ThinkServer RD120 Types 6444, 6445, 6446, and 6447

lenovo

Installation Guide

ThinkServer RD120 Types 6444, 6445, 6446, and 6447

Installation Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 85 and the *Warranty and Support Information* document on the Lenovo *ThinkServer Documentation* DVD.

First Edition (October 2008)

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

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Important:

Each caution and danger statement in this document is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document.

For example, if a caution statement is labeled "Statement 1", translations for that caution statement are in the *Safety Information* document under "Statement 1."

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

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

Statement 1:

DANGER

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

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

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

Statement 2:

CAUTION:
When replacing the lithium battery, use only the 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 drives, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

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

DANGER

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

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

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

Statement 4:

≥ 18 kg (39.7 lb)   ≥ 32 kg (70.5 lb)   ≥ 55 kg (121.2 lb)
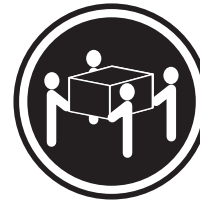
CAUTION:
Use safe practices when lifting.

Statement 5:

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

2

1
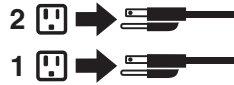
Statement 8:

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

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

Statement 26:

CAUTION:
Do not place any object on top of rack-mounted devices.

This server is suitable for use on an IT power-distribution system whose maximum phase-to-phase voltage is 240 V under any distribution fault condition.

Important: This product is not suitable for use with visual display workplace devices according to Clause 2 of the German Ordinance for Work with Visual Display Units.

Chapter 1. Introduction

This *Installation Guide* contains instructions for setting up your Lenovo®
ThinkServer™ RD120 Types 6444, 6445, 6446, and 6447 server and basic
instructions for installing some optional devices. More detailed instructions for
installing optional devices are in the *User Guide* on the *ThinkServer Documentation*
DVD, which comes with the server. This document contains information about:

* Setting up and cabling the server
* Starting and configuring the server
* Installing some optional devices
* Solving problems

Attention: The information in this document regarding installing and removing
power supplies and connecting and disconnecting power refers to ac power
supplies only. If the server contains dc power supplies, see the documentation that
comes with the dc power supplies. In a dc power environment, only trained service
personnel other than Lenovo service technicians are authorized to connect or
disconnect power to the dc power supply and to install and remove a dc power
supply.

The server has two model styles, which are based on the size and number of hard
disk drive bays:

* The *3.5-inch* models have six 3.5-inch hot-swap hard disk drive bays. Install only
  3.5-inch drives in these models. If you intend to install a tape drive, the tape
  drive will occupy two of the six 3.5-inch drive bays.
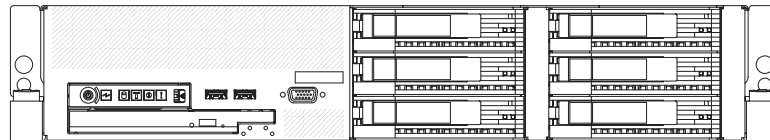
* The *2.5-inch* models have eight 2.5-inch hot-swap hard disk drive bays and one
  3.5-inch tape drive bay. Install only 2.5-inch hard disk drives and an optional
  3.5-inch tape drive in these models.

Throughout this documentation, the terms *2.5-inch models* and *3.5-inch models* are
used to distinguish between the server styles.

If firmware and documentation updates are available, you can download them from
the Lenovo Web site. The server might have features that are not described in the
documentation that comes with the server, and 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. To check for updates, complete the following steps:

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

1. Go to: http://www.lenovo.com/support.

© Lenovo 2008. Portions © IBM Corp. 2007.   **1**

2. Enter your product number (machine type and model number) or select **Servers** from the **Select your product** list.
3. Select **Servers** from the **Brand** list.
4. From **Family** list, select **ThinkServer RD120**, and click **Continue**.

The server comes with an *ThinkServer EasyStartup* DVD to help you configure the hardware, install device drivers, and install the operating system.

The server comes with a limited warranty. You can obtain up-to-date information about the server and other Lenovo products at http://www.lenovo.com/thinkserver.

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

Product name	ThinkServer RD120
Machine type	6444, 6445, 6446, and 6447
Model number	_____
Serial number	_____

The model number and serial number are on the ID label **1** on the bezel, as shown in the following illustration.
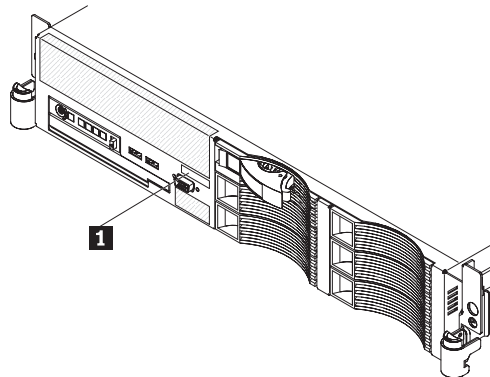
Note: This illustration shows a model with 3.5-inch serial-attached SCSI (SAS) hot-swap hard disk drives. Models with 2.5-inch SAS hot-swap hard disk drives are also available. The location of the ID label is the same on both model styles. This illustration might differ slightly from your hardware.

For a list of supported optional devices for the server, see http://www.lenovo.com/ accessories.

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

The Lenovo *ThinkServer Documentation* DVD

The Lenovo *ThinkServer Documentation* DVD contains documentation for the server in Portable Document Format (PDF).

Hardware and software requirements

The Lenovo *ThinkServer Documentation* DVD requires the following minimum hardware and software:

- Microsoft® Windows® XP, 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

Notices and statements 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 Lenovo *ThinkServer Documentation* DVD. 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:
- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate 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 4.45 cm (1.75 inches). Each increment is referred to as a unit, or "U." A 1-U-high device is 1.75 inches tall.

Notes:

1. Power consumption and heat output vary depending on the number and type of optional features that are installed and the power-management optional features that are in use.

2. The sound 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.

Table 1. Features and specifications

Microprocessor:
- Intel® Xeon™ FC-LGA 771 dual-core with 4 MB Level-2 cache or quad-core with 8 MB (2x4 MB) Level-2 cache
- Support for up to two microprocessors
- Support for Intel Extended Memory 64 Technology (EM64T)

Note:
- Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors.

Memory:
- Twelve DIMM connectors
- Minimum: 1 GB
- Maximum: 48 GB
- Type: Fully buffered DIMM (FBD) PC2-5300 DIMMs only
- Sizes: 512 MB, 1 GB, 2 GB, or 4 GB (when available), in pairs
- Chipkill™ supported

Drives:

CD/DVD: IDE 24x CD-RW/ 8x DVD combination

Expansion bays:
- Hot-swap hard disk drive bays: SAS only. Number and size depend on the server model. One of the following configurations:
  – Six 3.5-inch drive bays (optional tape drive [SATA or SCSI] requires two of these bays)
  – Eight 2.5-inch drive bays and one tape-drive (SATA or SCSI) bay
- One 5.25-inch Ultrabay Enhanced bay (CD-RW/DVD drive installed)

Expansion slots:
- Two PCI Express x8 slots (x4 lanes) on system board (low profile)
- Support for either of the following optional riser cards:
  – Riser card with two PCI Express x8 slots (x8 lanes) (standard)
  – Riser card with two 133 MHz/64-bit PCI-X slots

Hot-swap fans:
- Standard: Five
- Maximum: Ten - provide redundant cooling

Hot-swap power supplies:

835 watts (100 - 240 V ac)
- Minimum: One
- Maximum: Two - provide redundant power

Size (2 U):
- Height: 85.4 mm (3.36 in.)
- Depth: 705 mm (27.8 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

Integrated functions:
- Baseboard management controller
- Two Broadcom 10/100/1000 Ethernet controllers with Wake on LAN® support and TCP/IP Offload Engine (TOE) support
- One RAID controller, active only when a 8k or 8k-I SAS controller is installed
- One serial port
- One serial-attached SCSI (SAS) controller
- Seven Universal Serial Bus (USB) ports (two on front and four on rear of server, plus one internal), v2.0 supporting v1.1
- Two video ports (one on front and one on rear of server)
- One internal serial ATA (SATA) connector for tape
- Support for Remote Supervisor Adapter II SlimLine

Note: In messages and documentation, the term *service processor* refers to the baseboard management controller or the optional Remote Supervisor Adapter II SlimLine.

Video controller:
- ATI RN50 video on system board
- Compatible with SVGA and VGA
- 16 MB DDR video memory

ServeRAID SAS controller:
- ServeRAID™-8k-I SAS Controller that supports RAID levels 0, 1, 10 (standard)
- Upgradeable to ServeRAID-8k SAS Controller, 256 MB with battery backup, that supports RAID levels 0, 1, 1E, 5, 6, and 10

Environment:
- Air temperature:
  – 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-foot 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° to 140°F); maximum altitude: 2133 m (7000 ft)
- Humidity:
  – Server on/off: 8% to 80%
  – Shipment: 5% to 100%

Acoustical noise emissions:
- Declared sound power, idle: 6.8 bel
- Declared sound power, operating: 6.8 bel

Heat output:

Approximate heat output in British thermal units (Btu) per hour:
- Minimum configuration: 1230 Btu per hour (360 watts)
- Maximum configuration: 3390 Btu per hour (835 watts)

Electrical input with hot-swap ac power supplies:
- Sine-wave input (50-60 Hz) required
- Input voltage range automatically selected
- Input voltage low range:
  – Minimum: 100 V ac
  – Maximum: 127 V ac
- Input voltage high range:
  – Minimum: 200 V ac
  – Maximum: 240 V ac
- Input kilovolt-amperes (kVA) approximately:
  – Minimum: 0.29 kVA
  – Maximum: 1.00 kVA

Major components of the 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 illustrations show the major components in the server.

Note: The illustrations in this document might differ slightly from your hardware.
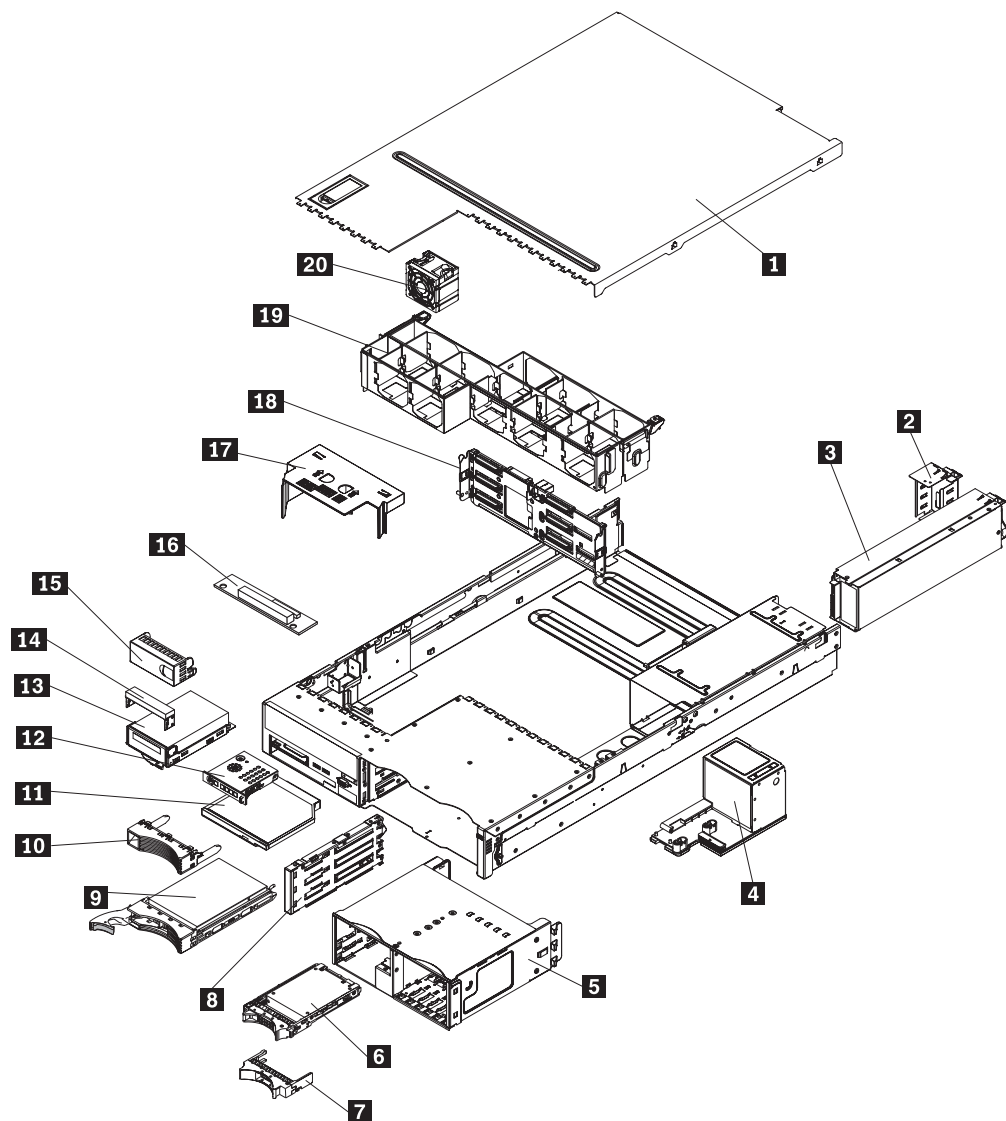
1	Cover	11	CD/DVD drive
2	Power-supply filler	12	Operator information panel
3	Power supply	13	Optional tape drive

4	Power backplane	14	Tape drive space filler
5	2.5-inch drive cage with hard disk drive backplane	15	Tape drive filler
6	2.5-inch hard disk drive	16	CD/DVD media backplane
7	2.5-inch filler panel	17	Microprocessor air baffle
8	3.5-inch cage divider	18	3.5-inch hard disk drive backplane
9	3.5-inch hard disk drive	19	Fan bracket assembly
10	3.5-inch filler panel	20	Fans (5 or 10)
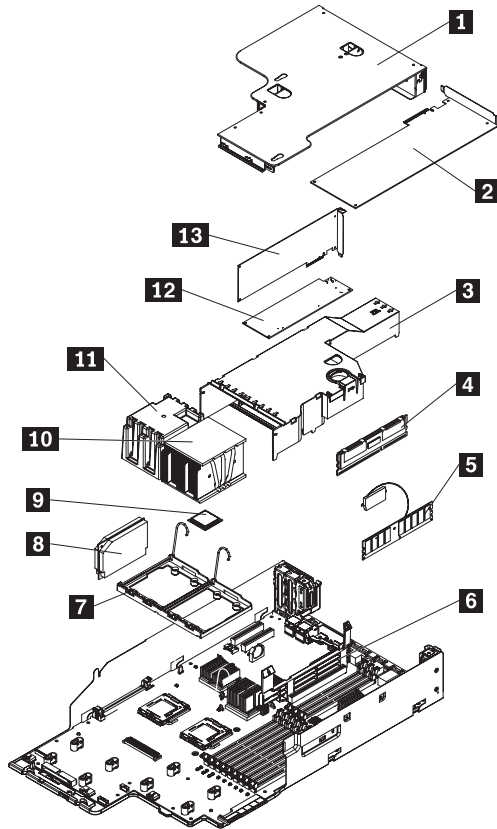
1	Riser-card assembly	8	VRM
2	Full-height adapter	9	Microprocessor
3	DIMM air baffle	10	Heat sink
4	DIMM	11	Heat sink filler
5	ServerRAID SAS controller	12	Remote Supervisor Adapter II SilmLine
6	system board	13	Low-profile adapter
7	Heat sink retention module		

Chapter 2. Installing optional devices

This chapter provides basic instructions for installing optional hardware devices in the server. These instructions are intended for users who are experienced with setting up Lenovo® server hardware. If you need more detailed instructions, see the *User Guide* on the *ThinkServer Documentation* DVD.

