Click the plus sign to display the additional documents.

When you select a document, a description of the document appears under **Topic Description**. To select more than one document, press and hold the Ctrl key while you select the documents. Click **View Book** to view the selected document or documents in Acrobat Reader or Xpdf. If you selected more than one document, all the selected documents are opened in Acrobat Reader or Xpdf.

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it, and press Ctrl+F to use the Acrobat search function or Alt+F to use the Xpdf search function within the document.

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

Notices and statements used in this document

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

The following notices and statements are used in this document:

- **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.

Features and specifications

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

Racks are marked in vertical increments of 1.75 inches. Each increment is referred to as a unit, or "U." A 1-U-high device is 1.75 inches tall.

Table 1. Features and specifications

<p>Microprocessor:</p> <ul style="list-style-type: none"> Intel® Xeon 2.8 GHz or higher depending on server model 800 MHz front-side bus (FSB) Support for up to two microprocessors with Intel Hyper-Threading Technology <p>Note: Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors.</p> <p>Memory:</p> <ul style="list-style-type: none"> Minimum: 512 MB Maximum: 16 GB Type: 2-way interleaved PC2-3200, ECC DDR II SDRAM, registered DIMMs only Sizes: 256 MB, 512 MB, 1 GB, or 2 GB <p>Drives:</p> <ul style="list-style-type: none"> Diskette: 1.44 MB DVD-ROM: IDE <p>Expansion bays:</p> <ul style="list-style-type: none"> Six hot-swap, 3.5-inch drive bays (hot-swap hard disk drives installed, some models) One 5.25-inch bay (DVD-ROM drive installed) One 3.5-inch removable-media drive bay (diskette drive installed) <p>Expansion slots:</p> <ul style="list-style-type: none"> Two PCI-X non-hot-plug 100 MHz/64-bit (low profile) Two PCI-X non-hot-plug 133 MHz/64-bit <p>Hot-swap fans:</p> <ul style="list-style-type: none"> Standard: Six Maximum: 12 - provide redundant cooling 	<p>Hot-swap power supplies:</p> <p>625 watts (100-240 V ac)</p> <ul style="list-style-type: none"> Minimum: One Maximum: Two - provide redundant power <p>Size (2 U):</p> <ul style="list-style-type: none"> Height: 85.4 mm (3.36 in.) Depth: 702 mm (27.64 in.) Width: 443.6 mm (17.5 in.) Weight: approximately 21.09 kg (46.5 lb) to 29.03 kg (64 lb) depending upon configuration <p>Integrated functions:</p> <ul style="list-style-type: none"> Baseboard management controller Two Broadcom 10/100/1000 Ethernet controllers (dual-port design) with Wake on LAN® support One serial port One external and one internal Ultra320 SCSI port (dual-channel controller with integrated RAID) Three Universal Serial Bus (USB) v1.1 or v2.0 ports <p>Note: The baseboard management controller is also known as the service processor.</p> <p>Video controller:</p> <ul style="list-style-type: none"> ATI Radeon 7000M IGP video on system board Compatible with SVGA and VGA 16 MB DDR-SDRAM video memory <p>Environment:</p> <ul style="list-style-type: none"> Air temperature: <ul style="list-style-type: none"> Server on: 10° to 35°C (50.0° to 95.0°F); altitude: 0 to 914.4 m (3000 ft) Decrease system temperature by 0.75°C for every 1000 feet increase in altitude. Server off: 10° to 43°C (50.0° to 109.4°F); maximum altitude: 2133 m (7000 ft) Shipment: -40° to 60°C (-40.0° to 140°F); maximum altitude: 2133 m (7000 ft) Humidity: <ul style="list-style-type: none"> Server on/off: 8% to 80% Shipment: 5% to 100% 	<p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> Declared sound power, idle: 6.6 bel Declared sound power, operating: 6.6 bel <p>Heat output:</p> <p>Approximate heat output in British thermal units (Btu) per hour:</p> <ul style="list-style-type: none"> Minimum configuration: 1230 Btu (360 watts) Maximum configuration: 2840 Btu (830 watts) <p>Electrical input:</p> <ul style="list-style-type: none"> Sine-wave input (50-60 Hz) required Input voltage range 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: 0.36 kVA Maximum: 0.83 kVA <p>Notes:</p> <ol style="list-style-type: none"> Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.
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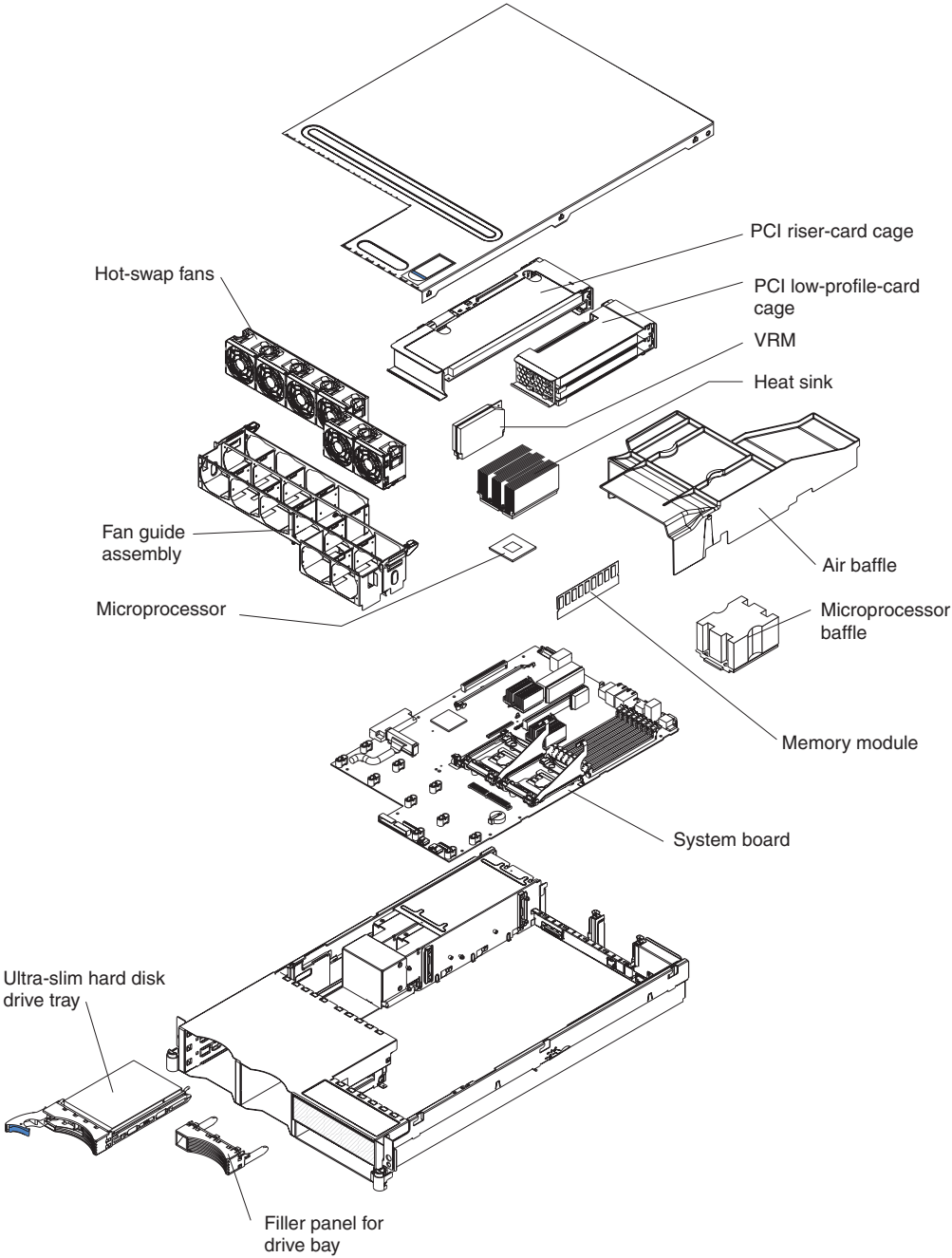
Major components of the xSeries 346 Type 8840 server

Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.

Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.

The following illustration shows the major components in the server.

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



Chapter 2. Installing options

This chapter provides basic instructions for installing hardware options in the 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, read the following information:

- Read the safety information beginning on page v and the guidelines in “Handling static-sensitive devices” on page 8. This information will help you work safely with the server and options.
- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- You do not have to turn off the server to install or replace hot-swap power supplies, hot-swap fans, or hot-plug Universal Serial Bus (USB) devices.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- For a list of supported options for your server, go to <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

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.
- Each of the power-supply bays has a power supply or power-supply blank installed in it.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2.0 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 (more than 30 minutes) with the server cover removed might damage server components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap drive within 2 minutes of removal.
- You do not remove the air baffle while the server is running. 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.

Working inside the server with the power on

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

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

Handling static-sensitive devices

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

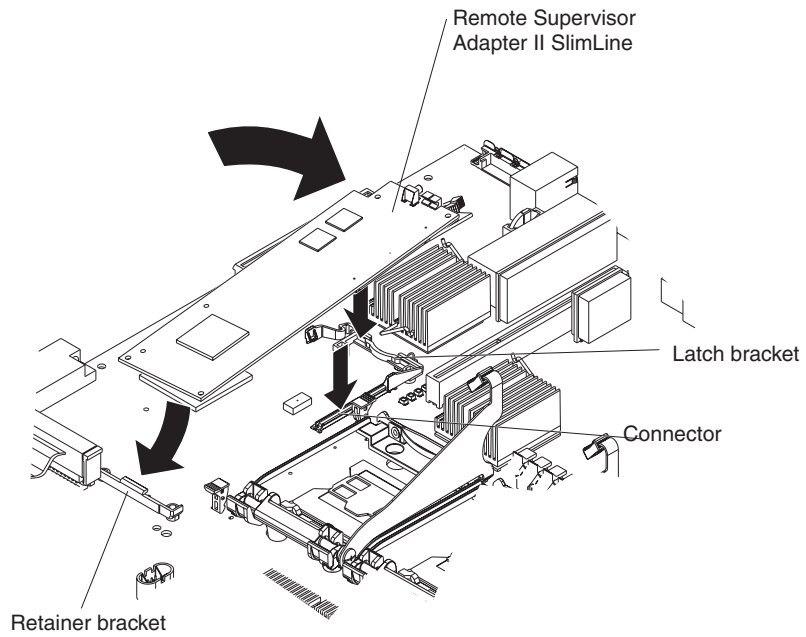
To reduce the possibility of damage from electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Wear an electrostatic-discharge wrist strap, if one is available.
- 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 the server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Installing an adapter

The following notes describe the types of adapters that the server supports and other information that you must consider when installing adapters:

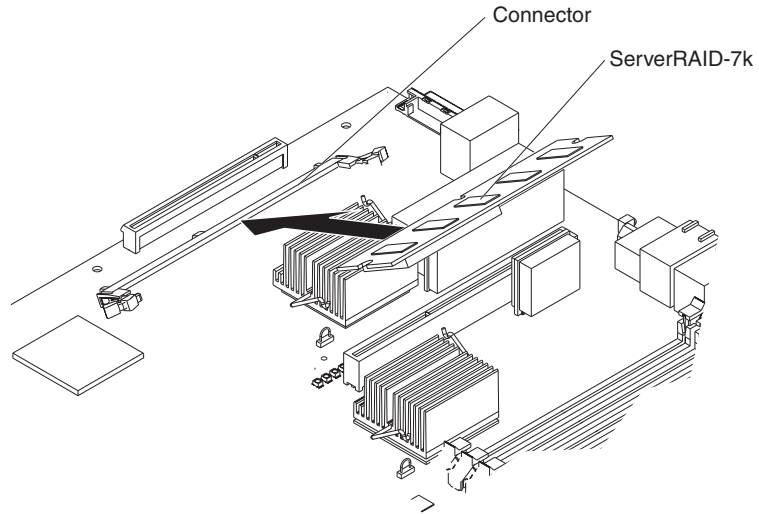
- PCI-X slots 1 and 2 support non-hot-plug, 64-bit, 100 MHz, low-profile adapters.
- PCI-X slots 3 and 4 support non-hot-plug, 64-bit, 133 MHz, standard full-length adapters.
- The optional IBM Remote Supervisor Adapter II SlimLine can be installed only in a dedicated slot on the system board. The following illustration shows how to install the Remote Supervisor Adapter II SlimLine.



Slip the free end of the card under the tab on the retainer bracket; then, press the card in the connector and make sure that all tabs on the latch bracket secure the card in place.

- If you are installing an optional ServeRAID™-7k, review the following information:
 - No rerouting of the internal SCSI cable is required if you are installing the ServeRAID-7k.
 - The ServeRAID-7k can be installed only in a dedicated slot on the system board.

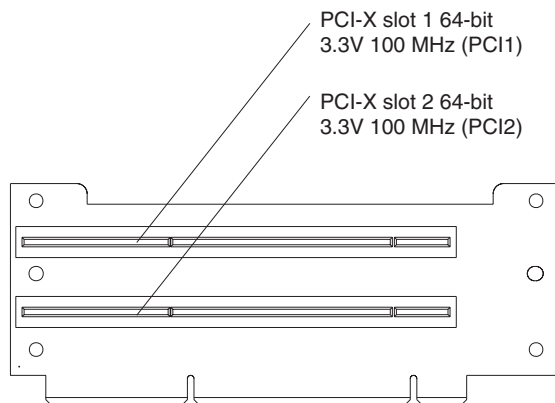
The following illustration shows how to install the ServeRAID-7k.



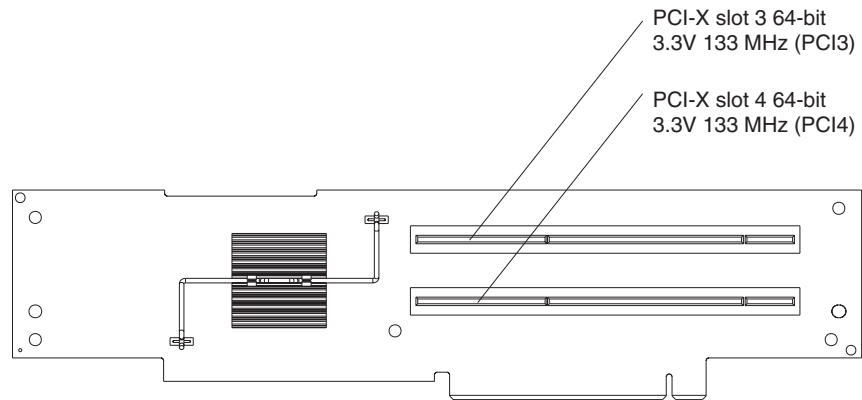
For more detailed instructions or information, see the *Option Installation Guide* on the IBM xSeries Documentation CD.

