lenovo

ThinkServer
User Guide

ThinkThinkThinkServerThink

Machine Types: 1098, 1100, 1105, and 1106

Note:

Before using this information and the product it supports, be sure to read and understand the following:

- The *Important Notices* that came with your product
- The *Safety Information* and the *Warranty and Support Information* at http://www.lenovo.com/support
- Appendix A "Notices" on page 83

Contents

Safety information

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.

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.

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」。

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

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

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-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

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

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

⚠️**DANGER**

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

Statement 4
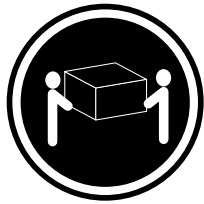
≥ 18 kg (39.7 lb)
< 32 kg (70.5 lb)
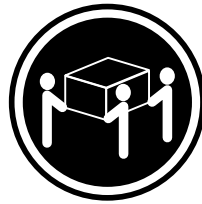
≥ 32 kg (70.5 lb)
< 55 kg (121.2 lb)
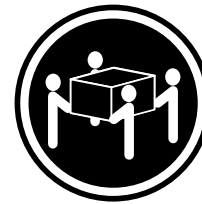
≥ 55 kg (121.2 lb)
< 100 kg (220.5 lb)

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
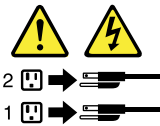
Statement 6

CAUTION:
If you install a strain-relief bracket option over the end of the power cord that is connected to the device, you must connect the other end of the power cord to an easily accessible power source.

Statement 7

CAUTION:
If the device has doors, be sure to remove or secure the doors before moving or lifting the device to avoid personal injury. The doors will not support the weight of the device.

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 9

CAUTION:
To avoid personal injury, disconnect the hot-swap fan cables before removing the fan from the device.

Statement 10

CAUTION:
The following label indicates sharp edges, corners, or joints nearby.

Statement 11

CAUTION:
The following label indicates a hot surface nearby.

Statement 12

DANGER

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

Statement 13

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

Statement 14

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

Statement 15

CAUTION:
The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.
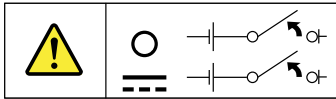
Statement 16

CAUTION:
To reduce the risk of electric shock or energy hazards:

- **This equipment must be installed by trained service personnel in a restricted-access location, as defined by the NEC and the latest edition of** IEC 60950**, The Standard for Safety of Information Technology Equipment.**

- **Connect the equipment to a reliably grounded safety extra low voltage** (SELV) **source. An SELV source is a secondary circuit that is designed so that normal and single fault conditions do not cause the voltages to exceed a safe level (60 V direct current).**

- **The branch circuit overcurrent protection must be rated in accordance with local building codes.**

- **Use 16 American Wire Gauge** (AWG) **or** 1.3 mm^2 **copper conductor only, not exceeding 3 meters in length.**

- **Torque the wiring-terminal screws to 12 inch-pounds (1.4 newton-meters).**

- **Incorporate a readily available approved and rated disconnect device in the field wiring.**

Statement 17

CAUTION:
This product contains a Class 1M laser. Do not view directly with optical instruments.

Statement 18

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

Statement 19

CAUTION:
Hazardous moving parts are nearby.
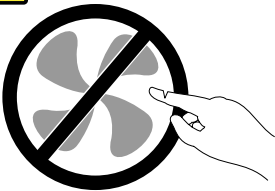
Statement 20

CAUTION:
The battery is a lithium ion battery. To avoid possible explosion, do not burn the battery. Exchange it only with the Lenovo-approved part. Recycle or discard the battery as instructed by local regulations.

Chapter 1. General information

This chapter provides some general information about your server.

This chapter contains the following topics:

- "Introduction" on page 1
- "Notices and statements in the document" on page 1
- "Related documentation" on page 2

Introduction

This user guide is for your Lenovo® ThinkServer® TS130 server (machine types 1098, 1100, 1105, and 1106). This document contains the following information:

- Setting up and cabling the server
- Starting and configuring the server
- Installing options and replacing customer replaceable units (CRUs)
- Solving problems

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

The server comes with a limited warranty. For information about the terms of the warranty and getting service and assistance, see the *Warranty and Support Information* at http://www.lenovo.com/support.