Installation guidelines

Before you install optional devices, read the following information:

- Read the safety information that begins on page v and the guidelines in "Handling static-sensitive devices" on page 9. This information will help you work safely.

- When you install your new server, take the opportunity to download and apply the most recent firmware updates. This step will help to ensure that any known issues are addressed and that your server is ready to function at maximum levels of performance. To download firmware updates for your server, complete the following steps:

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

  1. Go to: http://www.lenovo.com/support.
  2. Enter your product number (machine type and model number) or select **Servers** from the **Select your product** list.
  3. Select **Servers** from the **Brand** list.
  4. From **Family** list, select **ThinkServer RD120**, and click **Continue**.
  5. Click **Downloads and drivers** to download firmware updates.

- Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see Chapter 5, "Solving problems," on page 61 for diagnostic information.

- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.

- If you must start the server while the cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.

- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  – Make sure that you can stand safely without slipping.
  – Distribute the weight of the object equally between your feet.
  – Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  – To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.

- Make sure that you have an adequate number of properly grounded electrical outlets for the 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 fans, redundant hot-swap ac power supplies, or hot-plug Universal Serial Bus (USB) devices. However, you must turn off the server before performing any steps that involve removing or installing adapter cables or non-hot-swap optional devices or components.

  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply.

- 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.

- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.

- For a list of supported optional devices for the server, see http://www.lenovo.com/accessories.

System reliability guidelines

To help ensure proper cooling and system reliability, make sure that the following requirements are met:

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.

- If the server has redundant power, each of the power-supply bays has a power supply installed in it.

- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2.0 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 operate the server without the air baffles installed. Operating the server without the air baffles might cause the microprocessors to overheat.

- Microprocessor socket 2 always contains either a heat-sink filler or a microprocessor and heat sink.

Working inside the server with the power on

Attention: Static electricity that is released to internal server components when the server is powered-on might cause the server to halt, which could result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.

The server supports hot-plug, hot-add, and 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.
- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available. Always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on
- 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 surface on the outside 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.

Removing the cover

Important: Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see the *Hardware Maintenance Manual* for diagnostic information.

To remove the cover, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 7.

2. If you are planning to install or remove a microprocessor, memory module, PCI adapter, battery, or other non-hot-swap optional device, turn off the server and all attached devices and disconnect all external cables and power cords (see "Turning off the server" on page 39).

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Press down on the left and right side latches and pull the server out of the rack enclosure until both slide rails lock.

   Note: You can reach the cables on the back of the server when the server is in the locked position.

4. Lift the cover-release latch **1** . Lift the cover off the server and set the cover aside.
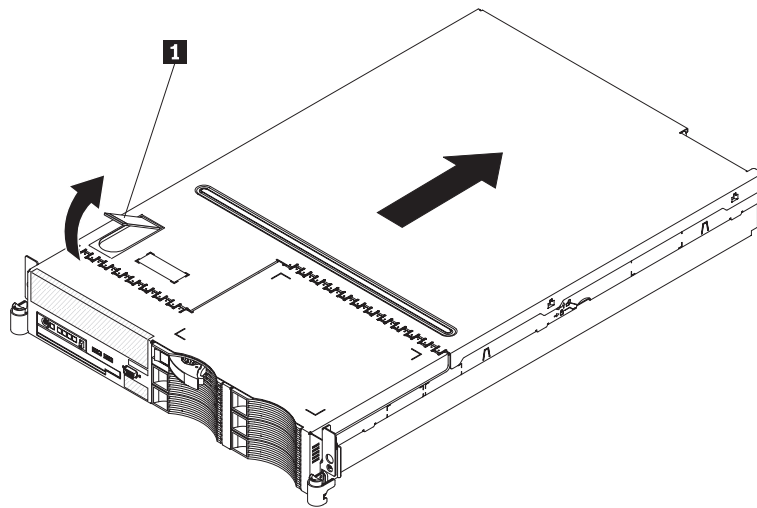
Attention: For proper cooling and airflow, replace the cover before you turn on the server. Operating the server for extended periods of time (more than 30 minutes) with the cover removed might damage server components.

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 up to 12 Fully Buffered DIMM PC2-5300 512 MB, 1 GB, 2 GB, and 4 GB DIMMs, for a maximum of 48 GB of system memory. See http://www.lenovo.com/accessories for a list of memory modules that you can use with the server.

   Note: Because some memory is reserved for system operation, the actual usable memory size that is reported by the operating system is less than the total installed size.

• The server comes with a minimum of two 512 MB DIMMs, installed in slots 1 and 4. When you install additional DIMMs, you must install two identical 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 4
2	7 and 10
3	2 and 5
4	8 and 11
5	3 and 6
6	9 and 12

Note: When only one pair of DIMMs is installed in the server and the BIOS code level is version 1.04 (GGE127A) or later, you can improve performance by installing the DIMMs in connectors 1 and 7 instead of 1 and 4. However, because the connectors in the pair are not on the same memory branch (see the following illustration), Chipkill memory protection is disabled.
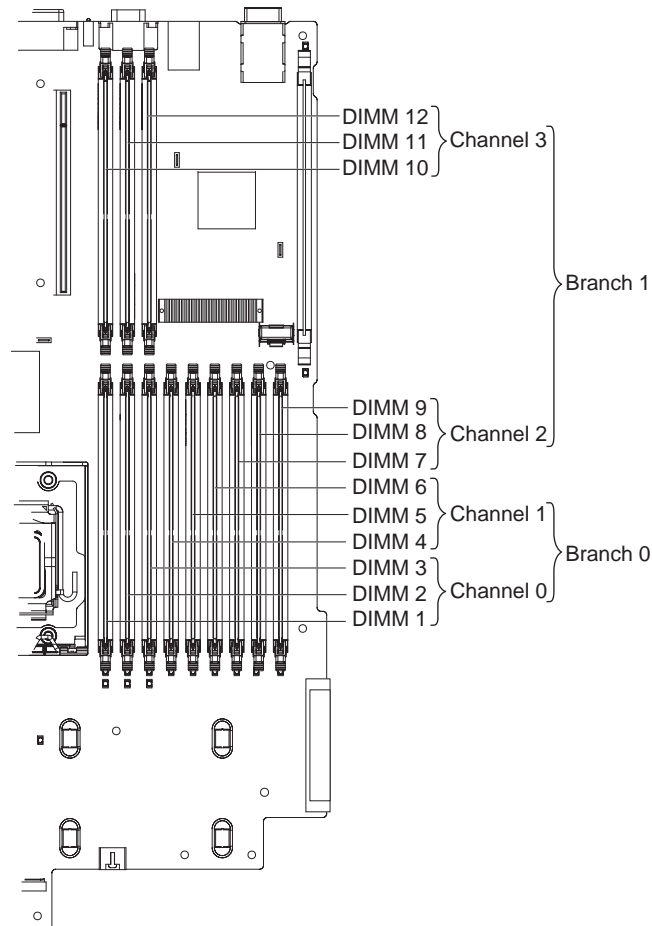
- Each DIMM in a pair must be the same size, speed, type, and technology to ensure that the server will operate correctly.
- You can configure the server to use memory mirroring. Memory mirroring stores data in two pairs of DIMMs simultaneously. If a failure occurs, the memory controller switches from the active pair to the mirroring pair. See "Memory mirroring" on page 13 for more information about memory mirroring and the DIMM installation sequence that is required.

Chapter 2. Installing optional devices **11**

- The server supports online-spare memory. This feature disables the failed memory from the system configuration and activates an online-spare pair of DIMMs to replace the failed active DIMM pair. See "Online-spare memory" on page 14 for more information about online-spare memory and the DIMM configuration that is required.
- You can enable either online-spare memory or memory mirroring, but not both at the same time. Online-spare memory provides more memory capacity than mirroring; mirroring provides better memory protection but less memory capacity than online-spare memory.
- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message that indicates that the memory configuration has changed.
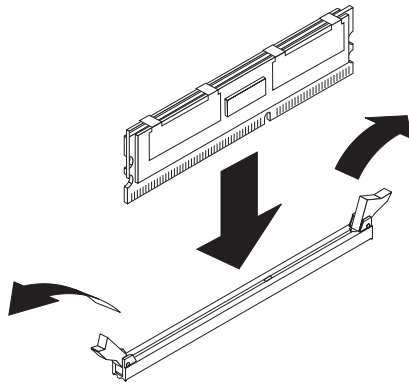
To install a DIMM, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 7.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover.

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open, and close the clips gently.
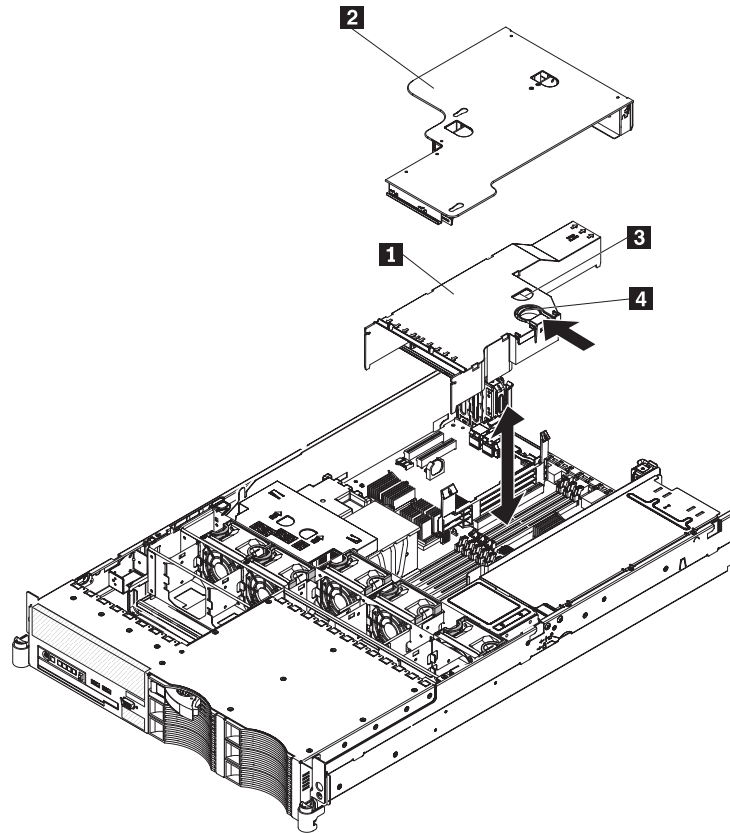
1	DIMM air baffle	**3**	Finger hole
2	Riser card assembly	**4**	Release ring

4. Remove the riser-card assembly.
5. Remove the DIMM air baffle.
6. Open the retaining clip on each end of the DIMM connector.
7. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the outside of the server. Then, remove the DIMM from the package.
8. Turn the DIMM so that the keys align correctly with the connector.
9. Insert the DIMM into the connector. Firmly press the DIMM straight down into the connector. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector.

   Note: If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.
10. Replace the DIMM air baffle.
11. Replace the riser-card assembly.

If you have other optional devices to install, do so now. Otherwise, go to "Completing the installation" on page 30.

Memory mirroring

You can configure the server to use memory mirroring. Memory mirroring stores data in two pairs of DIMMs simultaneously. If a failure occurs, the memory controller

switches from the active pair to the mirroring pair. Memory mirroring reduces the amount of available memory. Enable memory mirroring through the Configuration/Setup Utility program. See the section about using the Configuration/Setup Utility program in the *User Guide* on the *ThinkServer Documentation* DVD for details about enabling memory mirroring.

When you use 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, 4, 7, and 10
2	2, 5, 8, and 11
3	3, 6, 9, and 12

Table 4. Memory mirroring DIMM functions

Group	Active DIMMs	Mirroring DIMMs
1	1, 4	7, 10
2	2, 5	8, 11
3	3, 6	9, 12

Online-spare memory

The server supports online-spare memory. This feature disables the failed memory from the system configuration and activates an online-spare 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 up to two additional pairs of DIMMs. The online-spare DIMM pairs must be the same speed, type, and the same size as, or larger than, the largest active DIMM pairs.

Enable online-spare memory through the Configuration/Setup Utility program. The BIOS code assigns the online-spare DIMM pairs according to your DIMM configuration. Online-sparing is enabled on a memory branch basis; the BIOS code does not enable online-sparing on a branch that cannot support online-sparing. See the illustration on page 11 for the memory branch structure. DIMM ranks are online-spared if the DIMMs are installed according to the rules in Table 5 on page 15 or Table 6 on page 15.

Note: POST gives a warning message when online-sparing cannot be enabled on both branches. However, no warning message is given when online-sparing is enabled on one branch and disabled on the other.

Online-spare configurations are supported for each branch. See Table 5 on page 15 and Table 6 on page 15 for the online-spare DIMM connector assignments.

Important: Table 5 on page 15 shows the default DIMM online-spare scheme. If the BIOS code level is version 1.04 or later, you can install the DIMMs according to the scheme shown in Table 6 on page 15 instead.

In the configuration that you use, install the largest DIMMs first.

Table 5. Online-spare DIMM configurations, basic scheme

Number of DIMMs	DIMM connectors	Results
4	1 and 4 (largest DIMMs) 2 and 5	Online-sparing on branch 0
6	1 and 4 (largest DIMMs) 2 and 5 3 and 6	Online-sparing on branch 0
8	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 (dual-rank DIMMs only)	Online-sparing on branch 0 Online-sparing on dual-rank DIMMs on branch 1
10	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 8 and 11	Online-sparing on branch 0 Online-sparing on branch 1
12	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 8 and 11 9 and 12	Online-sparing on branch 0 Online-sparing on branch 1

Table 6. Online-spare DIMM configurations, alternative scheme (requires BIOS code version 1.04 or later)

Number of DIMMs	DIMM connectors	Results
4	7 and 10 (largest DIMMs) 8 and 11	Online-sparing on branch 1
6	7 and 10 (largest DIMMs) 8 and 11 9 and 12	Online-sparing on branch 1
8	7 and 10 (largest DIMMs) 8 and 11 9 and 12 1 and 4 (dual-rank DIMMs only)	Online-sparing on branch 1 Online-sparing on dual-rank DIMMs on branch 0
10	1 and 4 (largest DIMMs) 2 and 5 7 and 10 8 and 11 9 and 12	Online-sparing on branch 0 Online-sparing on branch 1
12	N/A	N/A

Installing a hard disk drive

Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this chapter.

Important: Do not install a SCSI hard disk drive in this server; install only SAS hard disk drives.

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

- The server 3.5-inch models support six slim 3.5-inch hard disk drives installed on Ultra-Slim hard disk drive trays for 3.5-inch drives.
- The server 2.5-inch models support eight 2.5-inch hot-swap hard disk drives installed on Ultra-Slim hard disk drive trays for 2.5-inch drives.
- All hot-swap drives in the server should have the same throughput speed rating. Mixing hard disk drives with different speed ratings will cause all drives to operate at the lower throughput speed.
- The ID that is assigned to each bay is printed on the front of the server.

The following illustrations show how to install a hot-swap hard disk drive.