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

PCI low-profile card

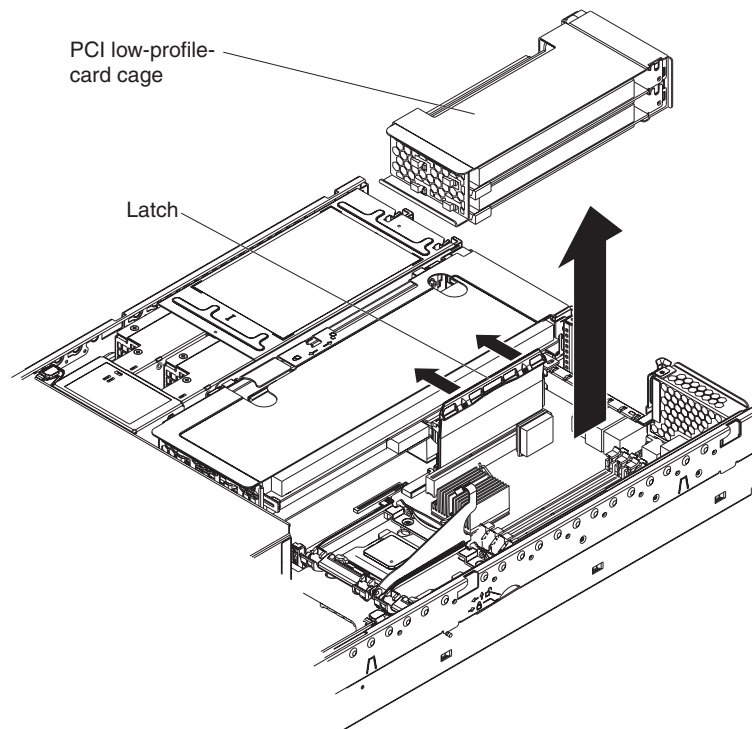


PCI riser card

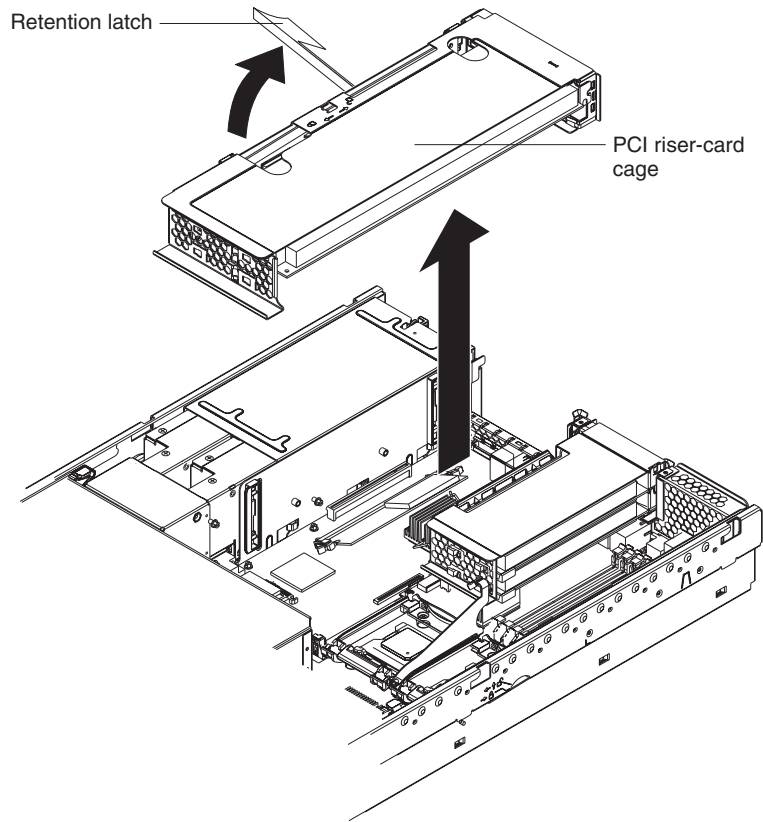


Complete the following steps to install an adapter:

1. Read the safety information beginning on page v and “Installation guidelines” on page 7.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Remove the top cover.
4. If you are installing an adapter in PCI slot 1 or 2, remove the PCI low-profile-card cage.



If you are installing an adapter in PCI slot 3 or 4, remove the PCI riser-card cage.



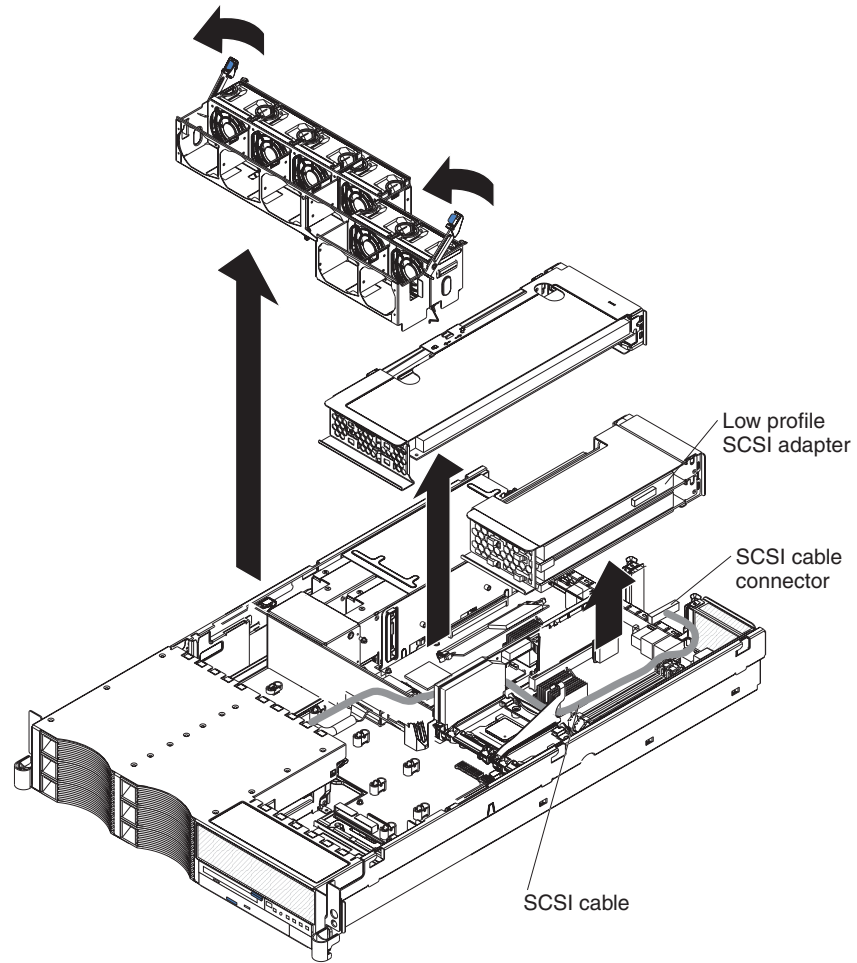
5. Slide the expansion-slot cover out of the PCI low-profile-card cage or PCI riser-card cage.
6. Install the adapter.
7. Reinstall the PCI low-profile card cage or PCI riser-card cage.
8. Connect any needed cables to the adapter.

Attention:

- When you route cables, do not block any connectors or the ventilated space around any of the fans.
- Make sure that cables are not routed on top of components under the PCI riser-card cage or the PCI low-profile-card cage.
- Make sure that cables are not pinched by the server components.

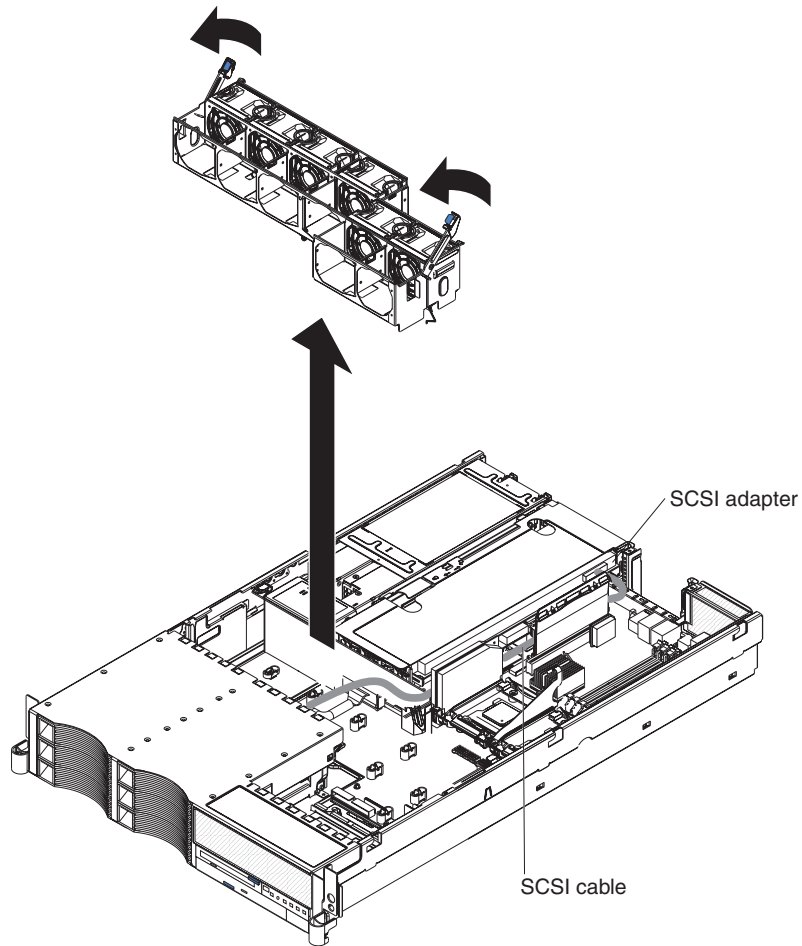
The following illustration shows the cable routing for an adapter installed in the PCI low-profile-card cage.

Note: Remove the PCI riser-card cage, the PCI low-profile card cage, and the fan guide before you route the cables. Reinstall the components when you complete the cable routing.



The following illustration shows the cable routing for an adapter installed in the PCI riser-card cage.

Note: Remove the fan guide before you route the cables. Reinstall the fan guide when you complete the cable routing.



9. Perform any configuration tasks that are required for the adapter.
10. If you have other options to install or remove, do so now.
11. Replace the top cover. Go to “Completing the installation” on page 22.

Installing a memory module

The following notes describe the types of dual inline memory modules (DIMMs) that the server supports and other information that you must consider when installing DIMMs:

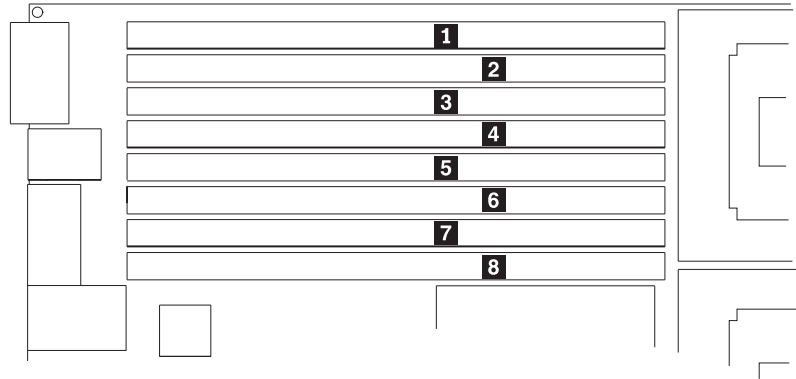
- The server supports 256 MB, 512 MB, 1 GB, and 2 GB DIMMs, for a maximum of 16 GB of system memory. The server supports up to eight 1.8 V, 240-pin, PC2-3200, ECC DDR II SDRAM, 200 MHz DIMMs. Go to the ServerProven list at <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of memory modules that you can use with the server.
- The server comes with a minimum of two 256 MB DIMMs, installed in slots 1 and 2. When installing additional DIMMs, you must install two DIMMS at a time, in the order shown in the following table, to maintain performance.

Table 2. DIMM installation sequence

Pair	DIMM connectors
1	1 and 2
2	3 and 4

Table 2. DIMM installation sequence (continued)

Pair	DIMM connectors
3	5 and 6
4	7 and 8



- Each DIMM in a pair must be the same size and technology to ensure that the server will operate properly.
- You can configure the server to use memory mirroring. Memory mirroring stores data in two pairs of DIMMs simultaneously. Memory mirroring reduces the amount of available memory. Enable memory mirroring through the Configuration/Setup Utility program. See the *User's Guide* on the IBM xSeries Documentation CD for details about enabling memory mirroring.

When using memory mirroring, you must install two pairs of DIMMs at a time. The four DIMMs in each group must be identical. See Table 3 for the DIMM connectors that are in each group.

Table 3. Memory mirroring DIMM installation sequence

Group	DIMM connectors
1	1, 2, 3, and 4
2	5, 6, 7, and 8

- The server supports online-spare memory. This feature disables the failed memory from the system configuration and activates an online-spare memory pair of DIMMs to replace the failed active DIMM pair. Online-spare memory reduces the amount of available memory. Before you can enable this feature, you must install one additional pair of DIMMs. The online-spare memory DIMM pair must be the same speed, type, and the same size, or larger, than the active DIMM pair.

Enable online-spare memory through the Configuration/Setup Utility program. The BIOS code assigns the online-spare memory DIMM pair according to your DIMM configuration. See the *User's Guide* on the IBM xSeries Documentation CD for information about enabling online-spare memory. See Table 4 for the online-spare memory DIMM connector assignments.

Table 4. Online-spare memory DIMM connector assignments

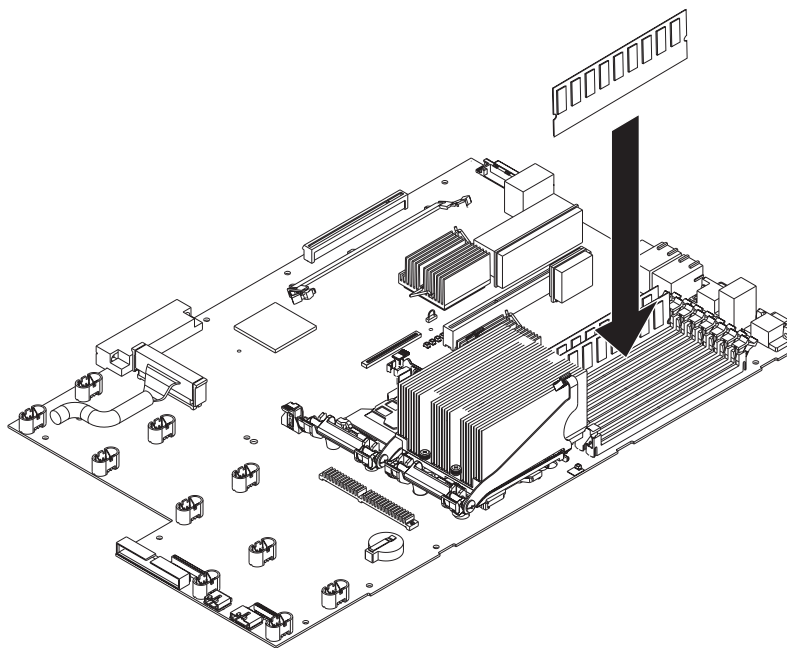
Active DIMM connectors	Online-spare memory DIMM connectors
1 and 2	3 and 4
1 and 2 3 and 4	5 and 6

Table 4. Online-spare memory DIMM connector assignments (continued)

Active DIMM connectors	Online-spare memory DIMM connectors
1 and 2 3 and 4 5 and 6	7 and 8

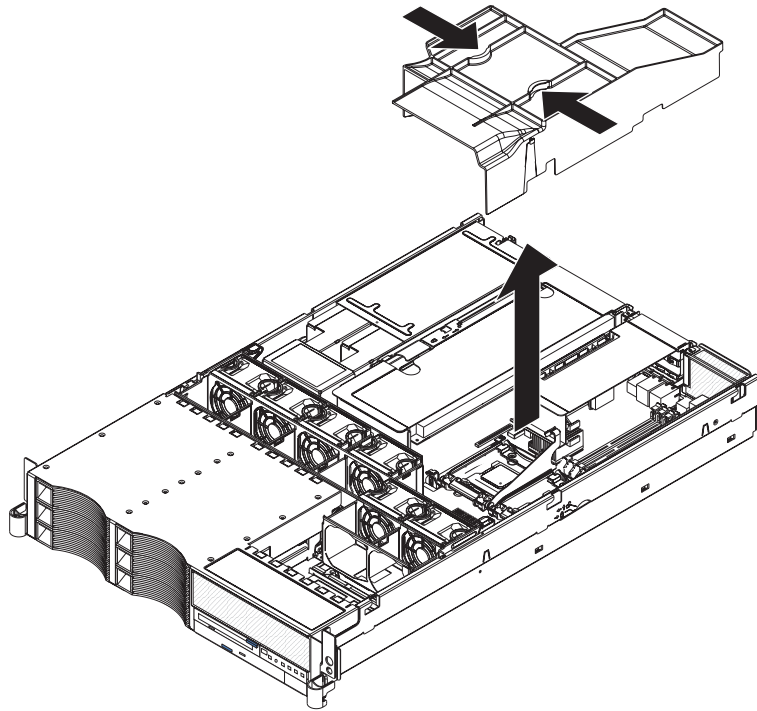
- You can enable either online-spare memory or memory mirroring, but not both at the same time.
- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message indicating that the memory configuration has changed.