To obtain the most up-to-date information about the server and other Lenovo products, go to: http://www.lenovo.com/thinkserver

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

Product name	ThinkServer TS130
Machine type	1098, 1100, 1105, and 1106
Model number	_____
Serial number	_____

The model number and serial number are on labels on the top or on the bottom of the server.

Notices and statements in the document

The caution and danger statements that appear in this document are also in the multilingual *Safety Information*. 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*. See "Related documentation" on page 2 for detailed information about how to get the various documentation for your server.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.

1

- **Important:** These notices provide information or advice that might help you avoid problems or inconvenient 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.

Related documentation

To view the documentation at http://www.lenovo.com/support, you need to have the Adobe Reader 5.0 program or later installed.

The following information provides general descriptions of the various documentation that came with your server and information about how to obtain all these documentation:

- *Hardware Maintenance Manual*: This document provides diagnostic information, parts listing, replacement procedures for all CRUs, and replacement procedures for other field replaceable units (FRUs) replaced by trained service personnel.
- *Getting Started*: This document provides general information about installing and configuring the server.

  Note: This document is in Serbian Latin only.
- *Important Notices*: This document includes safety and legal notices that you are expected to read before using the server.
- *Read Me First*: This document directs you to the http://www.lenovo.com/support for complete warranty and support information.
- *Safety Information*: This document includes translations of all safety statements used in the ThinkServer documentation.
- *Warranty and Support Information*: This document includes the warranty statement and information about how to contact Lenovo Support.

You can obtain all the documentation in Portable Document Format (PDF) for your server from the Lenovo Support Web site at http://www.lenovo.com/support.

Chapter 2. Server setup road map

This chapter provides a general road map to guide you through setting up your server.

The server setup procedure varies depending on the configuration of the server when it was delivered. In some cases, the server is fully configured and you just need to connect the server to the network and an electrical outlet, and then you can turn on the server. In other cases, the server needs to have hardware features installed, requires hardware and firmware configuration, and requires the operating system to be installed.

Table 1. Server setup road map

Task	Where to find the information
Unpack	"What is included with your server" on page 5
Install hardware	Chapter 5 "Installing, removing, or replacing hardware" on page 15
Connect the Ethernet cable and power cord	"Rear view" on page 9
Turn on the server to verify operation	"Turning on the server" on page 49
Review the BIOS settings and customize as needed	"Starting the Setup Utility program" on page 53
Configure RAID	"Configuring RAID" on page 69
Check for firmware updates	"Updating the firmware" on page 71
Install the operating system and basic drivers	"EasyStartup" on page 7
Install any additional drivers needed for added features	Refer to the instructions that came with the hardware option.
Configure Ethernet settings in the operating system	See the operating system help. This step is not required if the operating system was installed using the ThinkServer EasyStartup program.
Install applications	Refer to the documentation that comes with the applications that you want to install.

Chapter 3. Product overview

This chapter provides information about the server package, features, specifications, and software programs.

What is included with your server

The ThinkServer TS130 server package includes the server, a power cord, documentation, and software media.
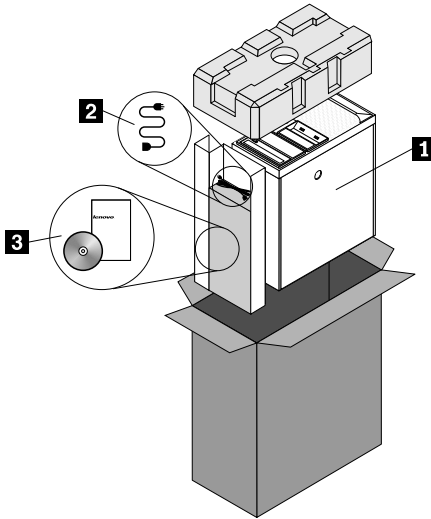
1 Server

2 Power cord

3 Documentation and software media

Features and specifications

The following table provides information about the features and specifications of the server. Depending on the server model, some features might not be available, or some specifications might not apply. For information about your specific model, use the Setup Utility program. See "Using the Setup Utility program" on page 53.