3.5-inch drives

1	Filler panel	**3**	Hard disk drive
2	Tray handle		
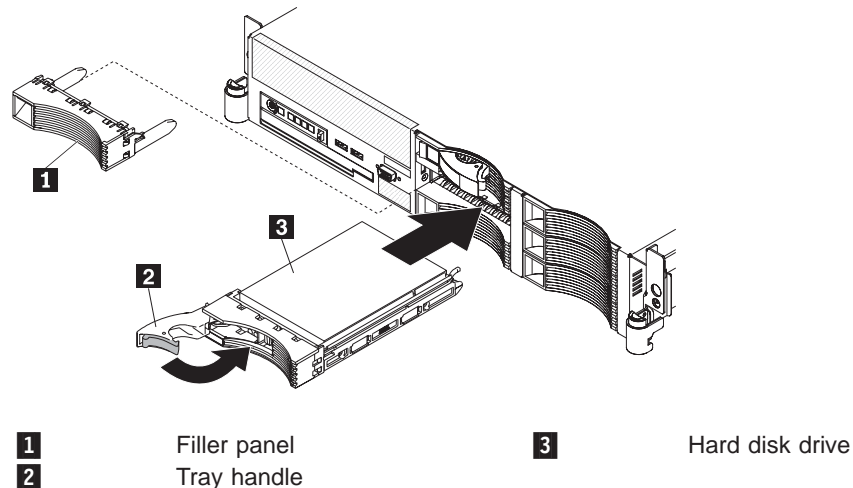
2.5-inch drives
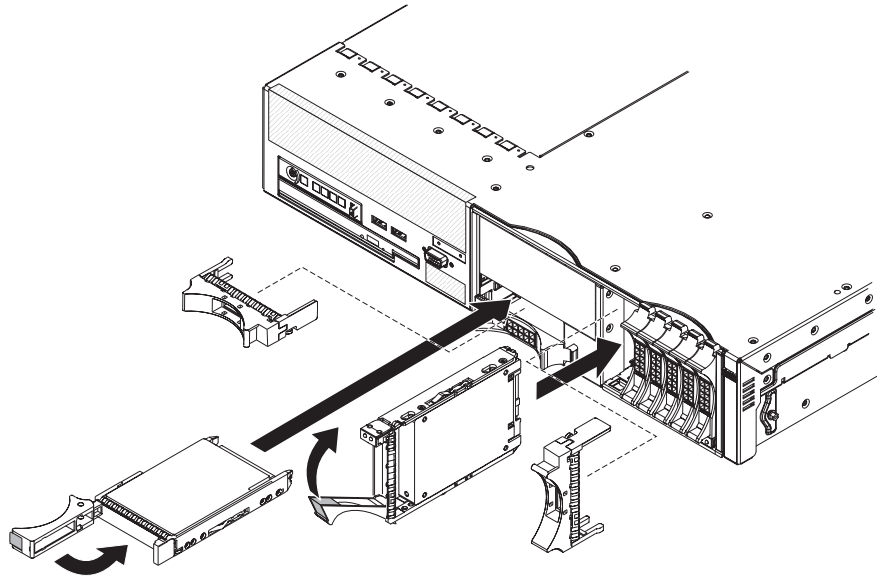
To install a drive in a hot-swap bay, complete the following steps:

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 that begins on page v, and "Installation guidelines" on page 7.
2. Remove the filler panel from one of the empty hot-swap bays.
3. Install the hard disk drive in the hot-swap bay:
   a. Make sure that the tray handle is open (that is, perpendicular to the drive).
   b. Align the drive assembly with the guide rails in the bay.
   c. Gently push the drive assembly into the bay until the drive stops.
   d. Push the tray handle to the closed (locked) position.
   e. Check the hard disk drive status LED to verify that the hard disk drive is operating correctly.

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

   Note: You might have to reconfigure the disk arrays after you install hard disk drives. See the RAID documentation on the *ThinkServer Documentation* DVD for information about RAID controllers.

If you have other optional devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 30.

Installing a tape drive

For information about installing an optional tape drive, see the *User Guide* on the *ThinkServer Documentation* DVD, which comes with the server.

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:

- The server supports certain Intel Xeon dual-core or quad-core flip-chip land grid array 771 (FC-LGA 771) microprocessors, which are designed for the LGA771 socket. See http://www.lenovo.com/accessories for a list of supported microprocessors.

  Important: Dual-core and quad-core microprocessors are not interchangeable and cannot be used in the same server. For example, if the server has a dual-core microprocessor, you cannot install a quad-core microprocessor as the second microprocessor. Use the Configuration/Setup Utility program to determine the type and speed of the microprocessor that is currently installed in the server.

- The server supports up to two microprocessors. If the server comes with one microprocessor, you can install a second microprocessor.

- Both microprocessors must have the same cache size and type, front-side bus frequency, and the same clock speed. Microprocessor internal and external clock frequencies must be identical.

- When you install an additional microprocessor in microprocessor connector 2, you must also install the voltage regulator module (VRM), which comes with the microprocessor, in the VRM connector.

- Read the documentation that comes with the microprocessor to determine whether you must update the basic input/output system (BIOS) code for the server. To download the most current level of BIOS code and many other code updates for your server:

  1. Go to: http://www.lenovo.com/support.
  2. Enter your product number (machine type and model number) or select **Servers** from the **Select your product** list.
  3. Select **Servers** from the **Brand** list.
  4. From **Family** list, select **ThinkServer RD120**, and click **Continue**.
  5. Click **Downloads and drivers** to download firmware updates.

- (Optional) Obtain an SMP-capable operating system. For a list of supported operating systems and optional devices, go to http://www.lenovo.com/support/.

- To order additional microprocessors, contact your Lenovo marketing representative or authorized reseller.

- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.

- If you have to replace a microprocessor, call for service.

- If the thermal-grease protective cover (for example, a plastic cap or tape liner) is removed from the heat sink, do not touch the thermal grease on the bottom of the heat sink or set down the heat sink.

- Do not remove the first microprocessor from the system board to install the second microprocessor.

The following illustration shows the microprocessor connector locations and other microprocessor-related components on the system board.
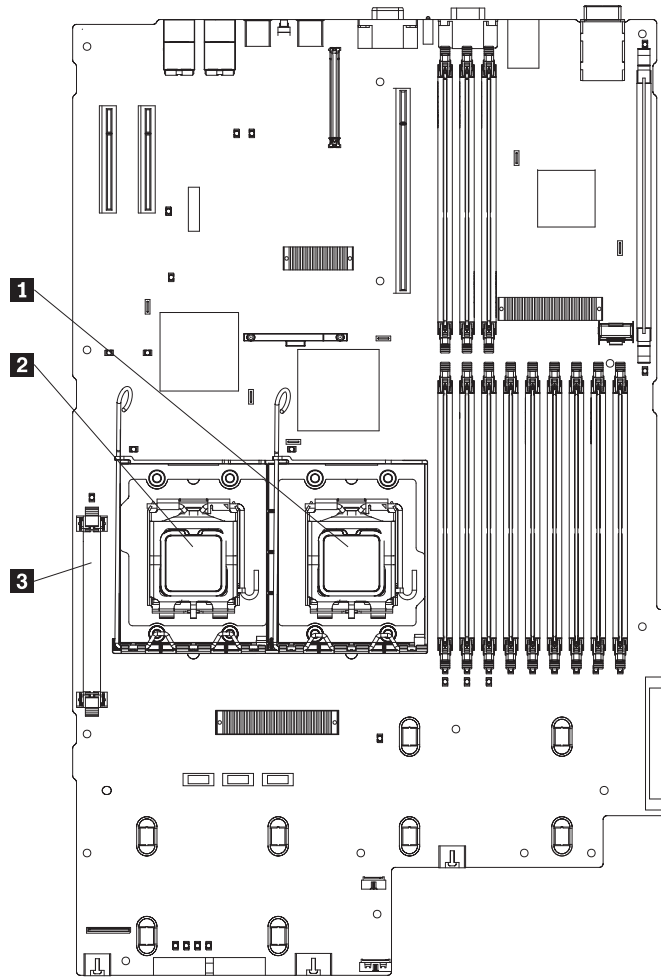
1	Microprocessor 1	**3**	Voltage regulator module connector
2	Microprocessor 2		

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

Note: For simplicity, certain components are not shown in this illustration.
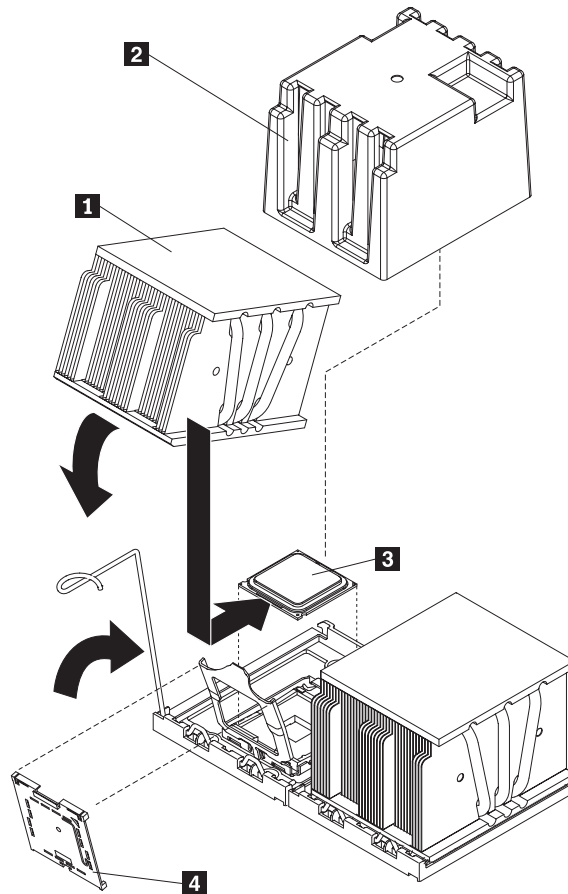
1	Heat sink	**3**	Microprocessor
2	Heat sink filler	**4**	Microprocessor socket dust cover

Attention:

- A startup (boot) processor must always be installed in microprocessor connector 1 on the system board.
- To ensure correct 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.

To install an additional microprocessor, complete the following steps:

1. Read the safety information that begins 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.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the server cover.

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see "Handling static-sensitive devices" on page 9.
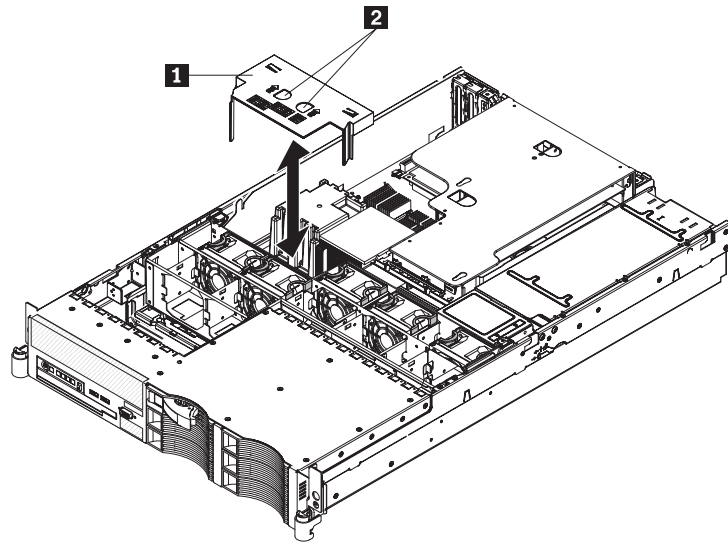
1	Microprocessor air baffle
2	Finger holes

4. Remove the microprocessor air baffle.
5. Touch the static-protective package containing the VRM to any unpainted metal surface on the outside of the server. Then, remove the VRM from the package.
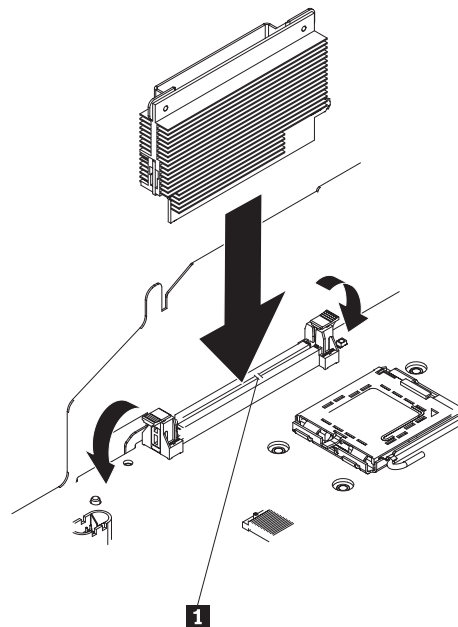
1	Alignment key

6. Turn the VRM so that the keys align correctly with the VRM connector; then, firmly press the VRM straight down into the connector. Make sure that the connector retaining clips are in the locked position.
7. Install the microprocessor:

Chapter 2. Installing optional devices **21**

a. Touch the static-protective package that contains the microprocessor to any unpainted metal surface on the server. Then, remove the microprocessor from the package.
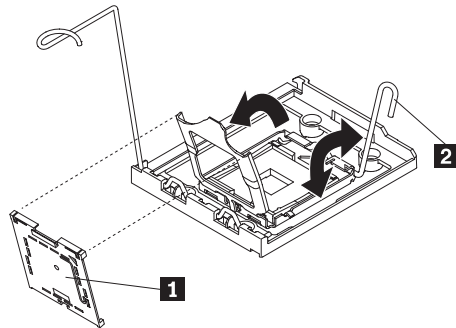
b. Remove the protective dust cover **1** , tape, or label from the surface of the microprocessor socket, if one is present.

c. Rotate the microprocessor release lever **2** on the socket from its closed and locked position until it stops in the fully open position.

   Attention:

   • Handle the microprocessor carefully. Dropping the microprocessor during installation or removal can damage the contacts. Also, contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

   • Do not use excessive force when you press the microprocessor into the socket.

   • Make sure that the microprocessor is correctly aligned and positioned in the socket before you try to close the lever.
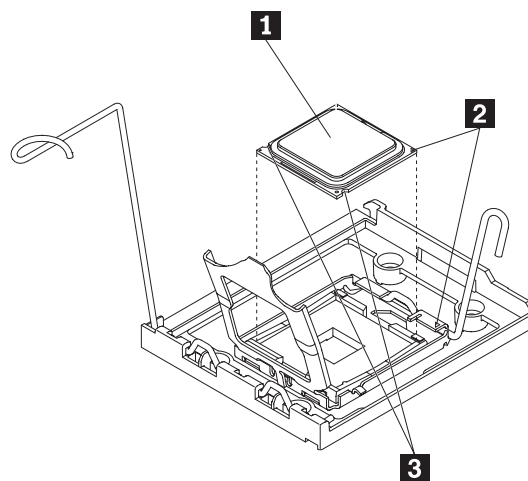
d. Align the microprocessor **1** with the socket (note the alignment marks **2** and the position of the notches **3**); then, carefully place the microprocessor on the socket. Close the microprocessor bracket frame.

   Note: The microprocessor fits only one way on the socket.

e. Carefully close the microprocessor release lever to secure the microprocessor in the socket.