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



Complete the following steps to install a DIMM:

1. Read the safety information beginning on page v and “Installation guidelines” on page 7.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables, if necessary; then, remove the top cover.
3. Remove the air baffle.



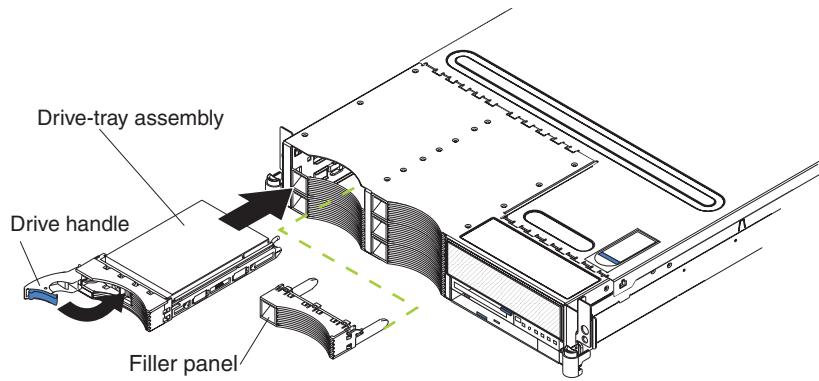
4. Determine the connectors into which you will install the DIMMs.
5. Install the DIMMs in the connectors.
6. If you have other options to install or remove, do so now.
7. Install the air baffle.
8. Replace the top cover. Go to “Completing the installation” on page 22.

Installing a hard disk drive

The following notes describe the types of hard disk drives that the server supports and other information that you must consider when installing hard disk drives:

- The server supports six 1-inch (26 mm) slim, 3.5-inch low-voltage differential (LVD) hard disk drives installed on Ultra-Slim hard disk drive trays. For a list of supported hard disk drives, go to the ServerProven Web site at <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.
- All hot-swap drives in the server should have the same throughput speed rating. Mixing hard drives with different speed ratings will cause all drives to operate at the lower throughput speed.
- The SCSI ID that is assigned to each bay is printed on the server front.

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



Complete the following steps to install a hard disk drive.

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. Read the safety information beginning on page v and “Installation guidelines” on page 7.
2. Remove the filler panel.
3. Place the drive handle in the open position and slide the drive into the bay.
4. Close the drive handle.
5. If you have other options to install or remove, do so now.
6. Go to “Completing the installation” on page 22.

Installing an additional microprocessor

The following notes describe the type of microprocessor that the server supports and other information that you must consider when installing a microprocessor:

- When you install the microprocessor in socket J23, you must also install the voltage regulator module (VRM) that comes with the microprocessor in VRM connector J72.
- If the thermal-grease protective cover (for example, a plastic cap or tape liner) is removed from the heat sink or fan sink, do not touch the thermal grease on the bottom of the heat sink or fan sink or set down the heat sink or fan sink.

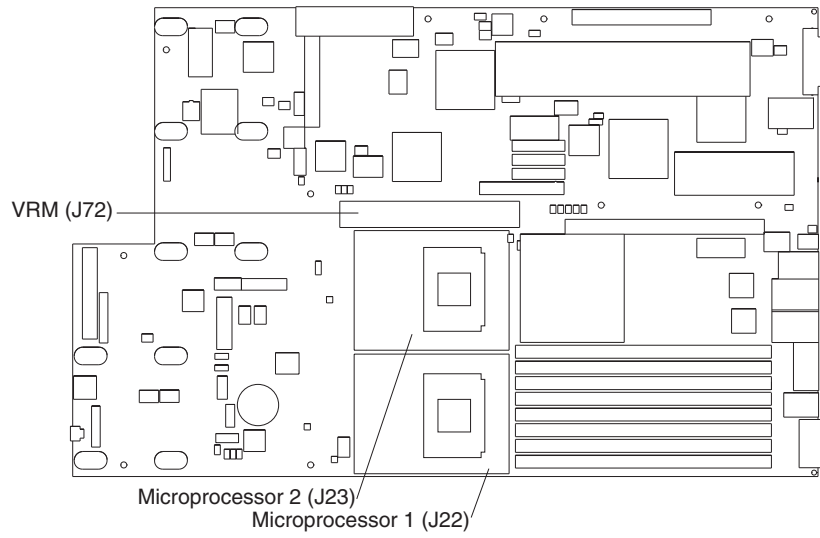
Note: Removing the heat sink or fan sink from the microprocessor destroys the even distribution of the thermal grease and requires replacing the thermal grease. Setting down the heat sink or fan sink onto any surface when the thermal-grease protective cover is removed will contaminate the thermal grease. If the thermal grease becomes contaminated with particles, it must be replaced.

For information about replacing contaminated thermal grease on the heat sink or fan sink, contact IBM Services. For support phone numbers, go to <http://www.ibm.com/planetwide/>, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

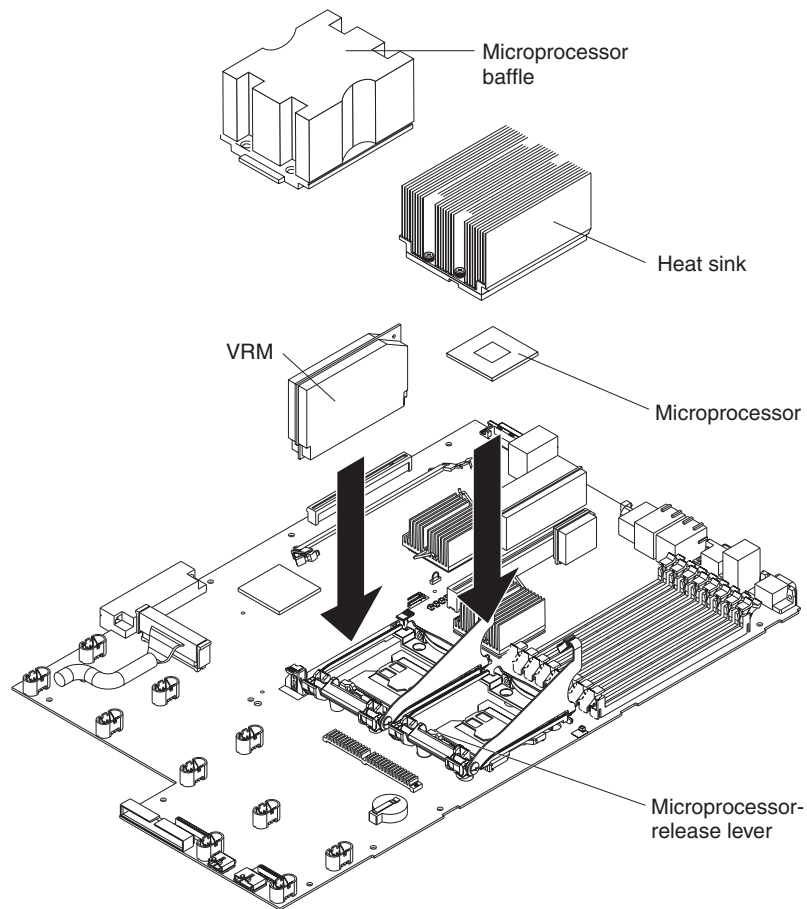
Have the following information ready when you call:

- Machine type and model
- Serial number of your server or computer

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



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



Attention:

- A startup (boot) processor must always be installed in socket J22 on the system board.
- To ensure proper server operation when you install an additional microprocessor, use microprocessors that have the same cache size and type, and the same clock speed. Microprocessor internal and external clock frequencies must be identical.

Complete the following steps to install an additional microprocessor:

1. Read the safety information beginning on page v and “Installation guidelines” on page 7.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables, if necessary; then, remove the top cover.
3. Remove the air baffle and the microprocessor baffle.
4. Install a VRM in the VRM connector (J72).
5. Install the microprocessor:

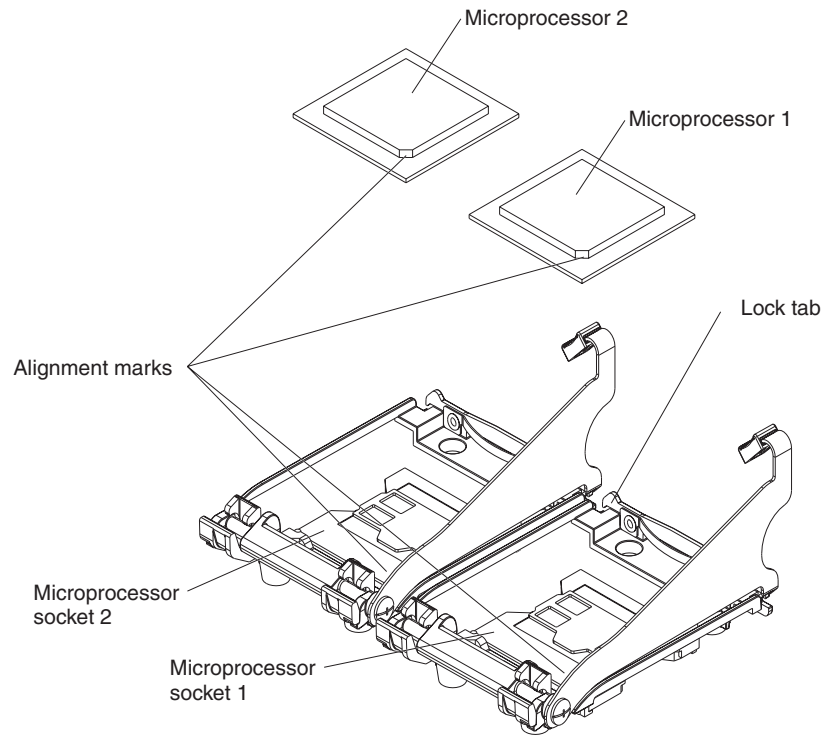
- a. Touch the static-protective package containing the microprocessor to any unpainted metal surface on the server. Then, remove the microprocessor from the package.
- b. Remove the protective cover, tape, or label from the surface of the microprocessor socket, if present.

Attention: You must ensure that the locking lever on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, and system board.

- c. Rotate the locking lever on the microprocessor socket from its closed and locked position until it stops or clicks in the fully open position (approximately 135° angle).

Attention:

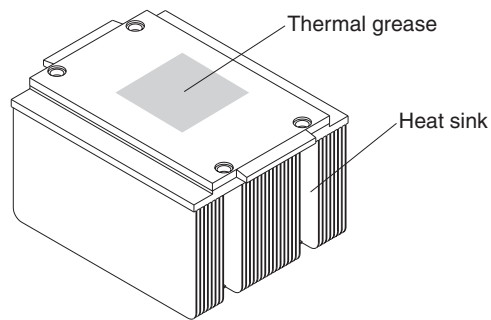
- Do not use excessive force when pressing the microprocessor into the socket.
 - Make sure that the microprocessor is oriented and aligned with pin number 1 in the socket before you try to close the lever.
- d. Center the microprocessor over the microprocessor socket. Align the triangle on the corner of the microprocessor with the triangle on the corner of the socket and carefully press the microprocessor into the socket.



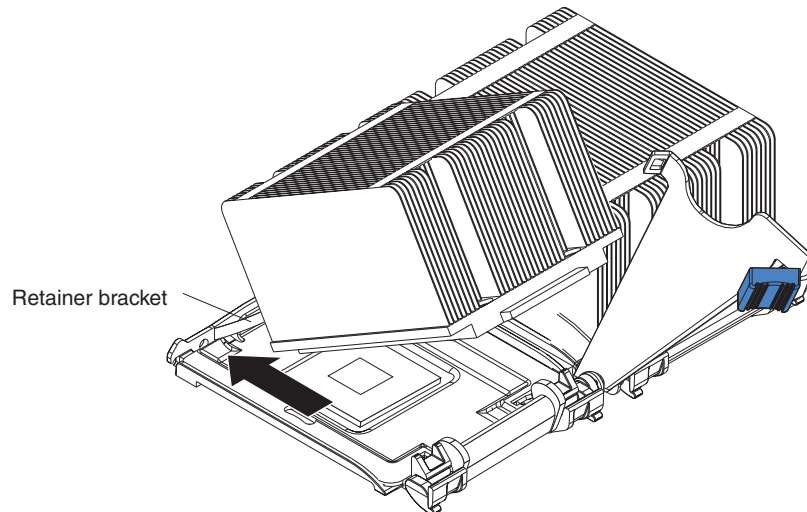
- e. Carefully close the locking lever to secure the microprocessor in the socket.
6. Install a heat sink on the microprocessor.

Attention:

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



- Do not touch the thermal grease on the bottom of the heat sink or set down the heat sink. Touching the thermal grease will contaminate it. For details, see the information about thermal grease on page 18.
- a. Remove the plastic protective cover from the bottom of the heat sink.
 - b. Make sure that the heat-sink lever is in the open position.
 - c. Align the heat sink above the microprocessor with the thermal grease side down.



- d. Slide the flange of the heat sink into the opening beneath the retainer bracket.
 - e. Press down firmly on the heat sink until it is seated securely.
 - f. Attach the heat sink to the microprocessor by rotating the heat-sink lever to the closed position and hooking it underneath the lock tab.
7. Install the air baffle.
 8. If you have other options to install or remove, do so now.
 9. Replace the top cover. Go to “Completing the installation.”

Completing the installation

Complete the following steps to complete the installation:

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

Attention:

- Install the server only in a rack cabinet with perforated doors.
 - Do not leave open spaces above or below an installed server in the rack cabinet. To help prevent damage to server components, always install a blank filler panel to cover the open space and to help ensure proper air circulation. See the documentation that comes with your rack cabinet for more information.
 - Install the server in a rack that meets the following requirements:
 - Minimum depth of 70 mm (2.76 in.) between the front mounting flange and the inside of the front door
 - Minimum depth of 157 mm (6.18 in.) between the rear mounting flange and the inside of the rear door
 - Minimum depth of 718 mm (28.27 in.) and maximum depth of 762 mm (30.00 in.) between the front and rear mounting flanges
3. Connect the cables and power cords. See “Connecting the cables” on page 23 for more information.