Table 2. Features and specifications

Microprocessor(s): Support up to two Intel® Xeon® dual-core, quad-core, or hex-core microprocessors (internal cache size varies by model type) For the specific type and speed information about the microprocessor, use the Setup Utility program. See "Using the Setup Utility program" on page 53. For a list of supported microprocessors, go to http://www.lenovo.com/thinkserver and click **Options** under the **Products** tab. **Memory** • Supports up to four DDR3 ECC UDIMMs (double data rate 3 error correction code unbuffered dual inline memory modules) • Types: 1333 MHz, DDR3 registered SDRAM DIMMs **Internal drives** • Serial Advanced Technology Attachment (SATA) hard disk drive • SATA optical drive **Video subsystem** • Integrated graphics for a Video Graphics Array (VGA) connector and a DisplayPort connector **Connectivity** • 100/1000 Mbps integrated Ethernet controller **Power supply:** Your server comes with one of the following power supplies: • 280–watt auto-sensing power supply • 320–watt auto-sensing power supply	**Expansion** • Two optical drive bays • Two hard disk drive bays • Two PCI card slots • One PCI Express x1 card slot • One PCI Express x16 card slot **System management features** • Ability to store power-on self-test (POST) hardware test results • Automatic power-on startup • Intel Active Management Technology (AMT) • Intel Hyper-Threading technology (some models) • Intel Rapid Storage Technology (RST) • Preboot Execution Environment (PXE) • System Management (SM) UEFI and SM software • Wake on LAN • Wake on Ring (in the Setup Utility program, this feature is called Serial Port Ring Detect for an external modem) **Input/Output (I/O) features** • Eight Universal Serial Bus (USB) connectors (two on the front panel and six on the rear panel) • One 9-pin serial port • One Ethernet connector • One DisplayPort connector • One VGA monitor connector • Three audio connectors on the rear panel (audio line-in connector, audio line-out connector, and microphone connector) **Preinstalled operating system** Some models are preinstalled with one of the following operating systems: • Microsoft® Windows Server® 2008 R2 Foundation • Microsoft Windows® Small Business Server (SBS) Aurora **Operating system(s), supported** • Microsoft Windows Server 2008 R2 Foundation • Microsoft Windows Server 2008 R2 (Service Pack 1) • Microsoft Windows Small Business Server (SBS) Aurora • Microsoft Windows Small Business Server (SBS) 7 • Microsoft Windows Multipoint Server

Table 2. Features and specifications (continued)

Integrated functions:	Environment

• Ethernet controllers (The server comes with two integrated Gigabit Ethernet controllers, which support connection to 100 Mbps or 1000 Mbps network.)
• One serial port
• One Video Graphics Array (VGA) monitor connector
• Six USB connectors (two front and four rear)
• One RJ-45 Ethernet connectors on the rear panel
• Eight diagnostic LEDs
 	
Size:
• Width: 174.8 mm (6.88 inches)
• Height: 377.3 mm (14.85 inches)
• Depth: 406.7 mm (16.01 inches)
 	
Weight: Maximum configuration: 11.2 kg (24.7 lbs)
 	
Electrical input
• Input voltage:
  – Low range:
     Minimum: 90 V ac
     Maximum: 137 V ac
  – High range:
     Minimum: 180 V ac
     Maximum: 264 V ac
	• Air temperature:
	  Operating: 10°C to 35°C (50°F to 95°F)
	  Non-operating: -40°C to 60°C (14°F to 140°F) (with package)
	  Non-operating: -10°C to 60°C (14°F to 140°F) (without package)
	• Humidity:
	  Operating: 10% to 80% (non-condensing) (10% per hour)
	  Non-operating: 10% to 90% (non-condensing) (10% per hour)
	• Altitude:
	  Operating: -50 to 10 000 ft (-15.2 to 3 048 m)
	  Non-operating: -50 to 35 000 ft (-15.2 to 10 668 m)
	