8. Install a heat sink on the microprocessor.

   Attention: Do not touch the thermal grease **1** on the bottom of the heat sink **2** or set down the heat sink after you remove the plastic cover. Touching the thermal grease will contaminate it. For details, see the information about thermal grease in the *User Guide* on the *ThinkServer Documentation* DVD.
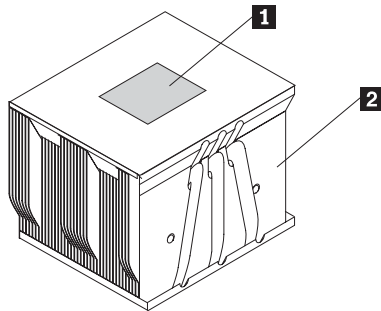
   a. Make sure that the heat-sink release lever is in the open position.
   b. Remove the plastic protective cover from the bottom of the heat sink.
   c. Align the heat sink above the microprocessor with the thermal grease side down.
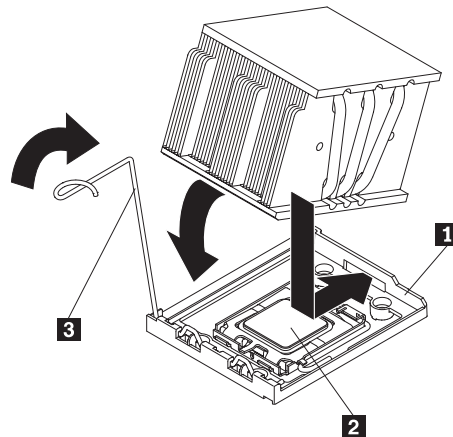
1	Retainer bracket	**3**	Heat sink release lever
2	Microprocessor		

   d. Slide the rear flange of the heat sink into the opening in the retainer bracket.
   e. Press down firmly on the front of the heat sink until it is seated securely.
   f. Rotate the heat-sink release lever to the closed position and hook it underneath the lock tab.

9. Install the microprocessor air baffle.

If you have other optional devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 30.

Installing an adapter
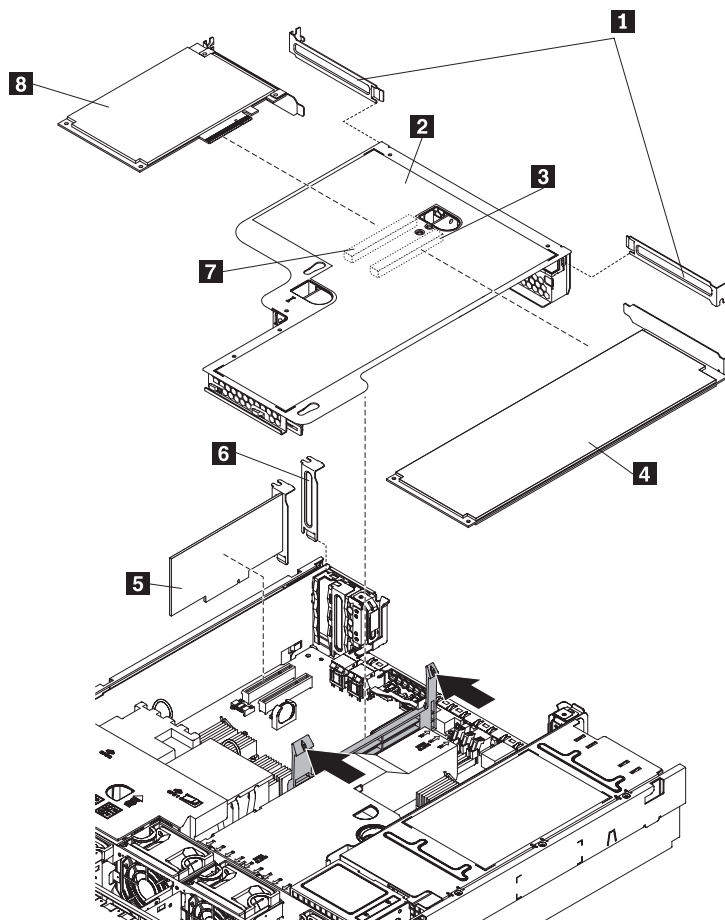
1	Expansion slot cover	**5**	Low-profile PCI Express adapter
2	Raiser-card assembly	**6**	Expansion slot cover
3	Expansion slot 1	**7**	Expansion slot 2
4	Adapter	**8**	Adapter

The following illustration shows the locations of the adapter expansion slots.
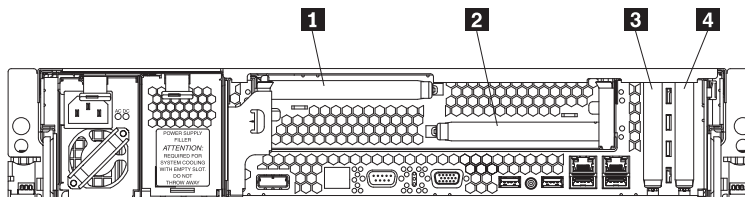
1	PCI slot 1	**3**	PCI slot 3
2	PCI slot 2	**4**	PCI slot 4

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

- You can install only low-profile PCI Express adapters in PCI slots 3 and 4 on the system board.

- You can install a full-height, half-length adapter in slot 2 on the PCI riser card and a full-height, full-length adapter in slot 1 on the PCI riser card.
- An optional Remote Supervisor Adapter II SlimLine can be installed only in a dedicated slot on the system board. To install a Remote Supervisor Adapter II SlimLine, see "Installing a Remote Supervisor Adapter II SlimLine" on page 27.
- The server supports only 3.3 V and universal PCI adapters.
- The PCI bus configuration is as follows:
  – Non-hot-plug, low-profile PCI Express x8 (x4 lanes), slot 4
  – Non-hot-plug, low-profile PCI Express x8 (x4 lanes), slot 3
  – Non-hot-plug, half-length PCI Express x8 (x8 lanes), slot 2
  – Non-hot-plug, full-length PCI Express x8 (x8 lanes), slot 1

  Note: If you have replaced the PCI Express riser-card assembly with the optional PCI-X riser-card assembly, slots 1 and 2 are non-hot-plug, 64-bit, 133-MHz PCI-X slots.
- The system scans devices in the following order, if you have not changed the default boot precedence: integrated Ethernet controllers, integrated SAS controller, and then PCI slots 1, 2, 3, and 4.

PCI riser card

The following illustration shows the location of the adapter expansion slots **1** on the PCI riser card.

Note: For clarity, the PCI riser-card assembly is inverted in the illustration.
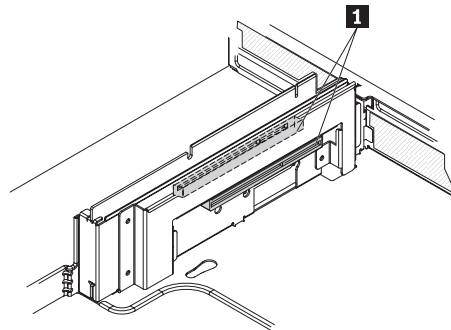
To install an adapter, complete the following steps:
1. Read the safety information that begins on page v and "Installation guidelines" on page 7.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables.
   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Determine which expansion slot you will use for the adapter. If you are installing an adapter in PCI slot 1 or 2, remove the PCI riser-card assembly.
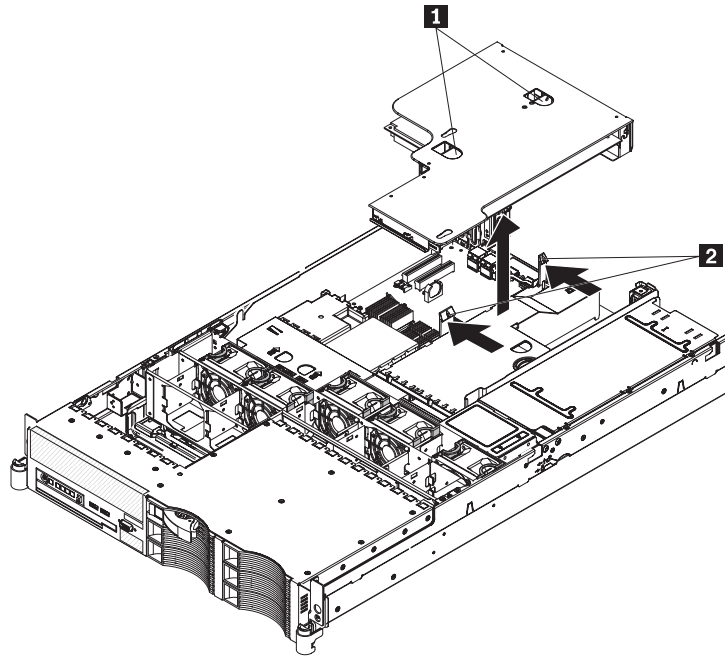
1	Access holes
2	Release tabs

4. Slide the expansion-slot cover out of the PCI low-profile expansion slot or PCI riser-card assembly expansion slot.

5. Install the adapter. The following illustration shows how to install an adapter in a PCI slot on the riser-card assembly.

   Note: For clarity, the PCI riser-card assembly **1** is shown inverted in the following illustration.
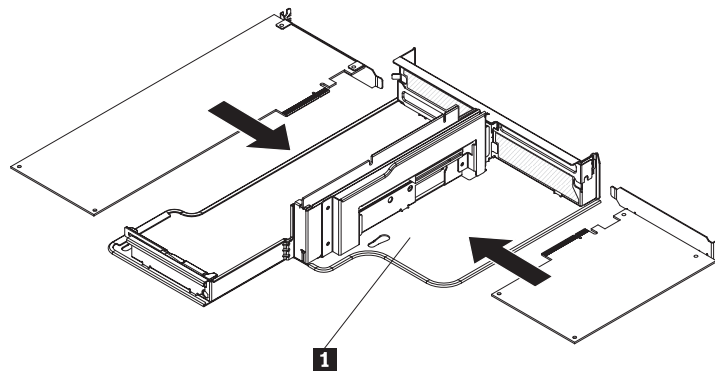
6. If you removed the PCI riser-card assembly to install the adapter, align the riser-card assembly with the release-tab posts, rear guides, and connector; then, press the PCI riser-card assembly *firmly* into the connector.
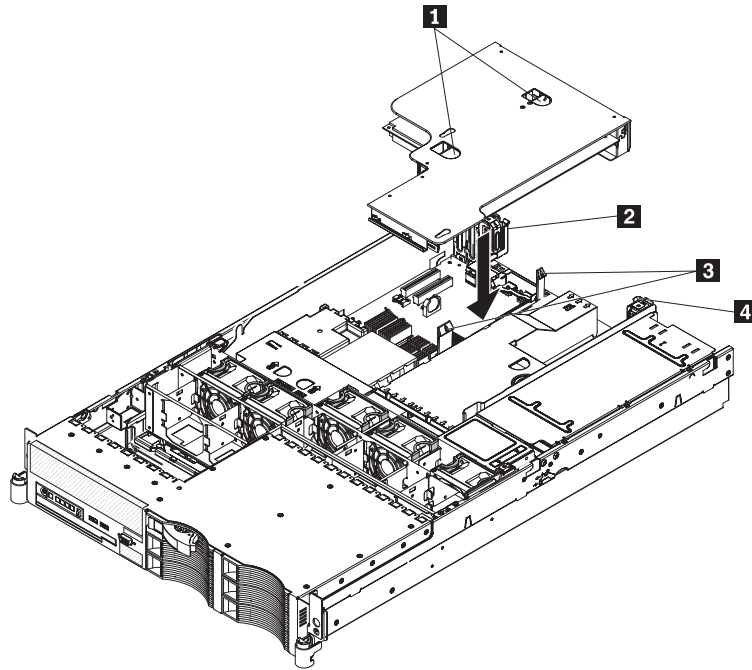
1	Hard disk drive cable connector 4 - 7	**4**	ServeRAID-MR10i SAS/SATA controller
2	Hard disk drive cable connector 0 - 3	**5**	Hard disk drive cable 4 - 7
3	Battery	**6**	Hard disk drive cable 0 - 3

7. Connect any required 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 assembly.

   • Make sure that cables are not pinched by the server components.

8. Perform any configuration tasks that are required for the adapter.

If you have other optional devices to install, do so now. Otherwise, go to "Completing the installation" on page 30.

Installing a Remote Supervisor Adapter II SlimLine

An optional Remote Supervisor Adapter II SlimLine can be installed only in a dedicated connector on the system board. After the Remote Supervisor Adapter II SlimLine is installed, the systems-management Ethernet port on the rear of the server is active.

Note: Earlier versions of the Remote Supervisor Adapter II SlimLine might not work in this server. See http://www.lenovo.com/support/ for information about which versions of the Remote Supervisor Adapter II SlimLine are supported.

The following illustration shows how to install a Remote Supervisor Adapter II SlimLine.
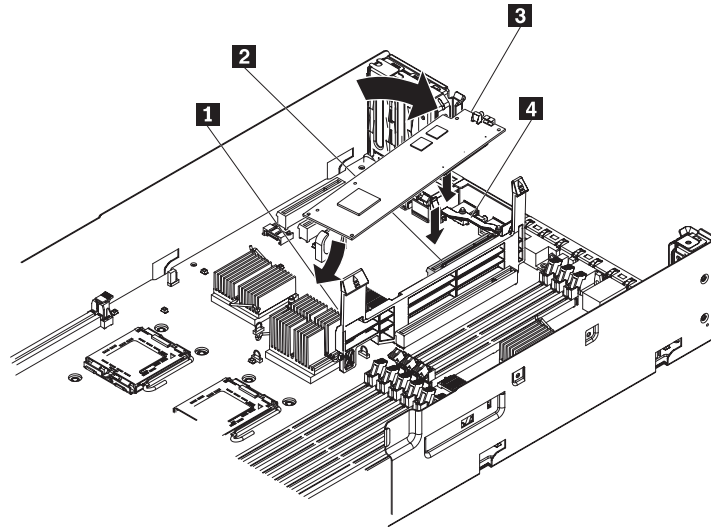
1	Retainer bracket	**3**	Remote Supervisor Adapter II SlimLine
2	Connector	**4**	Latch bracket

To install a Remote Supervisor Adapter II SlimLine, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 7.

2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Remove the cover.

4. Remove the PCI riser-card assembly.

5. Align the keys on the Remote Supervisor Adapter II SlimLine connector with the connector on the system board.

6. Slip the free end of the Remote Supervisor Adapter II SlimLine under the tab on the retainer bracket, aligning the holes in the adapter with the posts on the retainer bracket and latch bracket; then, press the adapter into the connector on the system board and make sure that all tabs on the latch bracket secure the adapter in place.

7. Replace the PCI riser-card assembly.

See the documentation that comes with the Remote Supervisor Adapter II SlimLine for information about installing the firmware and configuring the adapter. Create a backup copy of the configuration so that if you have to replace the adapter in the future, you can restore the configuration.

If you have other optional devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 30.

Replacing the ServeRAID SAS controller

A ServeRAID SAS controller can be installed only in a dedicated slot on the system board. The server comes with a ServeRAID-8k-I SAS Controller installed.

Note: The ServeRAID-8k-I SAS Controller does not have a battery.

To replace the ServeRAID-8k-I SAS Controller with a ServeRAID-8k SAS Controller, complete the following steps:

1. Read the safety information that begins on page v and the "Installation guidelines" on page 7.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see "Turning off the server" on page 39).

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see "Removing the cover" on page 9).
4. Remove the riser-card assembly and the air baffle over the DIMMs. See the *User Guide* for more information.
5. Locate the ServeRAID-8k-I SAS controller on the system board.