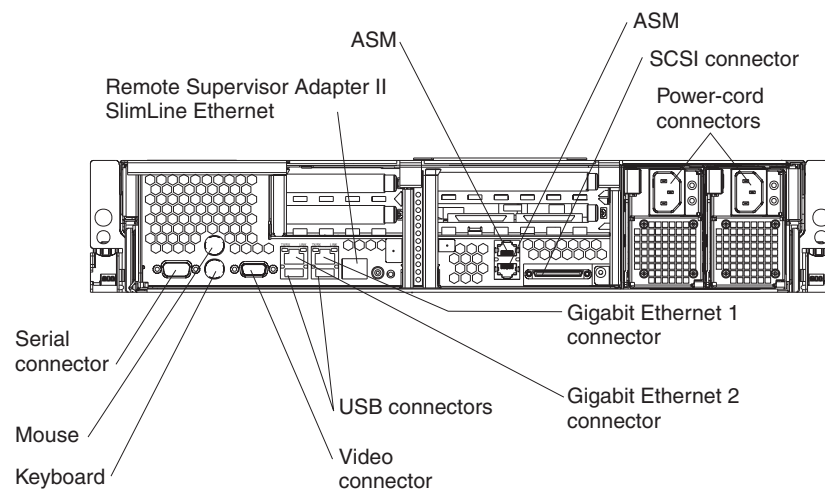
Connecting the cables

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

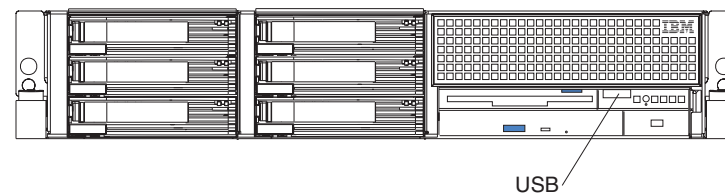
Notes:

1. You must turn off the server before connecting cables to or disconnecting any cables from the server (see “Turning off the server” on page 28).
2. See the documentation that comes with your options for additional cabling instructions. It might be easier for you to route cables before you install certain options.
3. Cable identifiers are printed on the cables that come with the server and options. Use these identifiers to connect the cables to the correct connectors.

Rear view



Front view



Updating the server configuration

When you start the server for the first time after you add or remove an internal option or external SCSI device, you might receive a message that the configuration has changed. The Configuration/Setup Utility program starts automatically so that you can save the new configuration settings. For more information, see the section about configuring the server in the *User's Guide* on the *IBM xSeries Documentation* CD.

Some options have device drivers that you must install. See the documentation that comes with each option for information about installing device drivers.

The server comes with at least one microprocessor. If more than one microprocessor is installed, the server can operate as a symmetric multiprocessing (SMP) server. You might have to upgrade the operating system to support SMP. For

more information, see the section about using the *ServerGuide Setup and Installation* CD in the *User's Guide* and the operating-system documentation.

If the server has an optional RAID adapter and you have installed or removed a hard disk drive, see the documentation that comes with the RAID adapter for information about reconfiguring the disk arrays.

If the server has a RAID configuration using the SCSI controller with integrated RAID and you have installed or removed a hard disk drive, you might have to reconfigure the disk arrays. See the RAID documentation on the IBM *ServeRAID-7e (Adaptec HostRAID) Support* CD for more information about reconfiguring the disk arrays.

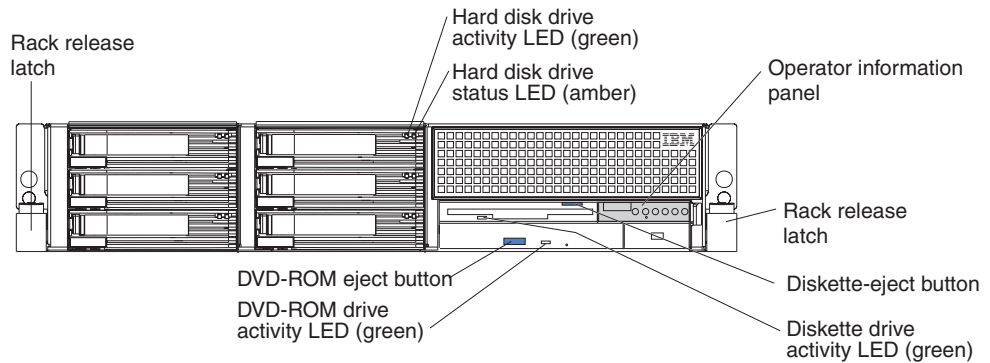
For information about configuring the integrated Gigabit Ethernet controllers, see the *User's Guide*.

Chapter 3. Server power, controls, and indicators

This chapter describes the controls and light-emitting diodes (LEDs) and how to turn the server on and off.

Front view

The following illustration shows the controls, LEDs, and connectors on the front of the server.

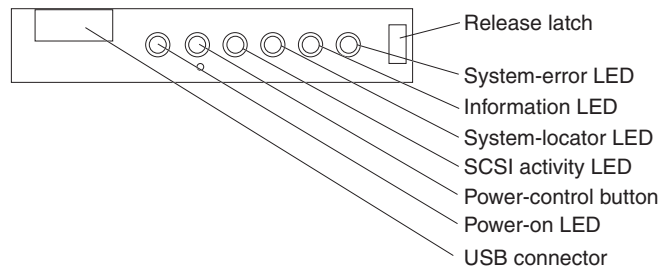


Rack release latches: Press these latches to release the server from the rack.

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

Hard disk drive status LED: On some server models, each hot-swap hard disk drive has a status LED. When this LED is lit, it indicates that the drive has failed. If an optional IBM ServeRAID controller is installed in the server, when this LED is flashing slowly (one flash per second), it indicates that the drive is being rebuilt. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.

Operator information panel: This panel contains controls, LEDs, and connectors. The following illustration shows the controls, LEDs, and connectors on the operator information panel.



The following controls, LEDs, and connectors are on the operator information panel:

- **Release latch:** Slide this latch to the left to access the light path diagnostics panel.
- **System-error LED:** When this LED is lit, it indicates that a system error has occurred. An LED on the light path diagnostics panel is also lit to help isolate the error.

- **Information LED:** When this LED is lit, it indicates that a noncritical event has occurred. An LED on the light path diagnostics panel is also lit to help isolate the error.
- **System-locator LED:** Use this LED to visually locate the server among other servers. You can use IBM Director to light this LED remotely.
- **SCSI activity LED:** When this LED is lit, it indicates that there is activity on the SCSI or IDE bus.
- **Power-control button:** Press this button to turn the server on and off manually. A power-control-button shield comes installed on the server 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 turned off and still connected to an ac power source. When this LED is off, it indicates that ac power is not present, or the power supply or the LED itself has failed.

Note: If this LED is off, it does not mean that there is no electrical power in the server. The LED might be burned out. To remove all electrical power from the server, you must disconnect the power cord from the electrical outlet.

- **USB connector:** Connect a USB device to this connector.

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

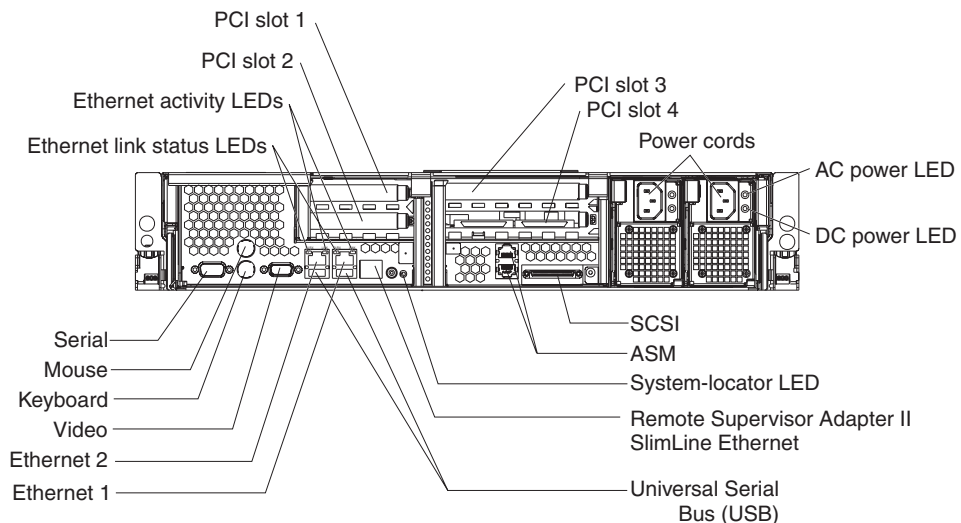
Diskette drive activity LED: When this LED is lit, it indicates that the diskette drive is in use.

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

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

Rear view

The following illustration shows the connectors and LEDs on the rear of the server.



Ethernet link status LEDs: When these LEDs are lit, they indicate that there is an active link connection on the 10BASE-T, 100BASE-TX, or 1000BASE-TX interface for the Ethernet port.

Ethernet activity LEDs: When these LEDs are lit, they indicate that the server is transmitting to or receiving signals from the Ethernet LAN that is connected to the Ethernet port.

PCI slots 1-4: When PCI adapters are installed in the server, the external adapter connectors are located in these four slots.

Power-cord connectors: Connect the power cords to these connectors.

AC power LED: On some server models, each hot-swap power supply has an ac power LED and a dc power LED. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

DC power LED: On some server models, each hot-swap power supply has a dc power LED and an ac power LED. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

SCSI connector: Connect a SCSI device to this connector.

ASM connectors: Use either of these connectors to connect the server to an Integrated xSeries Adapter (IXA) that is installed in the server.

System-locator LED: Use this LED to visually locate the server among other servers. You can use IBM Director to light this LED remotely.

Remote Supervisor Adapter II SlimLine Ethernet connector: Use this connector to connect the server to a network for systems-management information control. This connector is active only if you have installed a Remote Supervisor Adapter II SlimLine.

USB connectors: Connect USB devices to these connectors.

Ethernet 1 connector: Use this connector to connect the server to a network.

Ethernet 2 connector: Use this connector to connect the server to a network.

Video connector: Connect a monitor to this connector.

Keyboard connector: Connect a PS/2® keyboard to this connector.

Mouse connector: Connect a mouse or other PS/2 device to this connector.

Serial connector: Connect a 9-pin serial device to this connector.

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 except for the service processor is shut down; however, the server can respond to requests from the service processor (also called the baseboard management controller), such as a remote request to turn on the server. The power-on LED flashes to indicate that the server is connected to ac power but is not turned on.

Turning on the server

Approximately 5 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 your operating system supports the systems-management software for an optional Remote Supervisor Adapter II SlimLine, the systems-management software can turn on the server.
- If your operating system supports the Wake on LAN feature, the Wake on LAN feature can 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 might be 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 requests from the service processor, such as a remote request to turn on the server. To remove all power from the server, you must disconnect it from the power source.

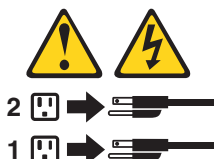
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

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.



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.
- The service processor can turn off the server as an automatic response to a critical system failure.
- You can turn off the server through a request from the service processor.

Chapter 4. Configuring the 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 the server to configure basic hardware features and to simplify the operating-system installation.

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

- Configuration/Setup Utility program
- Baseboard management controller utility programs
- SCSISelect Utility program for Adaptec® HostRAID™ configuration
- SCSISelect Utility program

For more information about these programs, see “Configuring the server” in the *User’s Guide* on the IBM *xSeries Documentation* 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 installed hardware options, configure the server hardware, provide device drivers, and help you install the operating system. For information about the supported operating-system versions, see the label on the CD. If the *ServerGuide Setup and Installation* CD did not come with your server, you can download the latest version from <http://www.ibm.com/pc/qtechinfo/MIGR-4ZKPPT.html>.

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

1. Insert the CD, and restart the server. If the CD does not start, see “ServerGuide problems” on page 54.
2. Follow the instructions 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 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
- Resolve configuration conflicts
- Set the date and time
- Set passwords and security settings

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

1. Turn on the server.
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.

Using the baseboard management controller

The baseboard management controller provides environmental monitoring for the server. If environmental conditions exceed thresholds or if system components fail, the baseboard management controller lights LEDs to help you diagnose the problem and also records the error in the System Event/Error log.

The baseboard management controller also provides the following remote server management capabilities through the OSA SMBridge management utility program:

- **Command-line interface (IPMI Shell)**

The command-line interface provides direct access to server management functions through the IPMI 1.5 protocol. Use the command-line interface to issue commands to control the server power, view system information, and identify the server. You can also save one or more commands as a text file and run the file as a script.

- **Serial over LAN**

Establish a Serial over LAN (SOL) connection to manage servers from a remote location. You can remotely view and change the BIOS settings, restart the server, identify the server, and perform other management functions. Any standard Telenet client application can access the SOL connection.

Enabling and configuring SOL using the OSA SMBridge management utility program

To enable and configure the server for SOL by using the OSA SMBridge management utility program, you must update and configure the BIOS code and enable the operating system for an SOL connection.

Note: In an SOL session, use the following commands instead of function keys:

- To start the Configuration/Setup Utility program when the prompt Press F1 for Configuration/Setup appears, press Esc, Shift+o, then Shift+p.
- To start the diagnostic programs, when the prompt F2 for Diagnostics appears, press Esc, Shift+o, then Shift+q.

BIOS update and configuration

Complete the following steps to update and configure the BIOS code to enable SOL:

1. Update the BIOS code:
 - a. Download the latest version of the BIOS code from <http://www.ibm.com/support/>.
 - b. Update the BIOS code, following the instructions that come with the update file that you downloaded.
2. Configure the BIOS settings:
 - a. Restart the server and press F1 when prompted to start the Configuration/Setup Utility program.

- b. Select **Devices and I/O Ports**; then, make sure that the values are set as follows:
 - **Serial Port A**: Auto-configure
 - **Serial Port B**: Auto-configure
- c. Select **Remote Console Redirection**; then, make sure that the values are set as follows:
 - **Remote Console Active**: Enabled
 - **Remote Console COM Port**: COM 1
 - **Remote Console Baud Rate**: 19200
 - **Remote Console Data Bits**: 8
 - **Remote Console Parity**: None
 - **Remote Console Stop Bits**: 1
 - **Remote Console Text Emulation**: ANSI
 - **Remote Console Keyboard Emulation**: ANSI
 - **Remote Console Active After Boot**: Enabled
 - **Remote Console Flow Control**: Hardware
- d. Press Esc twice to exit the **Remote Console Redirection** and **Devices and I/O Ports** sections of the Configuration/Setup Utility program.

Note: Do not use Planar Ethernet 1 for PXE/DHCP booting or installation.
- e. Select **Start Options**; then, set **Planar Ethernet PXE/DHCP** to one of the following settings:
 - **Disabled**
 - **Planar Ethernet 2**. If you set **Planar Ethernet PXE/DHCP** to **Planar Ethernet 2**, you must also set **Run PXE only on selected Planar NIC** to **Enabled**.
- f. Press Esc to exit the **Start Options** section of the Configuration/Setup Utility program.
- g. Select **Save Settings**; then, press Enter.
- h. Press Enter to confirm.
- i. Select **Exit Setup**; then, press Enter.
- j. Make sure that **Yes, exit the Setup Utility** is selected; then, press Enter.

Linux configuration

For SOL operation on the server, you must configure the Linux[®] operating system to expose the Linux initialization (booting) process. This enables users to log in to the Linux console through an SOL session and directs Linux output to the serial console. See the documentation for your specific Linux operating-system type for information and instructions.

Use one of the following procedures to enable SOL sessions for your Linux operating system. You must be logged in as a root user to perform these procedures.

Red Hat Enterprise Linux ES 2.1 configuration:

Note: This procedure is based on a default installation of Red Hat Enterprise Linux ES 2.1. The file names, structures, and commands might be different for other versions of Red Hat Linux.

Complete the following steps to configure the general Linux parameters for SOL operation when using the Red Hat Enterprise Linux ES 2.1 operating system.