	Security features
	• Computrace
	• Enabling or disabling a device
	• Enabling or disabling USB connectors individually
	• Hard disk drive password
	• Power-On Password (POP) and Administrator Password for UEFI access
	• Startup sequence control
	• Startup without keyboard or mouse
	• Support for an integrated cable lock (Kensington lock)
	• Support for a padlock
	• Trusted Platform Module (TPM)

Software programs

Lenovo provides software to help get your server up and running.

EasyStartup

The ThinkServer EasyStartup program simplifies the process of configuring RAID and installing supported Microsoft Windows operating systems and device drivers on your server. The EasyStartup program is provided with your server on the *ThinkServer EasyStartup DVD*. The DVD is self-starting (bootable). The user guide for the EasyStartup program is on the DVD and can be accessed directly from the program interface. For additional information, see "Using the ThinkServer EasyStartup program" on page 72.

Reliability, availability, and serviceability

Reliability, availability, and serviceability (hereafter referred to as RAS) are three important server design features. The RAS features help you to ensure the integrity of the data stored on the server, the availability of the server when you need it, and the ease with which you can diagnose and correct problems.

The server has the following RAS features:

- Advanced Configuration and Power Interface (ACPI)
- Advanced Desktop Management Interface (DMI)
- Automatic memory downsizing on error detection
- Automatic restart on non-maskable interrupt (NMI)
- Availability of microcode level
- Built-in, menu-driven setup, system configuration, and RAID configuration
- Built-in monitoring for fan, temperature, and voltage
- Cooling fans with speed-sensing capability
- ECC DDR3 SDRAM with Serial Presence Detect (SPD)
- Error codes and messages to help you identify problems
- Generating error logs for the power-on self-test (POST) failures
- Hot-swap SAS hard disk drives
- Integrated Ethernet controllers
- Intelligent Platform Management Interface (IPMI) 2.0
- Power-on self-test (POST)
- Standby voltage for system-management features and monitoring
- System-error light-emitting diode (LED) on the front panel
- Vital product data (VPD), including the serial number information and replacement part numbers, stored in the nonvolatile memory for easier remote maintenance

Chapter 4. Locating parts, controls, and connectors

This chapter provides information to help you locate your server parts, controls, and connectors.

Front view

Figure 1 "Front control and connector locations" on page 9 shows the locations of the controls and connectors on the front of your server.
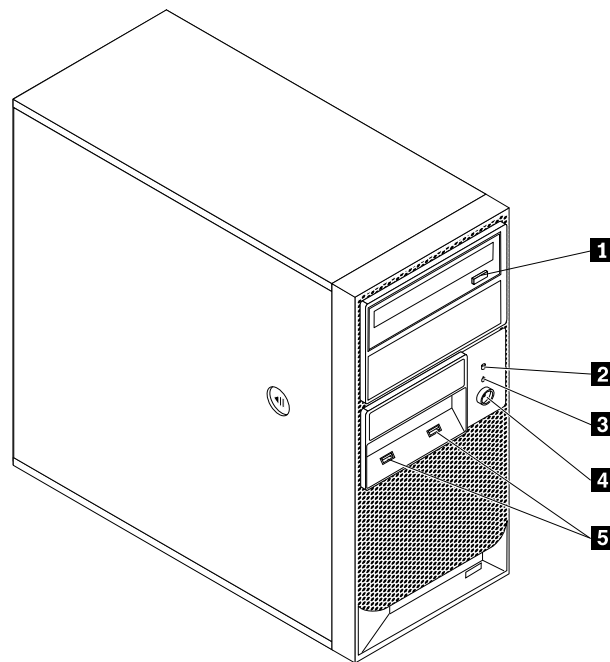
Figure 1. Front control and connector locations