   Attention: To avoid breaking the retaining clips or damaging the connectors, handle the clips gently.
6. Open the retaining clip on each end of the connector.
7. Lift the ServeRAID-8k-I SAS controller out of the connector.
8. Touch the static-protective package that contains the new ServeRAID-8k SAS controller to any unpainted metal surface on the server. Then, remove the ServeRAID-8k SAS controller from the package.
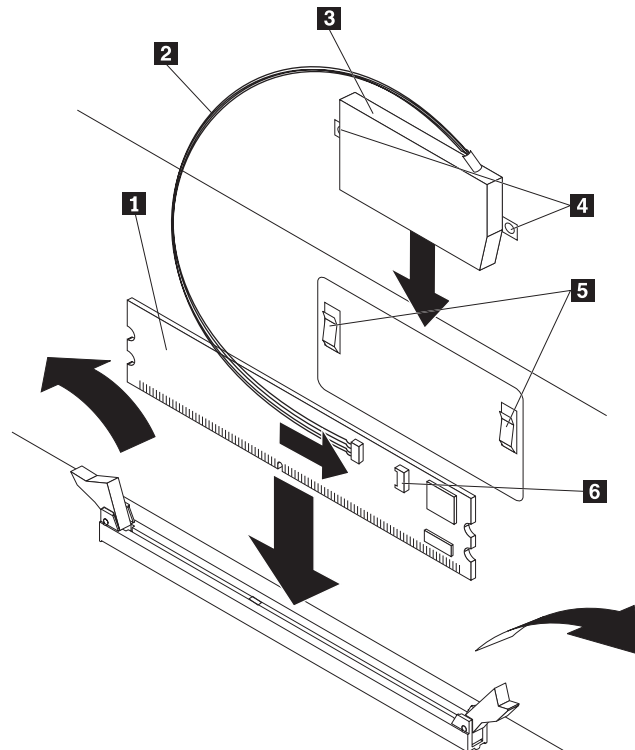
1	RAID controller	4	Battery mounting tabs
2	Battery cable	5	Battery mounting clips
3	Battery	6	Battery cable connector

9. Turn the new ServeRAID-8k SAS controller so that the keys on the bottom edge align correctly with the connector.

10. Firmly press the ServeRAID-8k SAS controller straight down into the connector by applying pressure on both ends of the controller simultaneously. The retaining clips snap into the locked position when the controller is firmly seated in the connector.

   Note: If there is a gap between the controller and the retaining clips, the controller has not been correctly installed. In this case, open the retaining clips and remove the controller; then, reinsert the controller.

11. Remove the battery from the ServeRAID-8k SAS Controller package.

12. Slide the battery mounting tabs into the battery mounting clips on the server wall that is next to the ServeRAID SAS controller connector.

13. Connect the battery to the ServeRAID-8k SAS Controller.

14. Replace the air baffle over the DIMMs. See the *User Guide* for more information.

15. Replace the riser-card assembly.

If you have other optional devices to install or remove, do so now. Otherwise, go to "Completing the installation."

Notes:

1. When you restart the server for the first time after you install a ServeRAID-8k SAS controller, the monitor screen remains blank while the controller initializes the battery. This might take a few minutes, after which the startup process continues. This is a one-time occurrence.

   Important: You must allow the initialization process to be completed. If you do not, the battery pack will not work, and the server might not start.

   The battery comes partially charged, at 30% or less of capacity. Run the server for 4 to 6 hours to fully charge the controller battery. The LED just above the battery on the controller remains lit until the battery is fully charged.

   Until the battery is fully charged, the controller firmware sets the controller cache to write-through mode; after the battery is fully charged, the controller firmware re-enables write-back mode.

2. When you restart the server, you will be given the opportunity to import the existing RAID configuration to the new ServeRAID SAS controller.

Completing the installation

To complete the installation, complete the following steps:

1. Install the cover. See "Installing the cover" on page 31 for more information.

2. Install the server in the rack cabinet. See the *Rack Installation Instructions* that come with the server for detailed information about how to install the server in a rack cabinet.

Attention:

- Install the server only in a rack cabinet that has perforated doors.
- Do not leave open space above or below an installed server in your rack cabinet. To help prevent damage to server components, always install a filler panel to cover the open space and to help ensure proper air circulation. See the documentation that comes with the rack cabinet for more information.

3. Connect the cables and power cords.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

   See "Connecting the cables" on page 31 for more information.

4. Update the server configuration. See "Updating the server configuration" on page 32 for more information.

Installing the cover

To install the cover, place it into position and slide it forward.
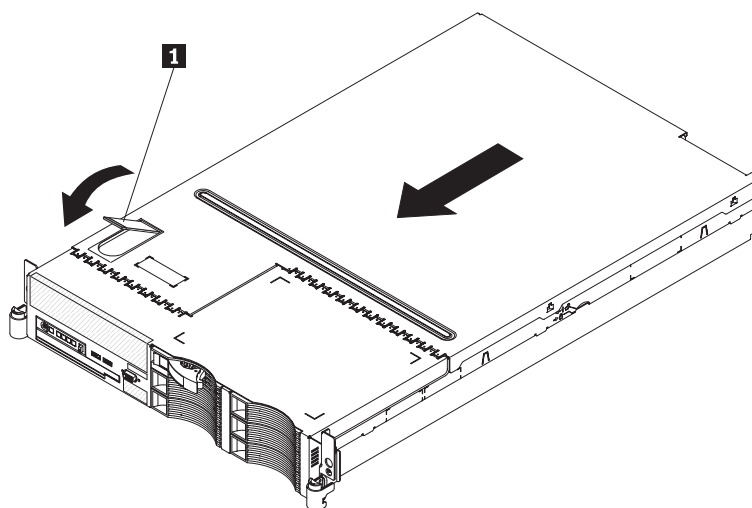
◾1	Cover-release latch

Connecting the cables

The following illustrations show the locations of the input and output connectors on the front and rear of the server.

Front view
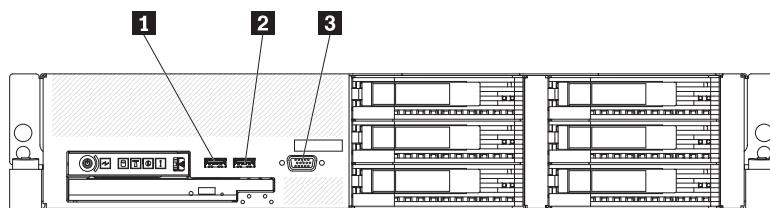
◾1	USB 5 connector	◾3	Video connector

2	USB 6 connector

Rear view
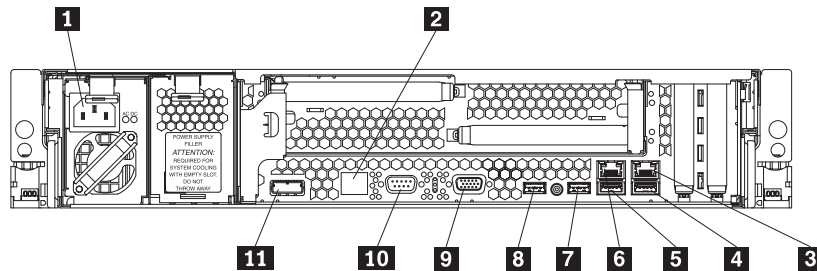
1	Power cord connector	**7**	USB connector 2
2	Systems-management Ethernet connector	**8**	USB connector 1
3	Ethernet connector	**9**	Video connector
4	USB connector 4	**10**	Serial connector
5	USB connector 3	**11**	SAS connector
6	Ethernet connector 2		

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply for instructions and an illustration of the dc power supply.

You must turn off the server before you connect or disconnect cables from the server.

See the documentation that comes with any external devices for additional cabling instructions. It might be easier for you to route cables before you connect the devices to the server.

Cable identifiers are printed on the cables that come with the server and optional devices. Use these identifiers to connect the cables to the correct connectors.

Updating the server configuration

When you start the server for the first time after you add or remove an internal optional device, external SAS device, or USB keyboard or mouse, 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 Chapter 4, "Configuring the server," on page 41.

Some optional devices have device drivers that you must install. See the documentation that comes with each optional device 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 operating-system documentation.

If you have installed or removed a hard disk drive, see "Using the RAID configuration programs" on page 44 for information about reconfiguring the disk arrays.

If you have installed a Remote Supervisor Adapter SlimLine to manage the server remotely, see the documentation comes with the adapter for information about setting up, configuring, and using the adapter.

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

Chapter 3. Server controls, LEDs, and power

This section 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, light-emitting diodes (LEDs), and connectors on the front of the 3.5-inch model server.
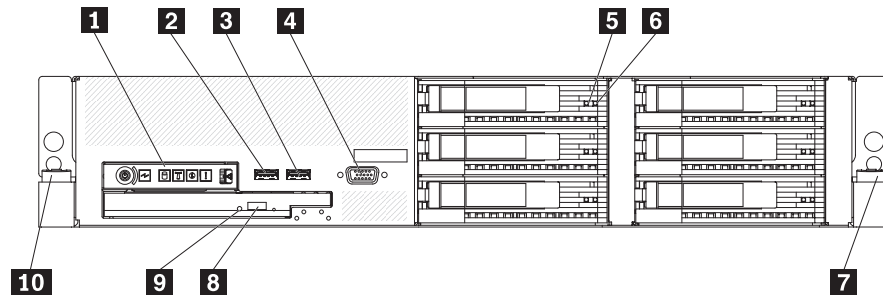
1	Operator information panel	**6**	Hard disk drive status LED (amber)
2	USB 5 connector	**7**	Rack release latch
3	USB 6 connector	**8**	CD/DVD eject button
4	Video connector	**9**	CD/DVD drive activity LED
5	Hard disk drive activity LED (green)	**10**	Rack release latch

The following illustration shows the controls, light-emitting diodes (LEDs), and connectors on the front of the 2.5-inch model server.
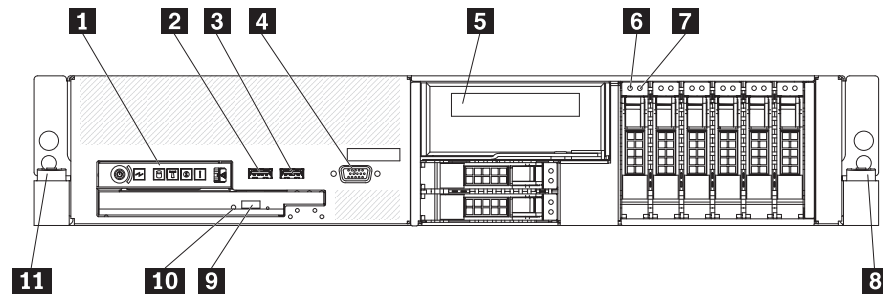
1	Operator information panel	**7**	Hard disk drive status LED (amber)
2	USB 5 connector	**8**	Rack release latch
3	USB 6 connector	**9**	CD/DVD eject button
4	Video connector	**10**	CD/DVD drive activity LED
5	Tape drive bay	**11**	Rack release latch
6	Hard disk drive activity LED (green)		

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

35
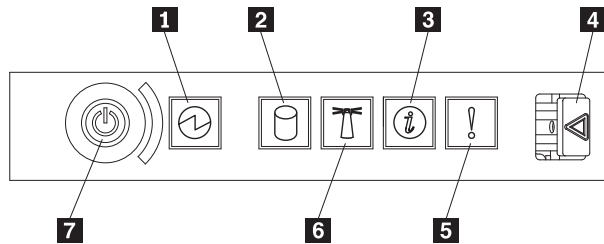
1	Power-on LED	**5**	System-error LED
2	Hard disk drive activity LED	**6**	System-locator LED
3	Information LED	**7**	Power-control button
4	Release latch		

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

- **Power-control button:** Press this button to turn the server on and off manually.
- **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 a power source. When this LED is off, it indicates that 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.

  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

- **Hard disk drive activity LED:** When this LED is flashing, it indicates that a hard disk drive is in use.
- **System-locator LED:** Use this LED to visually locate the server among other servers. You can use IBM Director to light this LED remotely.
- **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-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.
- **Release latch:** Slide this latch to the left to access the light path diagnostics panel, which is behind the operator information panel.

USB connectors: Connect a USB device, such as USB mouse, keyboard, or other USB device, to either of these connectors.

Video connector: Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.

Hard disk drive activity LED: 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. When this LED is flashing slowly (one flash per second), it indicates that the drive is

being rebuilt as part of a RAID configuration. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.

CD/DVD-eject button: Press this button to release a CD or DVD from the CD-RW/DVD drive.

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

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

Rear view

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

Attention: In a dc power environment, see the documentation that comes with the dc power supply for information about the power-supply LEDs.
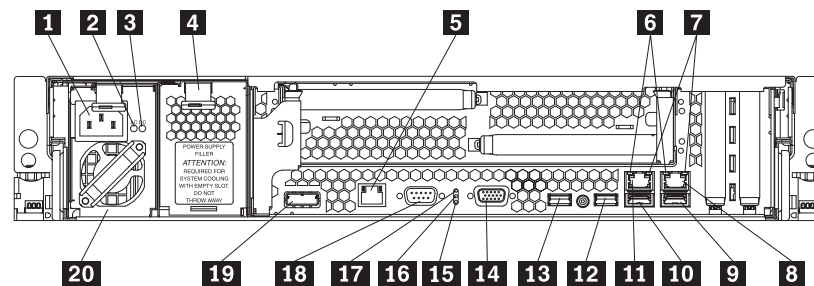
1	Power cord connector 1	**11**	Ethernet connector 2
2	AC power LED	**12**	USB connector 2
3	DC power LED	**13**	USB connector 1
4	Power supply filler panel	**14**	Video connector
5	Systems-management Ethernet connector	**15**	System-error LED
6	Ethernet activity LEDs	**16**	System-locator LED
7	Ethernet link LEDs	**17**	Power-on LED
8	Ethernet connector 1	**18**	Serial connector
9	USB connector 4	**19**	SAS connector
10	USB connector 3	**20**	Power supply 1

Power-cord connector (ac power supply only): Connect the power cord to this connector.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

AC power LED: Each hot-swap power supply has an ac power LED and a dc power LED. When the ac power LED is lit, it indicates that sufficient power is coming into the power supply through the power cord. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD.

DC power LED: Each hot-swap power supply has a dc power LED and an ac power LED. When the dc power LED is lit, it indicates that the power supply is

supplying adequate DC power to the system. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD.

Systems-management 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, and it is used only by the Remote Supervisor Adapter II SlimLine.

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.

Ethernet link 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 connectors: Use either of these connectors to connect the server to a network.

USB connectors: Connect a USB device, such as USB mouse, keyboard, or other USB device, to any of these connectors.

Video connector: Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.

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.

System-locator LED: Use this LED to visually locate the server among other servers.

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 a power source. When this LED is off, it indicates that power is not present, or the power supply or the LED itself has failed.

Serial connector: Connect a 9-pin serial device to this connector. The serial port is shared with the baseboard management controller (BMC). The BMC can take control of the shared serial port to perform text console redirection and to redirect serial traffic, using Serial over LAN (SOL).

SAS connector: Connect a serial-attached SCSI (SAS) device to this connector.

Server power features

When the server is connected to a power source but is not turned on, the operating system does not run, and all core logic except for the service processor (the baseboard management controller or optional Remote Supervisor Adapter II SlimLine) is shut down; however, the server can respond to requests from the service processor, such as a remote request to turn on the server. The power-on LED flashes to indicate that the server is connected to power but is not turned on.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Turning on the server

Approximately 5 seconds after the server is connected to power, the power-control button becomes active, and one or more fans might start running to provide cooling while the server is connected to power. 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 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 is unavailable to the operating system. The amount of memory that is reserved for system resources depends on the operating system, the configuration of the server, and the configured PCI options.

Turning off the server

When you turn off the server and leave it connected to power, the server can respond to requests from the service processor, such as a remote request to turn on the server. While the server remains connected to power, one or more fans might continue to run. To remove all power from the server, you must disconnect it from the power source.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

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.
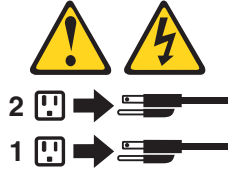
Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

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

Lenovo provides a number of programs to assist you with getting your server up and running quickly.