Note: Hardware flow control prevents character loss during communication over a serial connection. You must enable it when using a Linux operating system.

1. Add the following line to the end of the # Run gettys in standard runlevels section of the /etc/inittab file. This enables hardware flow control and enables users to log in through the SOL console.

```
7:2345:respawn:/sbin/agetty -h ttyS0 19200 vt102
```

2. Add the following line at the bottom of the /etc/securetty file to enable a user to log in as the root user through the SOL console:

```
ttyS1
```

LILO configuration: If you are using LILO, complete the following steps:

1. Complete the following steps to modify the /etc/lilo.conf file:
 - a. Add the following text to the end of the first default=linux line

```
-Monitor  
# This will allow you to only Monitor the OS boot via SOL
```

- b. Comment out the map=/boot/map line by adding a # at the beginning of this line.
- c. Comment out the message=/boot/message line by adding a # at the beginning of this line.

```
-Monitor
```

- d. Add the following line before the first image= line:

```
append="console=ttyS0,19200n8 console=tty1"
```

- e. Add the following text to the end of the first label=linux line:

```
-Monitor
```

- f. Add the following line to the first image= section. This enables SOL.

```
append="console=ttyS0,19200n8 console=tty1"
```

- g. Add the following lines between the two image= sections:

```
# This will allow you to Interact with the OS boot via SOL
```

```
image=/boot/vmlinuz-2.4.9-e.12smp  
label=linux-Interact  
initrd=/boot/initrd-2.4.9-e.12smp.img  
read-only  
root=/dev/hda6  
append="console=tty1 console=ttyS0,19200n8 "
```

The following examples show the original content of the /etc/lilo.conf file and the content of this file after modification.

Original /etc/lilo.conf contents

```
prompt
timeout=50
default=linux
boot=/dev/hda
map=/boot/map
install=/boot/boot.b
message=/boot/message
linear
image=/boot/vmlinuz-2.4.9-e.12smp
    label=linux
    initrd=/boot/initrd-2.4.9-e.12smp.img
    read-only
    root=/dev/hda6
image=/boot/vmlinuz-2.4.9-e.12
    label=linux-up
    initrd=/boot/initrd-2.4.9-e.12.img
    read-only
    root=/dev/hda6
```

Modified /etc/lilo.conf contents

```
prompt
timeout=50
default=linux-Monitor
boot=/dev/hda
#map=/boot/map
install=/boot/boot.b
#message=/boot/message
linear
# This will allow you to only Monitor the OS boot via SOL
image=/boot/vmlinuz-2.4.9-e.12smp
    label=linux-Monitor
    initrd=/boot/initrd-2.4.9-e.12smp.img
    read-only
    root=/dev/hda6
    append="console=ttyS0,19200n8 console=tty1"
# This will allow you to Interact with the OS boot via SOL
image=/boot/vmlinuz-2.4.9-e.12smp
    label=linux-Interact
    initrd=/boot/initrd-2.4.9-e.12smp.img
    read-only
    root=/dev/hda6
    append="console=tty1 console=ttyS0,19200n8 "
image=/boot/vmlinuz-2.4.9-e.12
    label=linux-up
    initrd=/boot/initrd-2.4.9-e.12.img
    read-only
    root=/dev/hda6
```

2. Run the **lilo** command to store and activate the LILO configuration.

When the Linux operating system starts, a LILO boot: prompt is displayed instead of the graphical user interface. Press Tab at this prompt to install all of the boot options that are listed. To load the operating system in interactive mode, type linux-Interact and then press Enter.

GRUB configuration: If you are using GRUB, complete the following steps to modify the /boot/grub/grub.conf file:

1. Comment out the splashimage= line by adding a # at the beginning of this line.
2. Add the following line before the first title= line:
This will allow you to only Monitor the OS boot via SOL
3. Append the following text to the first title= line:
SOL Monitor
4. Append the following text to the kernel/ line of the first title= section:
console=ttyS0,19200 console=tty1
5. Add the following five lines between the two title= sections:
This will allow you to Interact with the OS boot via SOL
title Red Hat Linux (2.4.9-e.12smp) SOL Interactive
root (hd0,0)


```
kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6 console=tty1
console=ttyS0,19200
initrd /initrd-2.4.9-e.12smp.img
```

Note: The entry that begins with `kernel /vmlinuz` is shown with a line break after `console=tty1`. In your file, the entire entry must all be on one line.

The following examples show the original content of the `/boot/grub/grub.conf` file and the content of this file after modification.

Original `/boot/grub/grub.conf` contents

```
#grub.conf generated by anaconda
#
# Note that you do not have to rerun grub after making changes to this file
# NOTICE: You have a /boot partition. This means that
#         all kernel and initrd paths are relative to /boot/, eg.
#         root (hd0,0)
#         kernel /vmlinuz-version ro root=/dev/hda6
#         initrd /initrd-version.img
#boot=/dev/hda
default=0
timeout=10
splashimage=(hd0,0)/grub/splash.xpm.gz
title Red Hat Enterprise Linux ES (2.4.9-e.12smp)
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6
    initrd /initrd-2.4.9-e.12smp.img
title Red Hat Enterprise Linux ES-up (2.4.9-e.12)
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12 ro root=/dev/hda6
    initrd /initrd-2.4.9-e.12.img
```

Modified /boot/grub/grub.conf contents

```
#grub.conf generated by anaconda
#
# Note that you do not have to rerun grub after making changes to this file
# NOTICE: You have a /boot partition. This means that
#           all kernel and initrd paths are relative to /boot/, eg.
#           root (hd0,0)
#           kernel /vmlinuz-version ro root=/dev/hda6
#           initrd /initrd-version.img
#boot=/dev/hda
default=0
timeout=10
# splashimage=(hd0,0)/grub/splash.xpm.gz
# This will allow you to only Monitor the OS boot via SOL
title Red Hat Enterprise Linux ES (2.4.9-e.12smp) SOL Monitor
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6 console=ttyS0,19200 console=tty1
    initrd /initrd-2.4.9-e.12smp.img
# This will allow you to Interact with the OS boot via SOL
title Red Hat Linux (2.4.9-e.12smp) SOL Interactive
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6 console=tty1 console=ttyS0,19200
    initrd /initrd-2.4.9-e.12smp.img
title Red Hat Enterprise Linux ES-up (2.4.9-e.12)
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12 ro root=/dev/hda6
    initrd /initrd-2.4.9-e.12.img
```

You must restart the Linux operating system after completing these procedures for the changes to take effect and to enable SOL.

SUSE SLES 8.0 configuration:

Note: This procedure is based on a default installation of SUSE Linux Enterprise Server (SLES) 8.0. The file names, structures, and commands might be different for other versions of SUSE LINUX.

Complete the following steps to configure the general Linux parameters for SOL operation when using the SLES 8.0 operating system.

Note: Hardware flow control prevents character loss during communication over a serial connection. You must enable it when using a Linux operating system.

1. Add the following line to the end of the # getty-programs for the normal runlevels section of the /etc/inittab file. This enables hardware flow control and enables users to log in through the SOL console.
7:2345:respawn:/sbin/agetty -h ttyS0 19200 vt102
2. Add the following line after the tty6 line at the bottom of the /etc/securetty file to enable a user to log in as the root user through the SOL console:
ttyS1
3. Complete the following steps to modify the /boot/grub/menu.lst file:

- a. Comment out the gfxmenu line by adding a # in front of the word gfxmenu.
- b. Add the following line before the first title line:
This will allow you to only Monitor the OS boot via SOL
- c. Append the following text to the first title line:
SOL Monitor
- d. Append the following text to the kernel line of the first title section:
console=ttyS1,19200 console=tty1
- e. Add the following four lines between the first two title sections:
This will allow you to Interact with the OS boot via SOL
title linux SOL Interactive
kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791
console=tty1 console=ttyS0,19200
initrd (hd0,1)/boot/initrd

The following examples show the original content of the /boot/grub/menu.lst file and the content of this file after modification.

Original /boot/grub/menu.lst contents	Notes
<pre>gfxmanu (hd0,1)/boot/message color white/blue black/light-gray default 0 timeout 8 title linux kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791 initrd (hd0,1)/boot/initrd title floppy root chainloader +1 title failsafe kernel (hd0,1)/boot/vmlinuz.shipped root=/dev/hda2 ide=nodma apm=off vga=normal nosmp disableapic maxcpus=0 3 initrd (hd0,1)/boot/initrd.shipped</pre>	<p>1</p> <p>1</p>
<p>Note 1: The kernel line is shown with a line break. In your file, the entire entry must all be on one line.</p>	

Modified /boot/grub/menu.lst contents	Notes
<pre>#gfxmanu (hd0,1)/boot/message color white/blue black/light-gray default 0 timeout 8 # This will allow you to only Monitor the OS boot via SOL title linux SOL Monitor kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791 console=ttyS1,19200 console=tty1 initrd (hd0,1)/boot/initrd # This will allow you to Interact with the OS boot via SOL title linux SOL Interactive kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791 console=tty1 console=ttyS0,19200 initrd (hd0,1)/boot/initrd title floppy</pre>	<p>1</p>

Modified /boot/grub/menu.lst contents	Notes
<pre> root chainloader +1 title failsafe kernel (hd0,1)/boot/vmlinuz.shipped root=/dev/hda2 ide=nodma apm=off vga=normal nosmp disableapic maxcpus=0 3 initrd (hd0,1)/boot/initrd.shipped </pre>	1
Note 1: The kernel line is shown with a line break. In your file, the entire entry must all be on one line.	

You must restart the Linux operating system after completing these procedures for the changes to take effect and to enable SOL.

Microsoft Windows 2003 Standard Edition configuration

Note: This procedure is based on a default installation of the Microsoft Windows 2003 operating system.

Complete the following steps to configure the Windows 2003 operating system for SOL operation. You must be logged in as a user with administrator access to perform this procedure.

1. Complete the following steps to determine which boot entry ID to modify:
 - a. Type `bootcfg` at a Windows command prompt; then, press Enter to display the current boot options for your server.
 - b. In the Boot Entries section, locate the boot entry ID for the section with an OS friendly name of Windows Server 2003, Standard. Write down the boot entry ID for use in the next step.
2. To enable the Microsoft Windows Emergency Management System (EMS), at a Windows command prompt, type

```
bootcfg /EMS ON /PORT COM1 /BAUD 19200 /ID boot_id
```

where *boot_id* is the boot entry ID from step 1b; then, press Enter.
3. Complete the following steps to verify that the EMS console is redirected to the COM2 serial port:
 - a. Type `bootcfg` at a Windows command prompt; then, press Enter to display the current boot options for your server.
 - b. Verify the following changes to the bootcfg settings:
 - In the Boot Loader Settings section, make sure that `redirect` is set to COM2 and that `redirectbaudrate` is set to 19200.
 - In the Boot Entries section, make sure that the OS Load Options: line has `/redirect` appended to the end of it.

The following examples show the original bootcfg program output and the output after modification.

Original bootcfg program output

```
Boot Loader Settings
-----
timeout: 30
default: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS
Boot Entries
-----
Boot entry ID: 1
OS Friendly Name: Windows Server 2003, Standard
Path: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS
OS Load Options: /fastdetect
```

Modified bootcfg program output

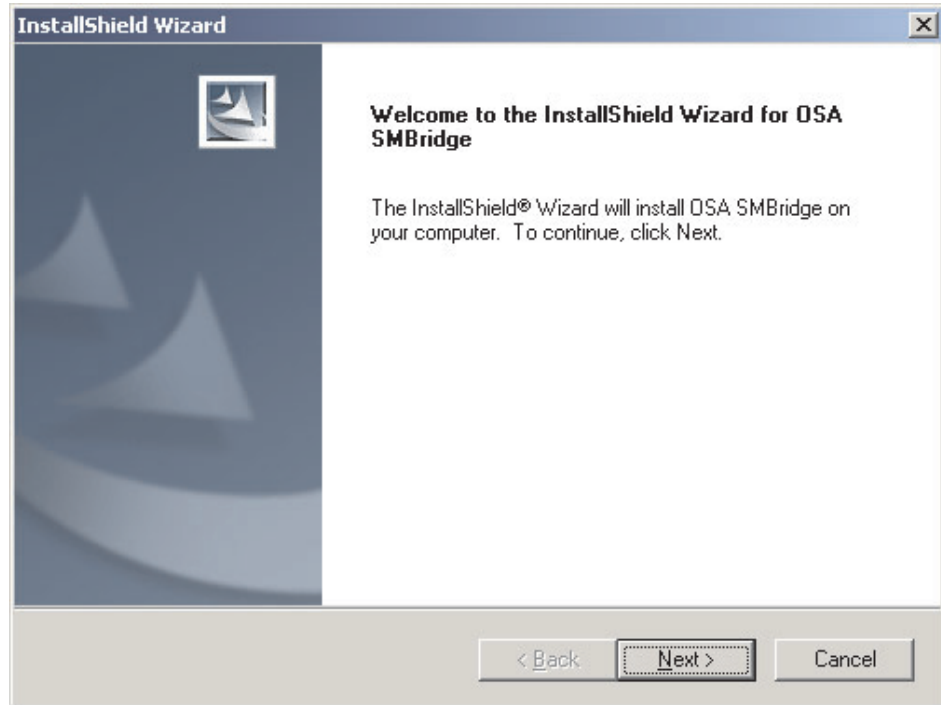
```
Boot Loader Settings
-----
timeout: 30
default: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS
redirect: COM1
redirectbaudrate: 19200
Boot Entries
-----
Boot entry ID: 1
OS Friendly Name: Windows Server 2003, Standard
Path: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS
OS Load Options: /fastdetect /redirect
```

You must restart the Windows 2003 operating system after completing this procedure for the changes to take effect and to enable SOL.

Installing the OSA SMBridge management utility program

Complete the following steps to install the OSA SMBridge management utility program on a server running a Windows operating system:

1. Go to <http://www.ibm.com/support/> and download the utility program and create the OSA BMC Management Utility CD.
2. Insert the OSA BMC Management Utility CD into the drive. The InstallShield wizard starts, and a window similar to that shown in the following illustration opens.



3. Follow the prompts to complete the installation.
The installation program prompts you for a TCP/IP port number and an IP address. Specify an IP address, if you want to limit the connection requests that will be accepted by the utility program. To accept connections from any server, type `INADDR_ANY` as the IP address. Also specify the port number that the utility program will use. These values will be recorded in the `smbridge.cfg` file for the automatic startup of the utility program.

Complete the following steps to install the OSA SMBridge management utility program on a server running a Linux operating system. You must be logged in as a root user to perform these procedures.

1. Go to <http://www.ibm.com/support/> and download the utility program and create the OSA BMC Management Utility CD.
2. Insert the OSA BMC Management Utility CD into the drive.
3. Type `mount/mnt/cdrom`.
4. Locate the directory where the installation RPM package is located and type `cd/mnt/cdrom`.
5. Type the following command to run the RPM package and start the installation:

```
rpm -i osabmcutil-1.0-i386.rpm
```
6. Follow the prompts to complete the installation. When the installation is complete, the utility copies files to the following directories:
 - `/etc/init.d/smbridge`
 - `/etc/smbridge.cfg`
 - `/ect/sol/oem.cfg`
 - `/usr/sbin/smbconfig`
 - `/usr/bin/smbconfig`
 - `/usr/sbin/ipmish`

The utility starts automatically when the server is started. You can also locate the `/ect/init.d` directory to start the utility and use the following commands to manage the utility:

```
smbridge status
smbridge start
smbridge stop
smbridge restart
```

Using the baseboard management controller utility programs

Use the baseboard management controller utility programs to configure the baseboard management controller, download firmware updates and SDR/FRU updates, and remotely manage a network.