- ThinkServer EasyStartup program

  This program simplifies the process of installing the operating system and devices drivers. It is on the ThinkServer *ThinkServer EasyStartup* DVD provided with your server. For details, see "Using the ThinkServer EasyStartup program."

- Configuration/Setup Utility program

  This program enables you to configure hardware settings and preferences in the BIOS. For details, see "Using the Configuration/Setup Utility program" on page 43

- RAID configuration programs

  – Adaptec RAID (HOSTRaid) Configuration Utility program:

    This program is part of the BIOS code on models that have an integrated ServeRAID-8e (Adaptec HostRAID) controller.

  – LSI Configuration Utility

    This program is part of the BIOS code on models with an optional LSI storage controller with RAID capability.

- Broadcom Gigabit Ethernet Utility program:

  Use this program to configure the network as a startable (bootable) device or specify where the network startup option is displayed in the startup sequence. For additional information, see "Configuring the Gigabit Ethernet controllers" on page 43.

- Baseboard management controller SMBridge management utility program:

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

- ThinkServer EasyManage products

  ThinkServer EasyManage Core Server and ThinkServer EasyManage Remote Client work together to provide centralized hardware and software inventory management and secure automated system management through a single console. See "Using ThinkServer EasyManage products" on page 43.

For more information about these programs, see "Configuring the server" in the *User Guide* on the *ThinkServer Documentation* DVD.

Using the ThinkServer EasyStartup program

The ThinkServer EasyStartup program simplifies the process of installing the operating system and devices drivers by performing the following tasks:

- Detects installed hardware devices
- Guides you through the process of creating a response file
- Prepares the hard disk for installation
- Prompts you to insert the operating-system installation disc
- Initiates an unattended installation of the operating system and device drivers for most adapters and devices

The program is contained on the ThinkServer EasyUpdate disc provided with your server. If you did not receive an *ThinkServer EasyStartup* DVD with your server,

you can download an ISO image of the DVD from http://www.lenovo.com/support. The program has a built-in help system and User Guide to answer any questions you might have. The program also provides compatibility notes to help you determine what server configurations and operating systems are supported by that specific version of the program.

The ThinkServer EasyStartup program also enables you to save the response file on a USB device or diskette for reuse, and an option that enables you to install an operating systems using the saved response. This option is useful if you intend to install the same operating system on similarly configured ThinkServer servers.

Notes:

1. If you intend to implement a RAID, make sure your storage controller or RAID adapter is configured correctly before you use the ThinkServer EasyStartup program to install the operating system.

2. If you are using any external storage devices or fiber channels, use the utilities provided with the device. You also will have to provide the device drivers for these devices and install them after the EasyStartup program finishes installing the operating system.

3. The *ThinkServer EasyStartup* DVD requires that you have a DVD drive that is configured as your first device in the startup sequence. Use the Configuration/Setup Utility program to view or change your startup sequence. See "Using the Configuration/Setup Utility program" on page 43.

4. To install an operating system, you need the operating system installation disc (CD or DVD) and the associated product key, if one was provided.

To start the *ThinkServer EasyStartup* DVD, do the following:

1. Insert the *ThinkServer EasyStartup* DVD and restart the server. If the EasyStartup program does not start, see "EasyStartup problems" on page 64.

2. Follow the instructions on the screen and continue to the main interface.

3. When you arrive at the Home screen, do any of the following:

   • Click Compatibility notes to view detailed information about the operating systems and server configurations supported by that version of the EasyStartup program.

   • Click User Guide to view an overview of the various functions provided by that version of the EasyStartup program.

   • Click Hardware list to view a list of hardware detected by the ThinkServer EasyStartup program.

   • Click Install operating system to begin the process of creating a response file and installing the operating system. As part of this procedure you will be given the opportunity to include the ThinkServer EasyUpdate program and the ThinkServer EasyManage products (ThinkServer EasyManage Core Server or ThinkVantage EasyManage Remote Client) as part of the installation process. You also can provide one or more command-line based instructions to be run at the end of the operating system installation process. Click About to view version information and legal notices.

To use the *ThinkServer EasyStartup* DVD to install an operation system using a preexisting response file, do the following:

1. Insert the *ThinkServer EasyStartup* DVD and restart the server. If the EasyStartup program does not start, see "EasyStartup problems" on page 64.

2. Follow the instructions on the screen until you get to the Start option screen.

3. When the Start option screen is displayed, do the following:

a. Insert the USB device or diskette that contains the response file.

b. Select Install the operating system using a preexisting response file.

c. Click OK.

4. Follow the remaining instructions on the screen to complete the procedure.

Using ThinkServer EasyManage products

ThinkServer EasyManage Core Server provides centralized hardware and software inventory management and secure automated system management through a single console. The ThinkServer EasyManage Agent enables other computers and servers to be managed by the centralized console.

You can install the ThinkServer EasyManage Core Server program from the ThinkServer EasyManage CD or you can download and install the program from http://www.lenovo.com/support. After one instance of the ThinkServer EasyManage Core Server has been installed, you can use the ThinkServer EasyManage Agent installer to install the agent on other servers and clients on the network.

Also, the ThinkServer EasyStartup program provides an option to install these products as part of the operating system installation process.

Using the Configuration/Setup Utility program

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

- View configuration information
- View and change assignments for devices and I/O ports
- Set the date and time
- Set and change passwords
- Set and change the startup characteristics of the server and the order of startup devices (startup-drive sequence)
- Set and change settings for advanced hardware features
- View and clear the error log
- Change interrupt request (IRQ) settings
- Resolve configuration conflicts

To start the Configuration/Setup Utility program, complete the following steps:

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.

Configuring the Gigabit Ethernet controllers

The Ethernet controllers are integrated on the system board. They provide an interface for connecting to a 10 Mbps, 100 Mbps, or 1 Gbps network and provide full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet ports in the server support auto-negotiation, the controllers detect the data-transfer rate (10BASE-T, 100BASE-TX, or 1000BASE-T) and duplex mode (full-duplex or half-duplex) of the network and automatically operate at that rate and mode.

Note: The Ethernet controller for Ethernet connector 1 supports Serial over LAN (SOL).

You do not have to set any jumpers or configure the controllers. However, you must install a device driver to enable the operating system to address the controllers. For device drivers and information about configuring the Ethernet controllers, see the *Broadcom NetXtreme II Gigabit Ethernet Software* CD that comes with the server. To find updated information about configuring the controllers, complete the following steps.

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

1. Go to: http://www.lenovo.com/support.

2. Enter your product number (machine type and model number) or select **Servers** from the **Select your product** list.

3. Select **Servers** from the **Brand** list.

4. From **Family** list, select **ThinkServer RD120**, and click **Continue**.

Using the RAID configuration programs

Use the IBM ServeRAID Configuration Utility program and ServeRAID Manager to configure and manage redundant array of independent disks (RAID) arrays. Be sure to use these programs as described in this document.

- Use the IBM ServeRAID Configuration Utility program to:
  - Perform a low-level format on a hard disk drive
  - View or change IDs for attached devices
  - Set protocol parameters on hard disk drives
- Use ServeRAID Manager to:
  - Configure arrays
  - View the RAID configuration and associated devices
  - Monitor operation of the RAID controller

Consider the following information when using the IBM ServeRAID Configuration Utility program and ServeRAID Manager to configure and manage arrays:

- The ServeRAID-8k-l SAS controller that comes with the server supports only RAID level-0, level-1, and level-10. You can replace it with a ServeRAID-8k SAS controller that supports additional RAID levels.
- Hard disk drive capacities affect how you create arrays. The drives in an array can have different capacities, but the ServeRAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- To help ensure signal quality, do not mix drives with different speeds and data rates.
- To update the firmware and BIOS code for an optional ServeRAID SAS controller, you must use the IBM *ServeRAID Support* CD that comes with the ServeRAID option.

Using the IBM ServeRAID Configuration Utility program

Use the IBM ServeRAID Configuration Utility programs to perform the following tasks:

- Configure a redundant array of independent disks (RAID) array
- View or change the RAID configuration and associated devices

Starting the IBM ServeRAID Configuration Utility program

To start the IBM ServeRAID Configuration Utility program, complete the following steps:

1. Turn on the server.
2. When the prompt `<<< Press <CTRL><A> for IBM ServeRAID Configuration Utility! >>>` appears, press Ctrl+A. If you have set an administrator password, you are prompted to type the password.
3. To select a choice from the menu, use the arrow keys.
4. Use the arrow keys to select the channel for which you want to change settings.
5. To change the settings of the selected items, follow the instructions on the screen. Be sure to press Enter to save your changes.

IBM ServeRAID Configuration Utility menu choices

The following choices are on the IBM ServeRAID Configuration Utility menu:

- **Array Configuration Utility**

  Select this choice to create, manage, or delete arrays, or to initialize drives.

- **SerialSelect Utility**

  Select this choice to configure the controller interface definitions or to configure the physical transfer and SAS address of the selected drive.

- **Disk Utilities**

  Select this choice to format a disk or verify the disk media. Select a device from the list and read the instructions on the screen carefully before making a selection.

Using ServeRAID Manager

Use ServeRAID Manager, which is on the *IBM ServeRAID Support* CD, to perform the following tasks:

- Configure a redundant array of independent disks (RAID) array
- Erase all data from a hard disk drive and return the disk to the factory-default settings
- View the RAID configuration and associated devices
- Monitor the operation of the RAID controller

To perform some tasks, you can run ServeRAID Manager as an installed program. However, to configure the RAID controller and perform an initial RAID configuration on the server, you must run ServeRAID Manager in Startable CD mode, as described in the instructions in this section.

See the ServeRAID documentation on the *IBM ServeRAID Support* CD for additional information about RAID technology and instructions for using ServeRAID Manager to configure the RAID controller. Additional information about ServeRAID Manager is also available from the **Help** menu. For information about a specific object in the ServeRAID Manager tree, select the object and click **Actions --> Hints and tips**.

Configuring the RAID controller

By running ServeRAID Manager in Startable CD mode, you can configure the RAID controller before you install the operating system. The information in this section assumes that you are running ServeRAID Manager in Startable CD mode.

To run ServeRAID Manager in Startable CD mode, turn on the server; then, insert the CD into the CD-RW/DVD drive. If ServeRAID Manager detects an unconfigured controller and ready drives, the Configuration wizard starts.

In the Configuration wizard, you can select express configuration or custom configuration. Express configuration automatically configures the controller by grouping the first two physical drives in the ServeRAID Manager tree into an array and creating a RAID level-1 logical drive. If you select custom configuration, you can select the two physical drives that you want to group into an array and create a hot-spare drive.

Using express configuration: To use express configuration, complete the following steps:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Express configuration**.
3. Click Next.
4. In the "Configuration summary" window, review the information. To change the configuration, click **Modify arrays**.
5. Click **Apply**; when you are asked whether you want to apply the new configuration, click **Yes**. The configuration is saved in the controller and in the physical drives.
6. Exit from ServeRAID Manager and remove the CD from the CD-RW/DVD drive.
7. Restart the server.

Using custom configuration: To use custom configuration, complete the following steps:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Custom configuration**.
3. Click **Next**.
4. In the "Create arrays" window, from the list of ready drives, select the drives that you want to group into the array.
5. Click the (Add selected drives) icon to add the drives to the array.
6. If you want to configure a hot-spare drive, complete the following steps:
   a. Click the **Spares** tab.
   b. Select the physical drive that you want to designate as the hot-spare drive, and click the (Add selected drives) icon.
7. Click **Next**.
8. Review the information in the "Configuration summary" window. To change the configuration, click **Back**.
9. Click **Apply**; when you are asked whether you want to apply the new configuration, click **Yes**. The configuration is saved in the controller and in the physical drives.
10. Exit from ServeRAID Manager and remove the CD from the CD-RW/DVD drive.
11. Restart the server.

Viewing the configuration

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

drives). When you click an object in the ServeRAID Manager tree, information about that object appears in the right pane. To display a list of available actions for an object, click the object and click **Actions**.

Using the baseboard management controller

The baseboard management controller provides basic service-processor environmental monitoring functions for the server. If an environmental condition exceeds a threshold or if a system component fails, the baseboard management controller lights LEDs to help you diagnose the problem and also records the error in the BMC system event 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 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 Telnet client application can access the SOL connection.

Important: The server Ethernet ports are set to DHCP by default. In order to find your BMC on an existing network, you will need to identify the server by the default hostname. The default hostname for each server is the last 8 characters of the BMC MAC address. The BMC MAC address can be found in the setup utility, on a label on the system board, and on a tag hanging from the front of the server. Once you have deployed your server, make sure that you remove the BMC MAC address tag from the front of the server so that it does not impede airflow through the front of the server.

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; update and configure the baseboard management controller (BMC) firmware; update and configure the Ethernet controller firmware; and enable the operating system for an SOL connection.

BIOS update and configuration

To update and configure the BIOS code to enable SOL, complete the following steps:

1. Update the BIOS code:

    a. Download the latest version of the BIOS code from http://www.lenovo.com/support/.

    b. Update the BIOS code, following the instructions that come with the update file that you downloaded.

2. Update the BMC firmware:

a. Download the latest version of the BMC firmware from http://www.lenovo.com/support/.

b. Update the BMC firmware, following the instructions that come with the update file that you downloaded.

3. Configure the BIOS settings:

   a. When you are prompted to start the Configuration/Setup Utility program, restart the server and press F1.

   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 or higher
      - **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.

   e. Select **Advanced Setup**; then, select **Baseboard Management Controller (BMC) Settings**.

   f. Set **BMC Serial Port Access Mode** to **Dedicated**.

   g. Press Esc twice to exit the **Baseboard Management Controller (BMC) Settings** and **Advanced Setup** sections of the Configuration/Setup Utility program.

   h. Select **Save Settings**; then, press Enter.

   i. Press Enter to confirm.

   j. Select **Exit Setup**; then, press Enter.

   k. 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 4 configuration:

Note: This procedure is based on a default installation of Red Hat Enterprise Linux ES 4. The file names, structures, and commands might be different for other versions of Red Hat Linux.

To configure the general Linux parameters for SOL operation when you are using the Red Hat Enterprise Linux ES 4 operating system, complete the following steps.

Note: Hardware flow control prevents character loss during communication over a serial connection. You must enable it when you are 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:

   `ttyS0`

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

1. Modify the /etc/lilo.conf file:

   a. Add the following text to the end of the first `default=linux` line

      `-Monitor`

   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.

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

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

   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 you complete these procedures for the changes to take effect and to enable SOL.

SUSE SLES 9.0 configuration:

Note: This procedure is based on a default installation of SUSE Linux Enterprise Server (SLES) 9.0. The file names, structures, and commands might be different for other versions of SUSE Linux.

To configure the general Linux parameters for SOL operation when using the SLES 9.0 operating system, complete the following steps.

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:

   `ttyS0`

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=tty0`

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

`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`
`  kernal (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`
	
	1
	
	1

Note 1: The kernel line is shown with a line break. In your file, the entire entry must all be on one line.	

Modified /boot/grub/menu.lst contents	Notes

`#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`
	
	1

Modified /boot/grub/menu.lst contents	Notes

``
  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
``
	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 you complete 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.

To configure the Windows 2003 operating system for SOL operation, complete the following steps. 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 COM1 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 `COM1` 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.

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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
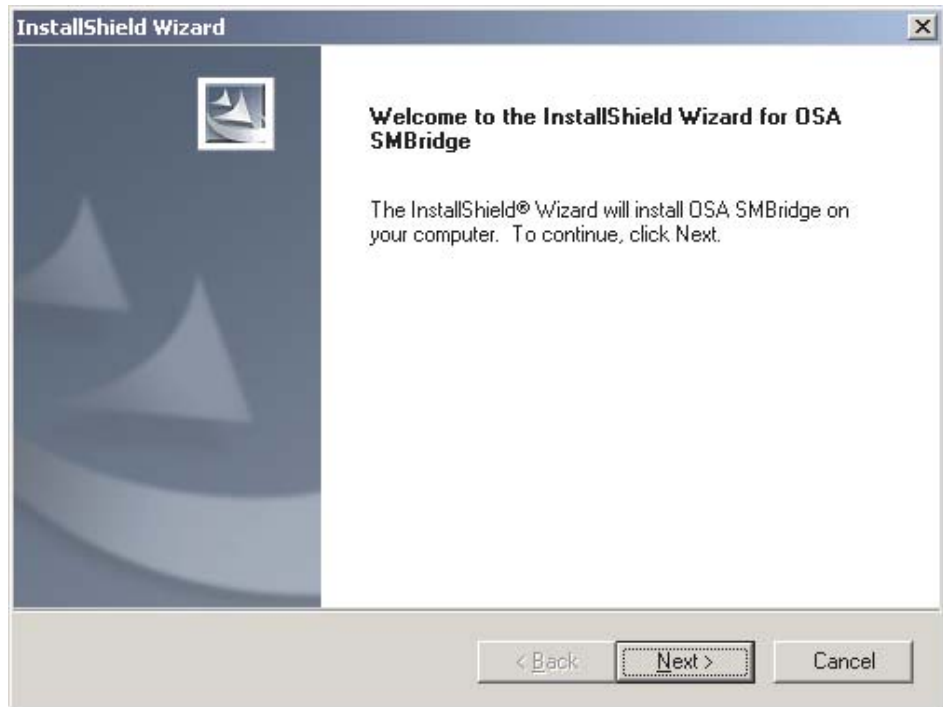OS Load Options: /fastdetect /redirect
``` |

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

Installing the OSA SMBridge management utility program

Important: To obtain maximum benefit from the OSA SMBridge management utility program, install and load the program *before* problems occur.

To install the OSA SMBridge management utility program on a server running a Windows operating system, complete the following steps:

1. Go to http://www.lenovo.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.

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

1. Go to http://www.lenovo.com/support/. 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 -ivh smbridge-2.0-xx.rpm`

   where *xx* is the release level being installed.

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
   /usr/sbin/smbridged
   /var/log/smbridge/Liscense.txt
   /var/log/smbridge/Readme.txt

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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.

Note: You must attach an optional USB diskette drive to the server to run this program.

To start the baseboard management controller configuration utility program, complete the following steps:

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

Note: To ensure proper server operation, be sure to update the server baseboard management controller firmware before you update 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 BMC system event 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 BMC system event 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 `telnet 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 BMC system event log.

  – **sol**

    Configure the SOL function.

  – **sysinfo**

    Display system information that is related to the server and the globally unique identifier (GUID).

Chapter 5. 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 chapter, see Appendix A, "Getting help and technical assistance," on page 81, the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD.

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 codes" and the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD for more information.

- *Diagnostics* **DVD**

    The *Diagnostics* DVD provided with your server contains the diagnostic programs for testing the major components of the server. For additional information about the *Diagnostics* DVD, see the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD.

- **Troubleshooting tables**

    These tables list problem symptoms and steps to correct the problems. See "Troubleshooting tables" on page 65 for more information.

- **Diagnostic programs and error messages**

    The system diagnostic programs are provided in ROM. These programs test the major components of the server. See the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD

- **Light path diagnostics**

    Use light path diagnostics to diagnose system errors quickly. See "Light path diagnostics" on page 77 for more information.

POST beep codes

POST emits one beep to signal successful completion. If POST detects a problem during startup, other beep codes might occur. Use the following beep code descriptions to help diagnose and solve problems that are detected during startup.

Note: See the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD 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

See the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD for information about other beep codes.

POST error codes

The following table provides an abbreviated list of the error codes that might appear during POST. See the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD for more information about the POST error codes. To check for updated technical information, complete the following steps.

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

1. Go to: http://www.lenovo.com/support.
2. Enter your product number (machine type and model number) or select **Servers** from the **Select your product** list.
3. Select **Servers** from the **Brand** list.
4. From **Family** list, select **ThinkServer RD120**, and click **Continue**.
5. Click **User's guides and manuals** for documentation.

Table 7. Abbreviated list of POST error messages

POST message	Failing device or problem found	Suggested action
161	The real-time clock battery has failed.	1. Reseat the battery. 2. Replace the battery or call for service.
162	A device configuration has changed.	• Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. • Make sure that optional devices are turned on and installed correctly.
163	The time of day has not been set.	Run the Configuration/Setup Utility program and 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.
1810	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.
1962	POST could not find an operating system.	Install an operating system.
00019*xxx*	Microprocessor *x* is not functioning or failed the built-in self-test.	Make sure that microprocessor *x* is installed correctly. (Trained service technician only) If the problem remains, replace microprocessor *x*.
012980*xx* 012981*xx*	Data for microprocessor *x*	Download and install the latest level of BIOS code.

EasyStartup problems

Table 8. ThinkServer EasyStartup DVD

• **Follow the suggested actions in the order in which they are listed in the Action Column until the problem is resolved.**	
• **See the** *Hardware Maintenance Manual* **on the** *ThinkServer Documentation* **DVD to determine which components are customer replaceable units (CRU's) and which fields are field replaceable units (FRU's).**	
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	

Symptom	Action
The *ThinkServer EasyStartup* DVD will not start.	• Make sure that the server supports the EasyStartup program and has a startable (bootable) CD or DVD drive. • If the startup (boot) sequence settings have been changed, make sure that the CD or DVD drive is first in the startup sequence. • If more than one CD or DVD drive is installed, make sure that only one drive is set as the primary drive. Start the CD from the primary drive.
The ServeRAID Manager program cannot view all installed drives, or the operating system cannot be installed.	• Make sure that the hard disk drive is connected correctly. • Make sure that the SAS hard disk drive cables are securely connected.
The operating-system installation program continuously loops.	Make more space available on the hard disk.
The EasyStartup program will not start the operating-system media.	Make sure that the operating-system media is supported by the EasyStartup program. See the Lenovo Support Web site for a list of supported operating-system versions.
The operating system cannot be installed; the option is not available.	Make sure that the server supports the operating-system. If it does, either no logical drive is defined (RAID servers), or the EasyStartup program is not installed. Run the EasyStartup program and make sure that setup is complete.

Troubleshooting tables

Use the troubleshooting tables to find solutions to problems that have identifiable symptoms. See the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD for more detailed troubleshooting information. If you cannot find the problem in these tables, run the diagnostic programs (see "Running the diagnostic programs" in the *Hardware Maintenance Manual*).

If you have just added new software or a new optional device and the server is not working, complete the following steps before using the troubleshooting tables:

1. Check the light path diagnostics LEDs on the operator information panel (see "Light path diagnostics" on page 77).
2. Remove the software or device that you just added.
3. Run the diagnostic tests to determine whether the server is running correctly.
4. Reinstall the new software or new device.

CD-RW/DVD drive problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

The CD-RW/DVD drive is not recognized.	1. Make sure that:
	• The IDE channel to which the CD-RW/DVD drive is attached (primary) is enabled in the Configuration/Setup Utility program.
	• All cables and jumpers are installed correctly.
	• The signal cable and connector are not damaged and the connector pins are not bent.
	• All damaged parts are repaired or replaced.
	• The correct device driver is installed for the CD-RW/DVD drive.
	2. Run the CD-RW/DVD drive diagnostic programs.
	3. Reseat the following components:
	  a. CD-RW/DVD drive
	  b. IDE/Ultrabay Enhanced (UBE) interposer card cable
	4. Replace the components listed in step 3 one at a time, in the order shown, restarting the server each time.

The CD-RW/DVD drive is not working correctly.	1. Clean the CD or DVD. 2. Run the CD-RW/DVD drive diagnostic programs. 3. Check the connector and signal cable for bent pins or damage. 4. Replace any damaged parts. 5. Reseat the CD-RW/DVD drive. 6. Replace the CD-RW/DVD drive.

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
• **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The CD-RW/DVD drive tray is not working.	1. Make sure that the server is turned on. 2. Insert the end of a straightened paper clip into the manual tray-release opening. 3. Reseat the CD-RW/DVD drive. 4. Replace the CD-RW/DVD drive.

General problems

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
• **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
A cover lock is broken, an LED is not working, or a similar problem has occurred.	If the part is a CRU, replace it. If the part is a FRU, the part must be replaced by a trained service technician.

Hard disk drive problems

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
• **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
Not all drives are recognized by the hard disk drive diagnostic test (the Fixed Disk test).	Remove the drive that is indicated by the diagnostic tests; then, run the hard disk drive diagnostic test again. 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.	Remove the hard disk drive that was being tested when the server stopped responding, and run the diagnostic test again. If the hard disk drive diagnostic test runs successfully, replace the drive that you removed with a new one.
A hard disk drive was not detected while the operating system was being started.	Reseat all hard disk drives and cables; then, run the hard disk drive diagnostic tests again.
A hard disk drive passes the diagnostic Fixed Disk Test, but the problem remains.	Run the diagnostic SCSI Attached Disk Test.

Intermittent problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
A problem occurs only occasionally and is difficult to diagnose.	1. Make sure that: • All cables and cords are connected securely to the rear of the server and attached devices. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. • When the server is turned on, air is flowing from the fan grille. If there is no airflow, the fans are not working. This can cause the server to overheat and shut down. 2. Check the system event/error log or BMC system event log (see "Error Logs" in the *Hardware Maintenance Manual*).
The server resets (restarts) occasionally	1. If the reset occurs during POST and the POST watchdog timer is enabled (click **Advanced Setup --> Baseboard Management Controller (BMC) Setting --> BMC Post Watchdog** in the Configuration/Setup Utility program to see the POST watchdog setting), make sure that sufficient time is allowed in the watchdog timeout value (**BMC POST Watchdog Timeout**). See the *User Guide* for information about the settings in the Configuration/Setup Utility program. If the server continues to reset during POST, see the "POST" and "Diagnostic programs" sections in the *Hardware Maintenance Manual*. 2. If the reset occurs after the operating system starts, disable any automatic server restart (ASR) utilities, such as the IBM Automatic Server Restart IPMI Application for Windows, or ASR devices that may be installed. **Note:** ASR utilities operate as operating-system utilities and are related to the IPMI device driver. If the reset continues to occur after the operating system starts, the operating system might have a problem; see "Software problems" on page 76. 3. If neither condition applies, check the system event/error log or BMC system event log (see "Error Logs" in the *Hardware Maintenance Manual*).

USB keyboard, mouse, or pointing-device problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

All or some keys on the keyboard do not work.	1. If you have installed a USB keyboard, run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup.
	2. See http://www.lenovo.com/accessories for keyboard compatibility.
	3. Make sure that:
	  • The keyboard cable is securely connected.
	  • The server and the monitor are turned on.
	4. Move the keyboard cable to a different USB connector.
	5. Replace the following components one at a time, in the order shown, restarting the server each time:
	  a. Keyboard
	  b. (Only if the problem occurred with a front USB connector) Internal USB cable
	  c. (Trained service technician only) System board

The USB mouse or USB pointing device does not work.	1. Make sure that:
	  • The mouse is compatible with the server. See http://www.lenovo.com/accessories.
	  • The mouse or pointing-device USB cable is securely connected to the server, and the device drivers are installed correctly.
	  • The server and the monitor are turned on.
	2. If a USB hub is in use, disconnect the USB device from the hub and connect it directly to the server.
	3. Move the mouse or pointing device cable to another USB connector.
	4. Replace the following components one at a time, in the order shown, restarting the server each time:
	  a. Mouse or pointing device
	  b. (Only if the problem occurred with a front USB connector) Internal USB cable
	  c. (Trained service technician only) System board

Memory problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The amount of system memory that is displayed is less than the amount of installed physical memory.	1. Make sure that: • No error LEDs are lit on the operator information panel. • Memory mirroring or memory sparing does not account for the discrepancy. • The memory modules are seated correctly. • You have installed the correct type of memory (see "Installing a memory module" on page 10). • 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. 2. Check the POST error log for error message 289: • If a DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. • If a DIMM was disabled by the user or by POST, run the Configuration/Setup Utility program and enable the DIMM. 3. Run memory diagnostics (see "Running the diagnostic programs" in the *Hardware Maintenance Manual*). 4. Make sure that there is no memory mismatch when the server is at the minimum memory configuration (two 512 MB DIMMs). 5. Add one pair of DIMMs at a time, making sure that the DIMMs in each pair are matching. Install the DIMMs in the sequence that is described in "Installing a memory module" on page 10. 6. Reseat the DIMMs. 7. Replace the following components one at a time, in the order shown, restarting the server each time: a. DIMMs b. (Trained service technician only) System board
Multiple rows of DIMMs in a branch are identified as failing.	1. Reseat the DIMMs; then, restart the server. 2. Replace the lowest-numbered DIMM pair of those that are identified; then, restart the server. Repeat as necessary. 3. (Trained service technician only) Replace the system board.

Microprocessor problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

The server emits a continuous beep during POST, indicating that the microprocessor is not working correctly.	1. Correct any errors that are indicated by the LEDs (see "Light path diagnostics LEDs" in the *Hardware Maintenance Manual*).
	2. Make sure that the server supports all the microprocessors and that the microprocessors match in speed and cache size.
	3. (Trained service technician only) Make sure that microprocessor 1 is seated correctly.
	4. Reseat the following components:
	   a. (Trained service technician only) Microprocessors
	   b. VRM, if microprocessor 2 is installed
	5. (Trained service technician only) Replace the microprocessors.

Monitor problems

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

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

Testing the monitor	1. Make sure that the monitor cables are firmly connected.
	2. Try using the other video port.
	3. Try using a different monitor on the server, or try testing the monitor on a different server.
	4. Run the diagnostic programs (see the *Hardware Maintenance Manual*). If the monitor passes the diagnostic programs, the problem might be a video device driver.
	5. Reseat the Remote Supervisor Adapter II SlimLine (if one is present).
	6. Replace the following components one at a time, in the order shown, restarting the server each time:
	  a. Remote Supervisor Adapter II SlimLine (if one is present)
	  b. (Trained service technician only) System board

The screen is blank.	1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server.
	2. Make sure that:
	  • The server is turned on. If there is no power to the server, see "Power problems" on page 73.
	  • The monitor cables are connected correctly.
	  • The monitor is turned on and the brightness and contrast controls are adjusted correctly.
	  • No beep codes sound when the server is turned on.
	
	  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** option in the **Start Options** of the Configuration/Setup Utility program is enabled, you must restart the server three times to reset the configuration settings to the default configuration (the memory connector or bank of connectors enabled).
	3. Make sure that the correct server is controlling the monitor, if applicable.
	4. Make sure that damaged BIOS code is not affecting the video; see the *Hardware Maintenance Manual* for information about recovering from a BIOS failure.
	5. See the *Hardware Maintenance Manual* for information about solving undetermined problems.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

The monitor works when you turn on the server, but the screen goes blank when you start some application programs.	1. Make sure that:
	   • The application program is not setting a display mode that is higher than the capability of the monitor.
	   • You installed the necessary device drivers for the application.
	2. Run video diagnostics (see the *Hardware Maintenance Manual* for information about running the diagnostic programs).
	   • If the server passes the video diagnostics, the video is good; see the *Hardware Maintenance Manual* for information about solving undetermined problems.

The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.	1. 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.
	Attention: Moving a color monitor while it is turned on might cause screen discoloration.
	Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor.
	Notes:
	   a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.).
	   b. Non-Lenovo monitor cables might cause unpredictable problems.
	2. Reseat the following components:
	   a. Monitor cable
	   b. Remote Supervisor Adapter II SlimLine (if one is present)
	3. Replace the following components one at a time, in the order shown, restarting the server each time:
	   a. Monitor cable
	   b. Monitor
	   c. Remote Supervisor Adapter II SlimLine (if one is present)
	   d. (Trained service technician only) System board

Wrong characters appear on the screen.	1. If the wrong language is displayed, update the BIOS code with the correct language.
	2. Reseat the monitor cable.
	3. Replace the following components one at a time, in the order shown, restarting the server each time:
	   a. Monitor
	   b. (Trained service technician only) System board

Optional-device problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

An Lenovo optional device that was just installed does not work.	1. Make sure that:
	  • The device is designed for the server (see http://www.lenovo.com/support/).
	  • You followed the installation instructions that came with the device and the device is installed correctly.
	  • You have not loosened any other installed devices or cables.
	    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
	  • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or any other device is changed, you must update the configuration.
	2. Reseat the device that you just installed.
	3. Replace the device that you just installed.

An Lenovo optional device that used to work does not work now.	1. Make sure that all of the hardware and cable connections for the device are secure. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 2. If the device comes with test instructions, use those instructions to test the device. 3. Reseat the failing device. 4. Follow the instructions for device maintenance, such as keeping the heads clean, and troubleshooting in the documentation that comes with the device. 5. Replace the failing device.