Using the baseboard management controller configuration utility program

Use the baseboard management controller configuration utility program to view or change the baseboard management controller configuration settings. You can also use the utility program to save the configuration to a file for use on multiple servers.

Go to <http://www.ibm.com/support/> to download the utility program; then, copy the `bmc_cfg.exe` file to a configuration utility diskette.

Complete the following steps to start the baseboard management controller configuration utility program:

1. Insert the configuration utility diskette into the diskette drive and restart the server.
2. From a command-line prompt, type `bmc_cfg` and press Enter.
3. Follow the instructions on the screen.

Using the baseboard management controller firmware update utility program

Use the baseboard management controller firmware update utility program to download a baseboard management controller firmware update or a SDR/FRU update. The firmware update utility program updates the baseboard management controller firmware or SDR/FRU data only and does not affect any device drivers.

Go to <http://www.ibm.com/support/> to download the utility program; then, copy the `Flash.exe` file to a firmware update diskette.

Note: To ensure proper server operation, be sure to update the server baseboard management controller firmware before updating the BIOS code.

To update the firmware, if the Linux or Windows operating-system update package is available from the World Wide Web and you have obtained the applicable update package, follow the instructions that come with the update package.

Using the OSA SMBridge management utility program

Use the OSA SMBridge management utility program to remotely manage and configure a network. The utility program provides the following remote management capabilities:

- **CLI (command-line interface) mode**

Use CLI mode to remotely perform power-management and system identification control functions over a LAN or serial port interface from a command-line interface. Use CLI mode also to remotely view the System Event/Error log.

Use the following commands in CLI mode:

- **identify**
Control the system-locator LED on the front of the server.
- **power**
Turn the server on and off remotely.
- **sel**
Perform operations with the System Event/Error log.
- **sysinfo**
Display general system information that is related to the server and the baseboard management controller.

- **Serial over LAN**

Use the Serial over LAN capability to remotely perform control and management functions over a Serial over LAN (SOL) network. You can also use SOL to remotely view and change the server BIOS settings.

At a command prompt, type `telenet localhost 623` to access the SOL network. Type `help` at the `smbridge>` prompt for more information.

Use the following commands in an SOL session:

- **connect**
Connect to the LAN. Type `connect -ip ip_address -u username -p password`.
- **identify**
Control the system-locator LED on the front of the server.
- **power**
Turn the server on and off remotely.
- **reboot**
Force the server to restart.
- **sel get**
Display the System Event/Error log.
- **sol**
Configure the SOL function.
- **sysinfo**
Display system information that is related to the server and the globally unique identifier (GUID).

Using the SCSISelect Utility program for Adaptec HostRAID configuration

Use the SCSISelect Utility program to add RAID level-0, level-1, and level-10 functionality with the option of a hot-spare drive to the SCSI controller with integrated RAID. Installing a ServeRAID-7k enables the SCSI controller to provide additional RAID levels. This utility is part of the BIOS code in the server.

The SCSI RAID feature comes disabled by default. You must enable it and install the device drivers before you can use it. SCSI RAID configuration utilities, device drivers, and information are available on the *ServeRAID-7e (Adaptec HostRAID) Support CD*. If this CD did not come with your server, you can download it from <http://www.ibm.com/support/>.

Enabling the SCSI HostRAID feature

Complete the following steps to enable the SCSI HostRAID feature:

1. Turn on the server.
2. When the prompt Press <CTRL><A> for SCISSelect Utility appears, press Ctrl+A. If you have set an administrator password, you are prompted to type the password.
3. Use the arrow keys to select the channel for which you want to change settings and press Enter.
4. Select **Configure/View SCSI Controller Setting**; then, select **HostRAID**.
5. Select **Enabled**.
6. Press Esc; then, select **Yes** to save the changes.

Using the SCSI HostRAID feature to perform a RAID level-0 configuration

The instructions in this section describe how to access the SCSI HostRAID feature from the SCISSelect Utility program and perform an initial RAID level-0 configuration. If you install a different type of RAID adapter in the server, use the configuration method described in the instructions that come with that adapter to view or change SCSI settings for attached devices.

See the documentation on the *ServeRAID-7e (Adaptec HostRAID) Support CD* for additional information about how to use the SCSI HostRAID feature.

Configuring the controller

Complete the following steps to use the SCSI HostRAID feature to configure a RAID level-0 array:

Note: You must have at least two hard disk drives installed in the server to configure a RAID level-0 array.

1. From the SCISSelect main menu, select **Configure/View HostRAID Settings**.
2. From the list of ready drives, type C to create an array.
3. Select **RAID-0** when asked to select the RAID type.
4. From the list of ready drives, select the two drives that you want to group into the array.
5. Select **Stripe Size**.
6. Select **Yes** if the array is bootable.
7. Select **Yes** to create the array.
8. Press Esc to exit the utility.
9. Restart the server.

Using the SCSI HostRAID feature to perform a RAID level-1 configuration

The instructions in this section describe how to access the SCSI HostRAID feature from the SCISSelect Utility program and perform an initial RAID level-1 configuration. If you install a different type of RAID adapter in the server, use the configuration method described in the instructions that come with that adapter to view or change SCSI settings for attached devices.

See the documentation on the *ServeRAID-7e (Adaptec HostRAID) Support CD* for additional information about how to use the SCSI HostRAID feature.

Configuring the controller

Complete the following steps to use the SCSI HostRAID feature to configure a RAID level-1 array:

Note: You must have at least two hard disk drives installed in the server to configure a RAID level-1 array.

1. From the SCSISelect main menu, select **Configure/View HostRAID Settings**.
2. From the list of ready drives, type C to create an array.
3. Select **RAID-1** when asked to select the RAID type.
4. From the list of ready drives, select the two drives that you want to group into the array.
5. Select **Create new RAID-1**.
6. Type an identifier for the array.
7. Select **Yes** if the array is bootable.
8. Select **Yes** to create the array.
9. Press Esc to exit the utility.
10. Restart the server.

Using the SCSI HostRAID feature to perform a RAID level-10 configuration

The instructions in this section describe how to access the SCSI HostRAID feature from the SCSISelect Utility program and perform an initial RAID level-10 configuration. If you install a different type of RAID adapter in the server, use the configuration method described in the instructions that come with that adapter to view or change SCSI settings for attached devices.

See the documentation on the *ServeRAID-7e (Adaptec HostRAID) Support CD* for additional information about how to use the SCSI HostRAID feature.

Configuring the controller

Complete the following steps to use the SCSI HostRAID feature to configure a RAID level-10 array:

Note: You must have at least four hard disk drives installed in the server to configure a RAID level-10 array.

1. From the SCSISelect main menu, select **Configure/View HostRAID Settings**.
2. From the list of ready drives, type C to create an array.
3. Select **RAID-10** when asked to select the RAID type.
4. From the list of ready drives, select the two drives that you want to group into the array.
5. Select **Create new RAID-10**.
6. Type an identifier for the array.
7. Select **Yes** if the array is bootable.
8. Select **Yes** to create the array.
9. Press Esc to exit the utility.
10. Restart the server.

Viewing the configuration

You can use the SCSISelect Utility program to view information about the SCSI controller. From the list of available arrays, select an array and press Enter. Press Esc to exit the utility.

Using the SCSISelect Utility program

Use the SCSISelect Utility program to view or change SCSI controller settings and view SCSI ID assignments.

Complete the following steps to start the SCSISelect Utility program:

1. Turn on the server.
2. When the message Press <CTRL><A> for SCSISelect Utility appears, press Ctrl+A. If an administrator password has been set, you are prompted to type the password.
3. Select the channel for which you want to change settings, and press Enter.
4. When the message Would you like to configure the SCSI controller, or run the SCSI Disk Utilities? appears, select a choice and press Enter.
5. Use the arrow keys to select a choice from the menu, and follow the instructions on the screen.

Chapter 5. Updating IBM Director

If you plan to use IBM Director to manage your server, you must check for the latest applicable IBM Director updates and interim fixes.

Complete the following steps to install the IBM Director updates and any other applicable updates and interim fixes:

1. Check for the latest version of IBM Director:
 - a. Go to http://www.ibm.com/servers/eserver/xseries/systems_management/xseries_sm/dwnl.html.
 - b. If a newer version of IBM Director than what comes with the server is shown in the drop-down list, follow the instructions on the Web page to download the latest version.
2. Install the IBM Director program.
3. Download and install any applicable updates or interim fixes for your server:
 - a. Go to <http://www.ibm.com>.
 - b. Click **Support & downloads**.
 - c. Click **Downloads & drivers**.
 - d. In the search field, type `director 8840` and click **Submit**.
 - e. Select any applicable update or interim fix that you want to download.
 - f. Click the file link for the executable file to download the file, and follow the instructions in the readme file to install the update or interim fix.
 - g. Repeat steps 3e and 3f for any additional updates or interim fixes that you want to install.

Chapter 6. Solving problems

This chapter provides basic troubleshooting information to help you solve some common problems that might occur while you are setting up the 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 63, the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD, and the “Server Support” flowchart in the front of this document.

Diagnostic tools overview

The following tools are available to help you diagnose and solve hardware-related problems:

- **POST beep codes**

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

- One beep indicates successful completion of POST, with no errors.
- More than one beep indicates that POST detected a problem. Error messages also appear during startup if POST detects a hardware-configuration problem.

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

- **Troubleshooting charts**

These charts list problem symptoms and steps to correct the problems. See “Troubleshooting charts” on page 55 for more information.

- **Diagnostic programs and error messages**

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

- **Light path diagnostics**

Use light path diagnostics to diagnose system errors quickly. See “Light path diagnostics” on page 60 for more information.

POST beep code descriptions

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

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

One beep

POST was completed successfully without finding any errors.

One long beep and two short beeps

A video error has occurred, and the BIOS cannot initialize the monitor screen to display additional information.

Other beep codes

Additional beep codes are listed in the following table.

Table 5. POST beep code descriptions

Beep code	Description
No beep	Call for service.
One short	POST was completed successfully. One beep also occurs after POST if you enter an incorrect password.
Two short	Follow the instructions that appear on the screen.
Repeating three short	POST detected a system memory error. Make sure that the memory is installed correctly. If it is, replace the failing memory module.
Repeating short	The system board might contain a failing component. Complete the following steps: <ol style="list-style-type: none"> 1. Make sure that the keyboard and pointing devices are connected correctly. 2. Make sure that nothing is resting on the keyboard. 3. Disconnect the pointing device; then, restart the server. If the problem is corrected, replace the pointing device. If the problem remains, call for service.
All other beep codes	<ol style="list-style-type: none"> 1. Make sure that the system memory modules are installed correctly. 2. Turn off the server; then, restart the server. If the problem remains, call for service.

POST error messages

The following table provides an abbreviated list of the error messages that might appear during POST. See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information about the POST error messages.

Table 6. Abbreviated list of POST error messages

POST message	Failing device or problem found	Suggested action
161	The real-time clock battery has failed.	Replace the battery or call for service.
162	A device configuration has changed.	<ul style="list-style-type: none">• Run the Configuration/Setup Utility program; then, exit, saving the configuration settings.• Make sure that optional devices are turned on and installed correctly.
163	The time of day has not been set.	Set the date and time.
289	A failing DIMM was disabled.	Make sure that the DIMMs are supported by the server and that they are installed correctly.
301, 303	Keyboard and keyboard controller	Make sure that the keyboard cable is connected and that nothing is resting on the keyboard keys.
1162	Serial port configuration conflict	Run the Configuration/Setup Utility program and make sure that the IRQ and I/O port assignments that are needed by the serial port are available.
00019xxx	Microprocessor <i>x</i> is not functioning or failed the built-in self-test.	Make sure that microprocessor <i>x</i> is installed correctly. If the problem remains, replace microprocessor <i>x</i> .
00180xxx	PCI device error	Make sure that all PCI adapters are installed correctly. In the Configuration/Setup Utility program, make sure that all PCI devices are enabled. Disable option ROMs and integrated devices that are not needed and set the PCI device boot priority to ensure that the boot device option ROM is able to load.
012980xx 012981xx	Data for microprocessor <i>x</i>	Download and install the latest level of BIOS code.
1962	POST could not find an operating system.	Install an operating system.

ServerGuide problems

The following table lists problem symptoms and suggested solutions.

Table 7. ServerGuide Setup and Installation CD

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

Troubleshooting charts

The following tables list 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 these charts, run the diagnostic programs. If you have run the diagnostic programs or if running the tests does not reveal the problem, call for service.

DVD-ROM drive problems

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

Diskette drive problems

Symptom	Suggested action
The diskette drive activity LED stays lit, or the server bypasses the diskette drive.	If there is a diskette in the drive, make sure that: <ul style="list-style-type: none">• The diskette drive cables are correctly and securely connected.• The diskette drive is enabled in the Configuration/Setup Utility program.• The diskette is good and not damaged. (Try another diskette if you have one.)• The diskette contains the necessary files to start the server.• Your software program is working properly. If the problem remains, call for service.

Expansion enclosure problems

Symptom	Suggested action
The SCSI expansion enclosure used to work but does not work now.	Make sure that: <ul style="list-style-type: none">• The cables for all external SCSI options are connected correctly.• The last device in each SCSI chain, or the end of the SCSI cable, is terminated correctly.• Any external SCSI devices are turned on. You must turn on external SCSI devices before turning on the server. For more information, see your SCSI expansion enclosure documentation.

General problems

Symptom	Suggested action
A cover lock is broken, an LED is not working, or a similar problem has occurred.	Call for service.

Hard disk drive problems

Symptom	Suggested action
Not all drives are recognized by the hard disk drive diagnostic test (the Fixed Disk test).	<ol style="list-style-type: none">1. Remove the first drive that is not recognized and try the hard disk drive diagnostic test again.2. If the remaining drives are recognized, replace the drive that you removed with a new one.
The server stops responding during the hard disk drive diagnostic test.	<ol style="list-style-type: none">1. Remove the hard disk drive that was being tested when the server stopped responding and try the diagnostic test again.2. If the hard disk drive diagnostic test runs successfully, replace the drive that you removed with a new one.

Intermittent problems

Symptom	Suggested action
A problem occurs only occasionally and is difficult to diagnose.	<p>Make sure that:</p> <ul style="list-style-type: none">• All cables and cords are connected securely to the rear of the server and attached devices.• When the server is turned on, air is flowing from the rear of the server at the fan grille. If there is no airflow, the fan is not working. This can cause the server to overheat and shut down.• The SCSI bus and devices are configured correctly and the last external device in each SCSI chain is terminated correctly. <p>If the problem remains, call for service.</p>

Keyboard, mouse, or pointing-device problems

Symptom	Suggested action
All or some keys on the keyboard do not work.	<ul style="list-style-type: none">• Make sure that the keyboard cable is securely connected to the server and that the keyboard and mouse cables are not reversed.• Make sure that 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.	<ul style="list-style-type: none">• Make sure that the mouse or pointing-device cable is securely connected to the server and that the keyboard and mouse cables are not reversed.• Make sure that the mouse device drivers are installed correctly.• Make sure that 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

Symptom	Suggested action
The amount of system memory that is displayed is less than the amount of installed physical memory.	<p>Make sure that:</p> <ul style="list-style-type: none"> • The DIMMs are seated correctly. • You have installed the correct type of memory. • If you changed the memory, you updated the memory configuration in the Configuration/Setup Utility program. • All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled. • Memory mirroring and online-spare memory are disabled. <p>Check the POST error log for error message 289:</p> <ul style="list-style-type: none"> • If the DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. • If the DIMM was disabled by the user or by POST, run the Configuration/Setup Utility program and enable the DIMM. • If this error remains, replace the DIMM. <p>If the problem remains, call for service.</p>

Microprocessor problems

Symptom	Suggested action
The server emits a continuous tone during POST.	<p>The startup (boot) microprocessor is not working correctly. Make sure that the startup microprocessor is seated correctly. If it is, replace the startup microprocessor.</p> <p>If the problem remains, call for service.</p>

Monitor problems

Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, see the information that comes with the monitor for instructions for testing and adjusting the monitor. If you cannot diagnose the problem, call for service.

Symptom	Suggested action
The screen is blank.	<p>Make sure that:</p> <ul style="list-style-type: none"> • The server power cord is connected to the server and a working electrical outlet. • The monitor cables are connected correctly. • The monitor is turned on and the brightness and contrast controls are adjusted correctly. <p>Important: In some memory configurations, the 3-3-3 beep code might sound during POST, followed by a blank monitor screen. If this occurs and the Boot Fail Count feature in the Start Options of the Configuration/Setup Utility program is enabled (its default setting), you must restart the server three times to force the BIOS to reset the configuration settings to the default configuration (the memory connector or bank of connectors enabled).</p> <p>If the problem remains, call for service.</p>
Only the cursor appears.	Call for service.

Symptom	Suggested action
The monitor works when you turn on the server, but the screen goes blank when you start some application programs.	<p>Make sure that you have installed the necessary device drivers for the application programs.</p> <p>If the problem remains, call for service.</p>
The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.	<p>If the monitor self-tests show that the monitor is working correctly, 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.</p> <p>Attention: Moving a color monitor while it is turned on might cause screen discoloration.</p> <p>Move the device and the monitor at least 300 mm (12 in.) apart, and turn on the monitor.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. To prevent diskette drive read/write errors, make sure that the distance between the monitor and diskette drives is at least 75 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 marketing representative or authorized reseller. <p>If the problem remains, call for service.</p>

Option problems

Symptom	Suggested action
An IBM option that was just installed does not work.	<p>Make sure that:</p> <ul style="list-style-type: none"> • The option is designed for the server. See the “Server Support” flowchart for information about obtaining ServerProven compatibility information from the World Wide Web. • You followed the installation instructions that come with the option. • The option is installed correctly. • You have not loosened any other installed options or cables. • You have updated the configuration information in the Configuration/Setup Utility program. Whenever memory or an option is changed, you must update the configuration. <p>If the problem remains, call for service.</p>
An IBM option that used to work does not work now.	<ul style="list-style-type: none"> • Make sure that all of the option hardware and cable connections are secure. • If the option comes with test instructions, use those instructions to test the option. • If the failing option is a SCSI device, make sure that: <ul style="list-style-type: none"> – The cables for all external SCSI options are connected correctly. – The last device in each SCSI chain, or the end of the SCSI cable, is terminated correctly. – Any external SCSI devices are turned on. You must turn on external SCSI devices before turning on the server. <p>If the problem remains, call for service.</p>

Power problems

Symptom	Suggested action
The server does not turn on.	<ul style="list-style-type: none"> • Make sure that the server power cord is connected to the server and a working electrical outlet. • Make sure that the type of memory that is installed is supported by the server. • 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. <p>If the problem remains, call for service.</p>
The server does not turn off.	<p>Determine whether you are using an ACPI or non-ACPI operating system.</p> <p>If you are using a non-ACPI operating system, complete the following steps:</p> <ol style="list-style-type: none"> 1. Press Ctrl+Alt+Delete. 2. Turn off the server by using the power-control button. You might have to press and hold the power-control button for 5 seconds to force the server to turn off. <p>If the problem remains or if you are using an ACPI operating system, call for service.</p>

Serial port problems

For more information about the serial port, see the *Option Installation Guide* on the IBM xSeries Documentation CD.

Symptom	Suggested action
The number of serial ports that are identified by the operating system is less than the number of installed serial ports.	<p>Make sure that:</p> <ul style="list-style-type: none"> • Each port is assigned a unique address in the Configuration/Setup Utility program and none of the serial ports is disabled. • The serial port adapter, if you installed one, is seated correctly. <p>If the problem remains, call for service.</p>
A serial device does not work.	<p>Make sure that:</p> <ul style="list-style-type: none"> • The device is compatible with the server. • The serial port is enabled and is assigned a unique address. • The device is connected to the serial port. • The serial port is assigned to the system. <p>If the problem remains, call for service.</p>

Software problems

Symptom	Suggested action
You suspect a software problem.	<p>To determine whether the problem is caused by the software, make sure that:</p> <ul style="list-style-type: none"> • Your server has the minimum memory needed to use the software. For memory requirements, see the information that comes with the software. If you have just installed an adapter or memory, the server might have a memory-address conflict. • The software is designed to operate on the server. • Other software works on the server. • The software works on another server. <p>If you received any error messages when using the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem.</p> <p>If the problem remains, contact your place of purchase of the software.</p>

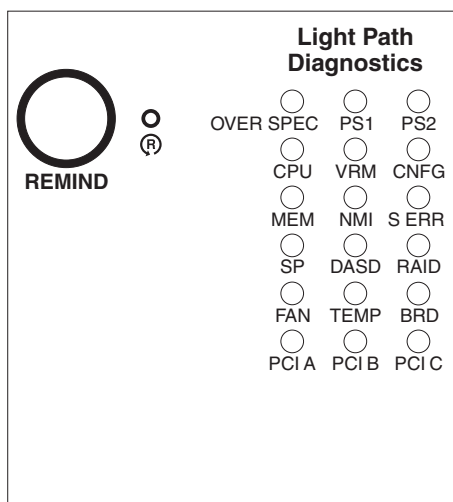
Universal Serial Bus device problems

Symptom	Suggested action
A USB device does not work.	<p>Make sure that:</p> <ul style="list-style-type: none"> You are not trying to use a USB device during POST if a standard (non-USB) keyboard is connected to the keyboard connector. If a standard (non-USB) keyboard is connected to the keyboard connector, the USB is disabled, and no USB device will work during POST. The correct USB device driver is installed. Your operating system supports USB devices. <p>If the problem remains, call for service.</p>

Light path diagnostics

Use light path diagnostics to diagnose system errors. The light path diagnostics panel is inside the light path diagnostics drawer, on the right front of the server. To access the light path diagnostics panel, slide the latch to the left on the front of the light path diagnostics drawer.

The following illustration shows the controls and LEDs on the light path diagnostics panel.



To acknowledge a system error but not take immediate action, press the remind button and place light path diagnostics in remind mode. When the server is in Remind mode, the system-error LED on the front of the server flashes. If a new failure occurs, the system-error LED is lit again.

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

The server is designed so that LEDs remain lit when the server is connected to an ac power source but is not turned on, provided that the power supply is operating correctly. This feature helps you to isolate the problem when the operating system is shut down.

Diagnosing problems using light path diagnostics

LEDs in two locations on the server are available to help you diagnose problems that might occur during installation. Use them in the following order:

1. **Light path diagnostics panel** - Look at this panel first. If a system error has occurred, the system-error LED on the front of the light path diagnostics drawer is lit. Slide the latch to the left on the front of the light path diagnostics drawer to access the light path diagnostics panel. Note any LEDs that are lit, and then close the drawer.
2. **LEDs on the system board** - To identify the component that is causing the error, note the lit LED on or beside the component.

Light path diagnostics LEDs

The following table lists the LEDs on the light path diagnostics panel, the problems that they indicate, and actions to solve the problems.

LED	Problem	Action
None	An error has occurred and cannot be diagnosed, or the ASM processor has failed. The error is not represented by a light path diagnostics LED.	Check the system error log for information about the error.
OVER SPEC	The power supplies are using more power than their maximum rating.	Replace the failing power supply, or remove optional devices from the server.
PS 1	When the LED is lit, the power supply in bay 1 has failed. When the LED flashes, an invalid power-supply configuration has occurred.	If the power supply has failed, call for service. If a configuration error has occurred, make sure that the power supply is installed correctly.
PS 2	When the LED is lit, the power supply in bay 2 has failed. When the LED flashes, an invalid power-supply configuration has occurred.	If the power supply has failed, call for service. If a configuration error has occurred, make sure that the power supply is installed correctly.
CPU	When the LED is lit, a microprocessor has failed. When the LED flashes, an invalid microprocessor configuration has occurred.	If a lit LED on the system board indicates a problem with a microprocessor, make sure that the microprocessor is installed correctly. See the <i>Option Installation Guide</i> on the IBM xSeries Documentation CD for information about installing a microprocessor. If the problem remains, call for service. If a configuration error has occurred, make sure that the microprocessors have the same cache size and type, and the same clock speed. Microprocessor internal and external clock frequencies must be identical.
VRM	When the LED is lit, an error occurred on the microprocessor voltage regulator module (VRM). When the LED flashes, an invalid VRM configuration has occurred.	Replace the VRM. If the problem remains, call for service. If a configuration error has occurred, make sure that the VRM is installed correctly. If the problem remains, replace the VRM.
CNFG	When the LED flashes, a hardware configuration error has occurred.	Check the system error log for information about the error. The light path diagnostic LED for the component that is causing the configuration error also flashes.
MEM	When the LED is on, a memory error has occurred. When the LED flashes, an invalid DIMM configuration has occurred.	Replace the failing DIMM, which is indicated by the lit LED on the system board. If a configuration error has occurred, make sure the DIMMs are installed correctly.

LED	Problem	Action
NMI	A machine check error has occurred.	Check the system error log for information about the error.
S ERR	A soft error has occurred.	Check the system error log for information about the error.
SP	The service processor has failed.	Remove ac power from the server; then, reconnect the server to ac power and restart the server. If the problem remains, call for service.
DASD	A hard disk drive error has occurred.	Check the LEDs on the hard disk drives and replace the indicated drive.
RAID	A RAID controller error has occurred.	Check the system error log for information about the error. See the documentation that comes with the RAID controller.
FAN	When the LED is lit, a fan has failed or is operating too slowly. A failing fan can also cause the TEMP LED to be lit. When the LED flashes, an invalid fan configuration has occurred.	Replace the failing fan, which is indicated by the lit LED. If a configuration error has occurred, make sure that the fans are installed correctly.
TEMP	The system temperature has exceeded a threshold level.	<ul style="list-style-type: none"> • Determine whether a fan has failed. If it has, replace it. • Make sure that the room temperature is not too high. See the <i>User's Guide</i> on the IBM xSeries Documentation CD for temperature information. • Make sure that the air vents are not blocked. <p>If the problem remains, call for service.</p>
BRD	An error has occurred on the system board.	<ul style="list-style-type: none"> • Check the LEDs on the system board to identify the component that is causing the error. • Check the system error log for information about the error.
PCI A PCI B PCI C	An error has occurred on a PCI bus.	<ul style="list-style-type: none"> • Check the system error log for information about the error. • If you cannot isolate the failing adapter through the information in the system error log, remove one adapter at a time from the failing PCI bus, and restart the server after each adapter is removed. <p>If the problem remains, call for service.</p>

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 @server® or IntelliStation® system or optional device, 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 and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Hardware Maintenance Manual and Troubleshooting Guide* or *Problem Determination and Service Guide* on the IBM Documentation CD that comes with your system.

Note: For some IntelliStation models, the *Hardware Maintenance Manual and Troubleshooting Guide* is available only from the IBM support Web site.

- Go to the IBM support Web site at <http://www.ibm.com/support/> to check for technical information, hints, tips, and new device drivers or to submit a request for information.

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

Using the documentation

Information about your IBM @server or IntelliStation system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, 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/support/> and follow the instructions. Also, some documents are available through the IBM Publications Center at <http://www.ibm.com/shop/publications/order/>.

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 @server and IntelliStation systems, optional devices, services, and support. The address for IBM xSeries and BladeCenter® information is <http://www.ibm.com/eserver/xseries/>. The address for IBM IntelliStation information is <http://www.ibm.com/intellistation/>.

You can find service information for IBM systems and optional devices at <http://www.ibm.com/support/>.

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, BladeCenter products, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, see <http://www.ibm.com/services/sl/products/>.

For more information about Support Line and other IBM services, see <http://www.ibm.com/services/>, or see <http://www.ibm.com/planetwide/> for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through IBM Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. See <http://www.ibm.com/planetwide/> for support telephone numbers, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

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. IBM Statement of Limited Warranty Z125-4753-08 04/2004

Part 1 - General Terms

Part 1 - General Terms

*This Statement of Limited Warranty includes Part 1 - General Terms, Part 2 - Country-unique Terms, and Part 3 - Warranty Information. 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. 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. **Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract.***

What this Warranty Covers

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications") which are available on request. The warranty period for the Machine starts on the original Date of Installation and is specified in Part 3 - Warranty Information. The date on your invoice or sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise. 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. Unless IBM specifies otherwise, these warranties apply only in the country or region in which you purchased the Machine.

THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

What this Warranty Does not Cover

This warranty does not cover the following:

- any software programs, whether pre-loaded or shipped with the Machine, or installed subsequently;
- failure resulting from misuse (including but not limited to use of any Machine capacity or capability, other than that authorized by IBM in writing), accident, modification, unsuitable physical or operating environment, or improper maintenance by you;
- failure caused by a product for which IBM is not responsible; and
- any non-IBM products, including those that IBM may procure and provide with or integrate into an IBM Machine at your request.

The warranty is voided by removal or alteration of identification labels on the Machine or its parts.

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 with “how-to” questions and those regarding Machine set-up and installation, is provided **WITHOUT WARRANTIES OF ANY KIND**.

How to Obtain Warranty Service

If the Machine does not function as warranted during the warranty period, contact IBM or your reseller to obtain warranty service. If you do not register the Machine with IBM, you may be required to present proof of purchase as evidence of your entitlement to warranty service.

What IBM Will Do to Correct Problems

When you contact IBM for service, you must follow the problem determination and resolution procedures that IBM specifies. An initial diagnosis of your problem can be made either by a technician over the telephone or electronically by access to an IBM website.

The type of warranty service applicable to your Machine is specified in Part 3 - Warranty Information.

You are responsible for downloading and installing designated Machine Code (microcode, basic input/output system code (called “BIOS”), utility programs, device drivers, and diagnostics delivered with an IBM Machine) and other software updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

If your problem can be resolved with a Customer Replaceable Unit (“CRU”) (e.g., keyboard, mouse, speaker, memory, hard disk drive), IBM will ship the CRU to you for you to install.

If the Machine does not function as warranted during the warranty period and your problem cannot be resolved over the telephone or electronically, through your application of Machine Code or software updates, or with a CRU, IBM or your reseller, if approved by IBM to provide warranty service, will either, at its discretion, 1) repair it to make it function as warranted, or 2) replace it with one that is at least functionally equivalent. If IBM is unable to do either, you may return the Machine to your place of purchase and your money will be refunded.

IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Exchange of a Machine or Part

When the 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.

Your Additional Responsibilities

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 service request procedures that IBM or your reseller provides;
 - b. backup or secure all programs, data, and funds contained in the Machine;
 - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit IBM to fulfill its obligations; and
 - d. inform IBM or your reseller of changes in the Machine's location.
4. (a) ensure all information about identified or identifiable individuals (Personal Data) is deleted from the Machine (to the extent technically possible), (b) allow IBM, your reseller or an IBM supplier to process on your behalf any remaining Personal Data as IBM or your reseller considers necessary to fulfill its obligations under this Statement of Limited Warranty (which may include shipping the Machine for such processing to other IBM service locations around the world), and (c) ensure that such processing complies with any laws applicable to such Personal Data.