Power problems

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The power-control button does not work, and the reset button does work (the server does not start). **Note:** The power-control button will not function until 20 seconds after the server has been connected to power.	1. Make sure that: • The power cords are correctly connected to the server and to a working power source. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. • The type of memory that is installed is correct. • The LEDs on the power supply do not indicate a problem. • The microprocessors are installed in the correct sequence. 2. Make sure that the power-control button and the reset button are working correctly: **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. a. Disconnect the server power cords. b. Reseat the operator information panel assembly cable. c. Reconnect the power cords. d. Press the power-control button to restart the server. If the button does not work, replace the operator information panel assembly. e. Press the reset button (on the light path diagnostics panel) to restart the server. If the button does not work, replace the operator information panel assembly. 3. If you just installed an optional device, remove it, and restart the server. If the server now starts, you might have installed more devices than the power supply supports. 4. Reseat the power backplane and restart the server. 5. Replace the power backplane and restart the server. 6. Replace the following components one at a time, in the order shown, restarting the server each time: a. Power supplies **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install the dc power supply. See the documentation that comes with each dc power supply. b. (Trained service technician only) System board 7. See "Solving power problems" and "Solving undetermined problems" in the *Hardware Maintenance Manual*.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The server does not turn off.	1. Turn off the server by pressing the power-control button for 5 seconds. 2. Restart the server. 3. If the server fails POST and the power-control button does not work, disconnect the power cord for 20 seconds; then, reconnect the power cord and restart the server. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 4. If the problem remains, suspect the system board.
The OVER SPEC LED on the light path diagnostics panel is lit, and the one of the power channel LEDs on the system board is lit.	See the power troubleshooting table in the *Hardware Maintenance Manual* or call for service.
The server unexpectedly shuts down, and the LEDs on the operator information panel are not lit.	See "Solving undetermined problems" in the *Hardware Maintenance Manual*.

Serial port problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

The number of serial ports that are identified by the operating system is less than the number of installed serial ports.	1. Make sure that:
	  • 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 one is present) is seated correctly.
	2. Reseat the serial port adapter, if one is present.
	3. Replace the serial port adapter, if one is present.

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**	
• **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**	
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	

Symptom	Action

A serial device does not work.	1. Make sure that:
	   • The device is compatible with the server.
	   • The serial port is enabled and is assigned a unique address.
	   • The device is connected to the correct connector (see "Rear view" on page 37).
	
	2. Reseat the following components:
	   a. Failing serial device
	   b. Serial cable
	   c. Remote Supervisor Adapter II SlimLine (if one is present)
	
	3. Replace the following components one at a time, in the order shown, restarting the server each time:
	   a. Failing serial device
	   b. Serial cable
	   c. Remote Supervisor Adapter II SlimLine (if one is present)
	   d. (Trained service technician only) System board

Software problems

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**	
• **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**	
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	

Symptom	Action

You suspect a software problem.	1. To determine whether the problem is caused by the software, make sure that:
	   • The server has the minimum memory that is 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.
	
	2. 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.
	
	3. Contact your place of purchase of the software.

Universal Serial Bus (USB) port problems

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**	
• **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**	
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	

Symptom	Action

A USB device does not work.	1. Make sure that:
	  • The correct USB device driver is installed.
	  • The operating system supports USB devices.
	
	2. Make sure that the USB configuration options are set correctly in the Configuration/Setup Utility program menu (see the *User Guide* for more information).
	
	3. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the server.
	
	4. Move the device cable to a different USB connector.

Video problems

See "Monitor problems" on page 71.

Light path diagnostics

Use light path diagnostics to diagnose system errors. The light path diagnostics panel is behind the operator information panel, on the left front of the server. To access the light path diagnostics panel, slide the release latch on the front of the operator information panel to the left.

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 to place the server 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 a 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 operator information panel 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 describes the LEDs on the light path diagnostics panel, the problems that they indicate, and actions to solve the problems.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

LED	Description	Action
None, but the system-error LED is lit.	An error has occurred and cannot be diagnosed, or the Advanced System Management (ASM) processor on the Remote Supervisor Adapter II SlimLine has failed. The error is not represented by a light path diagnostics LED.	Use the Configuration/Setup Utility program to check the system-error log for information about the error.
OVER SPEC	The power supplies are using more power than their maximum rating.	1. Remove optional devices from the server. 2. Replace the failing power supply. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply.
PS 1	The power supply in bay 1 has failed.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply. 1. Make sure that the power supply is correctly seated. 2. Replace the failed power supply.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

LED	Description	Action
PS 2	The power supply in bay 2 has failed.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply. 1. Make sure that the power supply is correctly seated. 2. Replace the failed power supply.
CPU	A microprocessor has failed.	1. Make sure that the failing microprocessor, which is indicated by a lit LED on the system board, is installed correctly. See the *User Guide* on the *ThinkServer Documentation* DVD for information about installing a microprocessor. 2. Call for service.
VRM	An error occurred on the microprocessor voltage regulator module (VRM).	1. Replace the VRM. 2. Call for service.
CNFG	A hardware configuration error has occurred.	1. Check the microprocessors that were just installed to make sure that they are compatible with each other and with the VRM (see "Installing an additional microprocessor" on page 18 for compatiblity requirements). 2. (Trained service technician only) Replace an incompatible microprocessor. 3. Check the system error logs for information about the error. Replace any components that are indicated. (Use the Configuration/Setup Utility program to view the error logs.)
MEM	A memory error has occurred.	Replace the failing DIMM, which is indicated by the lit LED on the system board.
NMI	A machine check error has occurred.	Check the system-error log for information about the error. (Use the Configuration/Setup Utility program to view the error logs.)
S ERR	Reserved.	
SP	The service processor has failed.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 1. Remove power from the server; then, reconnect the server to power and restart the server. 2. Update the firmware on the BMC. 3. If a Remote Supervisor Adapter II SlimLine is installed, update the firmware; if the problem remains, replace the adapter. 4. Call for service
DASD	A hard disk drive error has occurred.	1. Check the LEDs on the hard disk drives and replace the indicated drive. 2. Call for service.

Chapter 5. Solving problems **79**

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

LED	Description	Action
RAID	A RAID controller error has occurred.	1. Make sure that a RAID controller is installed. **Note:** The server will not start without a RAID controller installed. 2. Check the system-error log for information about the error. (Use the Configuration/Setup Utility program to view the error logs.)
FAN	A fan has failed, is operating too slowly, or has been removed. The TEMP LED might also be lit.	Replace the failing fan, which is indicated by a lit LED on the fan itself.
TEMP	The system temperature has exceeded a threshold level. A failing fan can cause the TEMP LED to be lit.	1. Determine whether a fan has failed. If it has, replace it. 2. Make sure that the room temperature is not too high. See "Features and specifications" on page 3 for temperature information. 3. Make sure that the air vents are not blocked. 4. Call for service.
BRD	An error has occurred on the system board.	1. Check the LEDs on the system board to identify the component that is causing the error. 2. Check the system-error log for information about the error. (Use the Configuration/Setup Utility program to view the error logs.)
PCI	An error has occurred on a PCI bus or on the system board. An additional LED will be lit next to a failing PCI slot.	1. Check the LEDs on the PCI slots to identify the component that is causing the error. 2. Check the system-error log for information about the error. (Use the Configuration/Setup Utility program to view the error logs.) 3. If you cannot isolate the failing adapter through the LEDs and 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. 4. Call for service.

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you. This section contains information about where to go for additional information about Lenovo and Lenovo products, what to do if you experience a problem with your system, and whom to call for service, if it is necessary.

Before you call

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

* Check all cables to make sure that they are connected.
* Check the power switches to make sure that the system 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* on the *ThinkServer Documentation* DVD that comes with your system.
* Go to the Lenovo support Web site at http://www.lenovo.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 using the information available on the Lenovo support site or by following the troubleshooting procedures that Lenovo provides in the documentation that is provided with your Lenovo product. The documentation that comes with Lenovo systems also describes the diagnostic tests that you can perform. Most 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 Lenovo 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. Most of the documentation for your server is on the *ThinkServer Documentation* DVD provided with your server. 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. Lenovo 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.lenovo.com/support and follow the instructions.

Getting help and information from the World Wide Web

On the World Wide Web, the Lenovo Web site has up-to-date information about Lenovo systems, optional devices, services, and support. For general information about Lenovo products or to purchase Lenovo products, go to http://www.lenovo.com. For support on Lenovo products, go to http://www.lenovo.com/support.

Calling for service

During the warranty period, you can get help and information by telephone through the Customer Support Center.

These services are available during the warranty period:
- **Problem determination -** Trained personnel are available to assist you with determining a hardware problem and deciding what action is necessary to fix the problem.
- **Hardware repair -** If the problem is caused by hardware under warranty, trained service personnel are available to provide the applicable level of service.
- **Engineering Change management -** There might be changes that are required after a product has been sold. Lenovo or your reseller will make selected Engineering Changes (ECs) available that apply to your hardware.

These items are not covered by the warranty:
- Replacement or use of parts not manufactured for or by Lenovo or non-warranted Lenovo parts
- Identification of software problem sources
- Configuration of BIOS as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

Refer to the safety and warranty information that is provided with your computer for a complete explanation of warranty terms. You must retain your proof of purchase to obtain warranty service.

For a list of service and support phone numbers for your country or region, go to http://www.lenovo.com/support and click **Support phone list** or refer to the safety and warranty information provided with your computer.

Note: Phone numbers are subject to change without notice. If the number for your country or region is not provided, contact your Lenovo reseller or Lenovo marketing representative.

If possible, be at your computer when you call. Have the following information available:
- Machine type and model
- Serial numbers of our hardware products
- Description of the problem
- Exact working of any error messages
- Hardware and software configuration information

Using other services

If you travel with a Lenovo notebook computer or relocate your computer to a country where your desktop, notebook, or server machine type is sold, your computer might be eligible for International Warranty Service, which automatically entitles you to obtain warranty service throughout the warranty period. Service will be performed by service providers authorized to perform warranty service.

Service methods and procedures vary by country, and some services might not be available in all countries. International Warranty Service is delivered through the method of service (such as depot, carry-in, or on-site service) that is provided in the servicing country. Service centers in certain countries might not be able to service all models of a particular machine type. In some countries, fees and restrictions might apply at the time of service.

To determine whether your computer is eligible for International Warranty Service and to view a list of the countries where service is available, go to http://www.lenovo.com/support, click **Warranty**, and follow the instructions on the screen.

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

Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and service name might vary by country or region. For more information about these services, go to the Lenovo Web site at http://www.lenovo.com/.

Lenovo product service

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Appendix B. Notices

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> *Morrisville, NC 27560*
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Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been

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Important notes

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

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 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 can 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 that are available from Lenovo.

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

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

Waste electrical and electronic equipment (WEEE) notices

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

Esta unidad debe reciclarse o desecharse de acuerdo con lo establecido en la normativa nacional o local aplicable. Lenovo recomienda a los propietarios de equipos de tecnología de la información (TI) que reciclen responsablemente sus equipos cuando éstos ya no les sean útiles. Lenovo dispone de una serie de programas y servicios de devolución de productos, a fin de ayudar a los propietarios de equipos a reciclar sus productos de TI. Se puede encontrar información sobre las ofertas de reciclado de productos de Lenovo en el sitio web de Lenovo http://www.lenovo.com/lenovo/environment.

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'etiquette 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 Lenovo representative.

Battery return program

This product may contain a 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 or batteries outside the United States, go to http://www.lenovo.com/lenovo/environment or contact your local waste disposal facility.

For Taiwan: Please recycle batteries.

For the European Union:

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

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

Les batteries ou emballages pour batteries sont étiquetés conformément aux directives européennes 2006/66/EC, norme relative aux batteries et accumulateurs en usage et aux batteries et accumulateurs usés. Les directives déterminent la marche à suivre en vigueue dans l'Union Européenne pour le retour et le recyclage des batteries et accumulateurs usés. Cette étiquette est appliquée sur diverses batteries pour indiquer que la batterie ne doit pas être mise au rebut mais plutôt récupérée en fin de cycle de vie selon cette norme.

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury, and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, go to http://www.lenovo.com/lenovo/environment.

For California:

Perchlorate material - special handling may apply. See http://www.dtsc.ca.gov/hazardouswaste/perchlorate/.

The foregoing notice is provided in accordance with California Code of Regulations Title 22, Division 4.5 Chapter 33. Best Management Practices for Perchlorate Materials. This product/part may include a lithium manganese dioxide battery which contains a perchlorate substance.

German Ordinance for Work gloss statement

The product is not suitable for use with visual display work place devices according to clause 2 of the German Ordinance for Work with Visual Display Units.

Das Produkt ist nicht für den Einsatz an Bildschirmarbeitsplätzen im Sinne § 2 der Bildschirmarbeitsverordnung geeignet.

Electronic emissions 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. Lenovo 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 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-Lenovo 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.

German Class A compliance statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der Lenovo empfohlene Kabel angeschlossen werden. Lenovo übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der Lenovo verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der Lenovo gesteckt/eingebaut werden.

Deutschland:

Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmittein

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln" EMVG (früher "Gesetz über die elektromagnetische Verträglichkeit von Geräten"). Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EG Richtlinie 2004/108/EC (früher 89/336/EWG), für Geräte der Klasse A.

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraf 5 des EMVG ist die Lenovo (Deutschland) GmbH, Gropiusplatz 10, D-70563 Stuttgart.

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

Nach der EN 55022: "Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen."

Nach dem EMVG: "Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind." (Auszug aus dem EMVG, Paragraph 3, Abs. 4). Dieses Genehmigungsverfahren ist nach Paragraph 9 EMVG in Verbindung mit der entsprechenden Kostenverordnung (Amtsblatt 14/93) kostenpflichtig.

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den Handbüchern angegeben, zu installieren und zu betreiben.

Japanese Voluntary Control Council for Interference (VCCI) statement

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種情況下，使用者會被要
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Chinese Class A warning statement

声　　明

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