Limitation of Liability

IBM is responsible for loss of, or damage to, your Machine only 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 are responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM for any reason. You should remove all such information from the Machine prior to its return.

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 ("LIC").

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, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING EVEN IF INFORMED OF THEIR POSSIBILITY: 1) THIRD PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF,

OR DAMAGE TO, DATA; 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR 4) LOST PROFITS, BUSINESS REVENUE, GOODWILL OR ANTICIPATED SAVINGS. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION 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 Statement of Limited Warranty, without regard to conflict of law principles.

THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE OR JURISDICTION TO JURISDICTION.

Jurisdiction

All of our rights, duties, and obligations are subject to the courts of the country in which you acquired the Machine.

Part 2 - Country-unique Terms

AMERICAS

ARGENTINA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Ordinary Commercial Court of the city of Buenos Aires.

BOLIVIA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the courts of the city of La Paz.

BRAZIL

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the court of Rio de Janeiro, RJ.

CHILE

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Civil Courts of Justice of Santiago.

COLOMBIA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Judges of the Republic of Colombia.

EQUADOR

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Judges of Quito.

MEXICO

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Federal Courts of Mexico City, Federal District.

PARAGUAY

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the courts of the city of Asuncion.

PERU

Limitation of Liability: *The following is added at the end of this section:*

In accordance with Article 1328 of the Peruvian Civil Code the limitations and exclusions specified in this section will not apply to damages caused by IBM's willful misconduct ("dolo") or gross negligence ("culpa inexcusable").

URUGUAY

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the City of Montevideo Court's Jurisdiction.

VENEZUELA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Courts of the Metropolitan Area Of the City of Caracas.

NORTH AMERICA

How to Obtain 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

Limitation of Liability: *The following replaces item 1 of this section:*

1. damages for bodily injury (including death) or physical harm to real property and tangible personal property caused by IBM's negligence; and

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

What this Warranty Covers: *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 AND LAOS

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, United States of America.

CAMBODIA, INDONESIA, AND LAOS

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Singapore in accordance with the Arbitration Rules of Singapore International Arbitration Center ("SIAC Rules") then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

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 who shall act as chairman of the proceedings. Vacancies in the

post of chairman shall be filled by the president of the SIAC. 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.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

HONG KONG S.A.R. OF CHINA AND MACAU S.A.R. OF CHINA

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 of China.

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; and
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, the charge paid by you for the individual Machine that is the subject of the claim. For purposes of this item, the term “Machine” includes Machine Code and Licensed Internal Code (“LIC”).

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Bangalore, India in accordance with the laws of India then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

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 who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Bar Council of India. 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.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

JAPAN

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

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

MALAYSIA

Limitation of Liability: *The word “SPECIAL” in item 3 of the fifth paragraph is deleted.*

NEW ZEALAND

What this Warranty Covers: *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 “laws of the country in which you acquired the Machine” in the first sentence:*

laws of the State of New York, United States of America (except when local law requires otherwise).

PHILIPPINES

Limitation of Liability: *Item 3 in the fifth paragraph is replaced by the following:*

SPECIAL (INCLUDING NOMINAL AND EXEMPLARY DAMAGES), MORAL, INCIDENTAL, OR INDIRECT DAMAGES FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Metro Manila, Philippines in accordance with the laws of the Philippines then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

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 who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Philippine Dispute Resolution Center, Inc. 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.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

SINGAPORE

Limitation of Liability: *The words “SPECIAL” and “ECONOMIC” in item 3 in the fifth paragraph are deleted.*

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.

How to Obtain Warranty Service:

*Add the following paragraph in **Western Europe** (Andorra, Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, San Marino, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Vatican State, and any country subsequently added to the European Union, as from the date of accession):*

The warranty for Machines acquired in Western Europe shall be valid and applicable in all Western Europe countries provided the Machines have been announced and made available in such countries.

If you purchase a Machine in one of the Western European countries, as defined above, 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, provided the Machine has been announced and made available by IBM in the country in which you wish to obtain service.

If you purchased a Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kyrgyzstan, 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 a 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 approved service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM approved service provider.

Governing Law:

The phrase “the laws of the country in which you acquired the Machine” is replaced by:

1) “the laws of Austria” in **Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia**; 2) “the laws of France” in **Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna**; 3) “the laws of Finland” in **Estonia, Latvia, and Lithuania**; 4) “the laws of England” in **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, the United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe**; and 5) “the laws of South Africa” in **South Africa, Namibia, Lesotho and Swaziland**.

Jurisdiction: *The following exceptions are added to this section:*

1) **In Austria** the choice of jurisdiction for all disputes arising out of this Statement of Limited Warranty and relating thereto, including its existence, will be the competent court of law in Vienna, Austria (Inner-City); 2) **in 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, West Bank/Gaza, Yemen, Zambia, and Zimbabwe** all disputes arising out of this Statement of Limited Warranty or related to its execution, including summary proceedings, will be submitted to the exclusive jurisdiction of the English courts; 3) **in Belgium and Luxembourg**, all disputes arising out of this Statement of Limited Warranty or related to its interpretation or its execution, the law, and the courts of the capital city, of the country of your registered office and/or commercial site location only are competent; 4) **in France, Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna** all disputes arising out of this Statement of Limited Warranty or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 5) **in Russia**, all disputes arising out of or in relation to the interpretation, the violation, the termination, the nullity of the execution of this Statement of Limited Warranty shall be settled by Arbitration Court of Moscow; 6) **in South Africa, Namibia, Lesotho and Swaziland**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the High Court in Johannesburg; 7) **in Turkey** all disputes arising out of or in connection with this Statement of Limited Warranty shall be resolved by the Istanbul Central (Sultanahmet) Courts and Execution Directorates of Istanbul, the Republic of Turkey; 8) in each of the following specified countries, any legal claim arising out of this Statement of Limited Warranty will be brought before, and settled exclusively by, the competent court of a) Athens for **Greece**, b) Tel Aviv-Jaffa for **Israel**, c) Milan for **Italy**, d) Lisbon for **Portugal**, and e)

Madrid for **Spain**; and 9) **in the United Kingdom**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the English courts.

Arbitration: *The following is added under this heading:*

In Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia all disputes arising out of this Statement of Limited Warranty or related to its violation, termination or nullity will be finally settled under the Rules of Arbitration and Conciliation of the International Arbitral Center of the Federal Economic Chamber in Vienna (Vienna Rules) by three arbitrators appointed in accordance with these rules. The arbitration will be held in Vienna, Austria, and the official language of the proceedings will be English. The decision of the arbitrators will be final and binding upon both parties. Therefore, pursuant to paragraph 598 (2) of the Austrian Code of Civil Procedure, the parties expressly waive the application of paragraph 595 (1) figure 7 of the Code. IBM may, however, institute proceedings in a competent court in the country of installation.

In Estonia, Latvia and Lithuania all disputes arising in connection with this Statement of Limited Warranty will be finally settled in arbitration that will be held in Helsinki, Finland in accordance with the arbitration laws of Finland then in effect. Each party will appoint one arbitrator. The arbitrators will then jointly appoint the chairman. If arbitrators cannot agree on the chairman, then the Central Chamber of Commerce in Helsinki will appoint the chairman.

EUROPEAN UNION (EU)

THE FOLLOWING TERMS APPLY TO ALL EU COUNTRIES:

The warranty for Machines acquired in EU countries is valid and applicable in all EU countries provided the Machines have been announced and made available in such countries.

How to Obtain Warranty Service: *The following is added to this section:*

To obtain warranty service from IBM in EU countries, see the telephone listing in Part 3 - Warranty Information.

You may contact IBM at the following address:

IBM Warranty & Service Quality Dept.
PO Box 30
Spango Valley
Greenock
Scotland PA16 0AH

CONSUMERS

Consumers have legal rights under applicable national legislation governing the sale of consumer goods. Such rights are not affected by the warranties provided in this Statement of Limited Warranty.

AUSTRIA, DENMARK, FINLAND, GREECE, ITALY, NETHERLANDS, NORWAY, PORTUGAL, SPAIN, SWEDEN AND SWITZERLAND

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty or due to any other cause related to this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault) or of such cause, for a maximum amount equal to the charges you paid for the Machine. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

FRANCE AND BELGIUM

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault), for a maximum amount equal to the charges you paid for the Machine that has caused the damages. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA

The provisions of this Statement of Limited Warranty replace any applicable statutory warranties.

What this Warranty Covers: *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 limitation period for consumers in action for breach of warranty is the statutory period as a minimum. 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.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *The following is added to this section:*

During the warranty period, IBM will reimburse you for the transportation charges for the delivery of the failing Machine to IBM.

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 ("LIC").

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).

GERMANY

What this Warranty Covers: *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 twelve 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.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *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.

HUNGARY

Limitation of Liability: *The following is added at the end of this section:*

The limitation and exclusion specified herein shall not apply to liability for a breach of contract damaging life, physical well-being, or health that has been caused intentionally, by gross negligence, or by a criminal act.

The parties accept the limitations of liability as valid provisions and state that the Section 314.(2) of the Hungarian Civil Code applies as the acquisition price as well as other advantages arising out of the present Statement of Limited Warranty balance this limitation of liability.

IRELAND

What this Warranty Covers: *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 the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to

you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default occurring on the date of occurrence of the last such Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.

1. IBM will accept unlimited liability for death or personal injury caused by the negligence of IBM.
2. Subject always to the **Items for Which IBM is Not Liable** below, IBM will accept unlimited liability for physical damage to your tangible property resulting from the negligence of IBM.
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2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

SLOVAKIA

Limitation of Liability: *The following is added to the end of the last paragraph:*

The limitations apply to the extent they are not prohibited under §§ 373-386 of the Slovak Commercial Code.

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

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UNITED KINGDOM

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3. IBM's entire liability for actual damages for any one Default will not in any event, except as provided in items 1 and 2 above, exceed the greater of 1) Pounds Sterling 75,000, or 2) 125% of the total purchase price payable or the charges for the Machine directly relating to the Default.

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2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

Part 3 - Warranty Information

This Part 3 provides information regarding the warranty applicable to your Machine, including the warranty period and type of warranty service IBM provides.

Warranty Period

The warranty period may vary by country or region and is specified in the table below.

Note: "Region" means either Hong Kong or Macau Special Administrative Region of China.

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

1. parts and labor during the first year of the warranty period; and
2. parts only, on an exchange basis, in the second and third years of the warranty period. IBM will charge you for any labor provided in performance of the repair or replacement(s) in the second and third year of the warranty period.

Machine type 8840

Country or Region of Purchase	Warranty Period	Type of Warranty Service*
Worldwide	3 years	1 and 2
* See " <u>Types of Warranty Service</u> " for the legend and explanations of warranty-service types.		

Types of Warranty Service

If required, IBM provides repair or exchange service depending on the type of warranty service specified for your Machine in the above table and as described below. Warranty service may be provided by your reseller if approved by IBM to perform warranty service. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations, additional charges may apply outside IBM's normal service area, contact your local IBM representative or your reseller for country and location specific information.

1. Customer Replaceable Unit (“CRU”) Service

IBM provides replacement CRUs to you for you to install. CRU information and replacement instructions are shipped with your Machine and are available from IBM at any time on your request. Installation of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation. You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service designated for your Machine. IBM specifies in the materials shipped with a replacement CRU whether a defective CRU must be returned to IBM. When return is required, 1) return instructions and a container are shipped with the replacement CRU, and 2) you may be charged for the replacement CRU if IBM does not receive the defective CRU within 30 days of your receipt of the replacement.

2. On-site Service

IBM or your reseller will either repair or exchange the failing Machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM Machine. The area must be clean, well lit and suitable for the purpose. For some Machines, certain repairs may require sending the Machine to an IBM service center.

3. Courier or Depot Service*

You will disconnect the failing Machine for collection arranged by IBM. IBM will provide you with a shipping container for you to return your Machine to a designated service center. A courier will pick up your Machine and deliver it to the designated service center. Following its repair or exchange, IBM will arrange the return delivery of the Machine to your location. You are responsible for its installation and verification.

4. Customer Carry-In or Mail-In Service

You will deliver or mail as IBM specifies (prepaid unless IBM specifies otherwise) the failing Machine suitably packaged to a location IBM designates. After IBM has repaired or exchanged the Machine, IBM will make it available for your collection or, for Mail-in Service, IBM will return it to you at IBM's expense, unless IBM specifies otherwise. You are responsible for the subsequent installation and verification of the Machine.

5. CRU and On-site Service

This type of Warranty Service is a combination of Type 1 and Type 2 (see above).

6. CRU and Courier or Depot Service

This type of Warranty Service is a combination of Type 1 and Type 3 (see above).

7. CRU and Customer Carry-In or Mail-In Service

This type of Warranty Service is a combination of Type 1 and Type 4 (see above).

When a 5, 6 or 7 type of warranty service is listed, IBM will determine which type of warranty service is appropriate for the repair.

* This type of service is called ThinkPad EasyServ or EasyServ in some countries.

The IBM Machine Warranty World Wide Web site at http://www.ibm.com/servers/support/machine_warranties/ provides a worldwide overview of IBM's Limited Warranty for Machines, a Glossary of IBM definitions, Frequently Asked Questions (FAQs) and Support by Product (Machine) with links to Product Support pages. **The IBM Statement of Limited Warranty is also available on this site in 29 languages.**

To obtain warranty service contact IBM or your IBM reseller. In Canada or the United States, call 1-800-IBM-SERV (426-7378). In the EU countries, see the telephone numbers below.

EU Country Telephone List

Phone numbers are subject to change without notice. For the warranty service contact telephone number in a country subsequently added to the EU and not yet reflected in the list below, contact IBM in that country or visit the website above for a current telephone listing.

Austria -- +43-1-24592-5901	Latvia -- +386-61-1796-699
Belgium -- +32-70-23-3392	Lithuania -- +386-61-1796-699
Cyprus -- +357-22-841100	Luxembourg -- +352-298-977-5063
Czech Republic -- +420-2-7213-1316	Malta -- +356-23-4175
Denmark -- +45-4520-8200	Netherlands -- +31-20-514-5770
Estonia -- +386-61-1796-699	Poland -- +48-22-878-6999
Finland -- +358-8001-4260	Portugal -- +351-21-892-7147
France -- +33-238-557-450	Slovakia -- +421-2-4954-1217
Germany -- +49-1805-253553	Slovenia -- +386-1-4796-699
Greece -- +30-210-680-1700	Spain -- +34-91-714-7983
Hungary -- +36-1-382-5720	Sweden -- +46-8-477-4420
Ireland -- +353-1-815-4000	United Kingdom -- +44-1475-555-055
Italy -- +39-800-820-094	

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

CD 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.

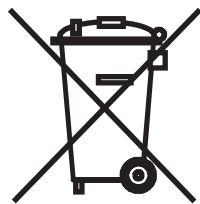
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Product recycling and disposal

This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at <http://www.ibm.com/ibm/environment/products/prp.shtml>.



Notice: This mark applies only to countries within the European Union (EU) and Norway.

This appliance is labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'étiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

Battery return program

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to <http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml> or contact your local waste disposal facility.

In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and battery packs from IBM equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Have the IBM part number listed on the battery available prior to your call.

In the Netherlands, the following applies.



For Taiwan: Please recycle batteries.



Electronic emission notices

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

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

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN

55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

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

Taiwanese Class A warning statement

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

Chinese Class A warning statement

聲 明
此為 A 級產品。在生活環境中，該產品可能會造成無線電干擾。在這種情況下，可能需要用戶對其干擾採取切实可行的措施。

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