1 Optical drive eject/close button		**4** Power switch	
2 Hard disk drive activity LED		**5** USB connectors (2)	
3 Power-on LED			

Rear view

Figure 2 "Rear connector locations" on page 10 shows the locations of the connectors on the rear of your server. Some connectors on the rear of your server are color-coded to help you determine where to connect the cables in your server.
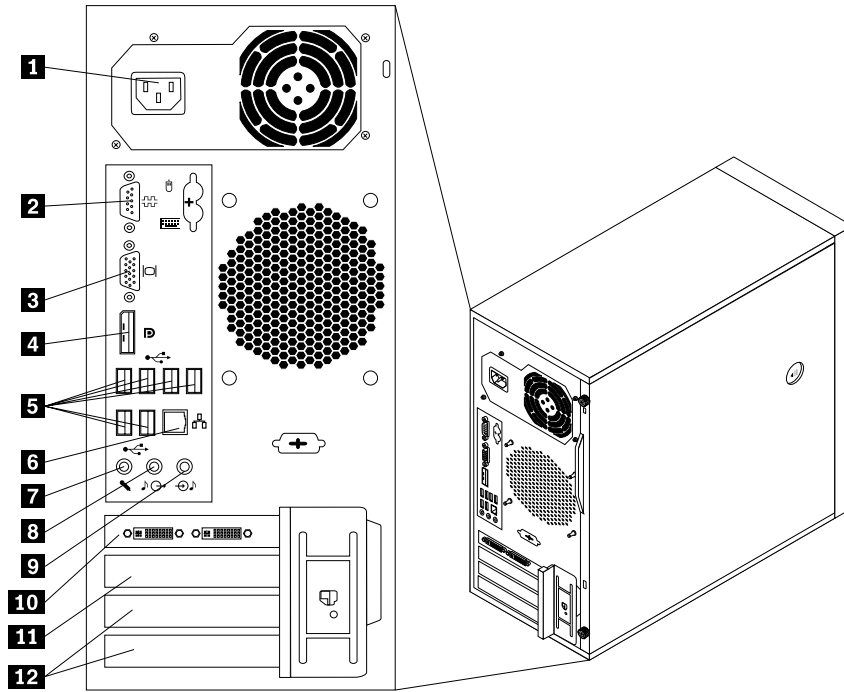
Figure 2. Rear connector locations

1 Power cord connector   **7** Microphone connector

2 Serial port   **8** Audio line-out connector

3 VGA monitor connector   **9** Audio line-in connector

4 DisplayPort connector   **10** PCI Express x16 card slot

5 USB connectors (6)   **11** PCI Express x1 card slot

6 Ethernet connector   **12** PCI card slots (2)

Connector	Description
Audio line-in connector	Used to receive audio signals from an external audio device, such as a stereo system. When you attach an external audio device, a cable connects the audio line-out connector of the device to the audio line-in connector of the server.
Audio line-out connector	Used to send audio signals from the server to external devices, such as powered stereo speakers (speakers with built-in amplifiers), headphones, multimedia keyboards, or the audio line-in connector on a stereo system or other external recording device.
DisplayPort connector	Used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a DisplayPort connector.
Ethernet connector	Used to attach an Ethernet cable for a local area network (LAN). **Note:** To operate the server within FCC Class B limits, use a Category 5 Ethernet cable.
Microphone connector	Used to attach a microphone to your server when you want to record sound or if you use speech-recognition software.
Serial port	Used to attach an external modem, a serial printer, or other devices that use a 9-pin serial port.

Connector	Description
USB connector	Used to attach a device that requires a USB connector, such as a USB keyboard, a USB mouse, a USB scanner, or a USB printer. If you have more than eight USB devices, you can purchase a USB hub, which you can use to connect additional USB devices.
VGA monitor connector	Used to attach a VGA monitor or other devices that use a VGA monitor connector.

Locating parts on the system board

Figure 3 "System board part locations" on page 11 shows the locations of the parts on the system board.
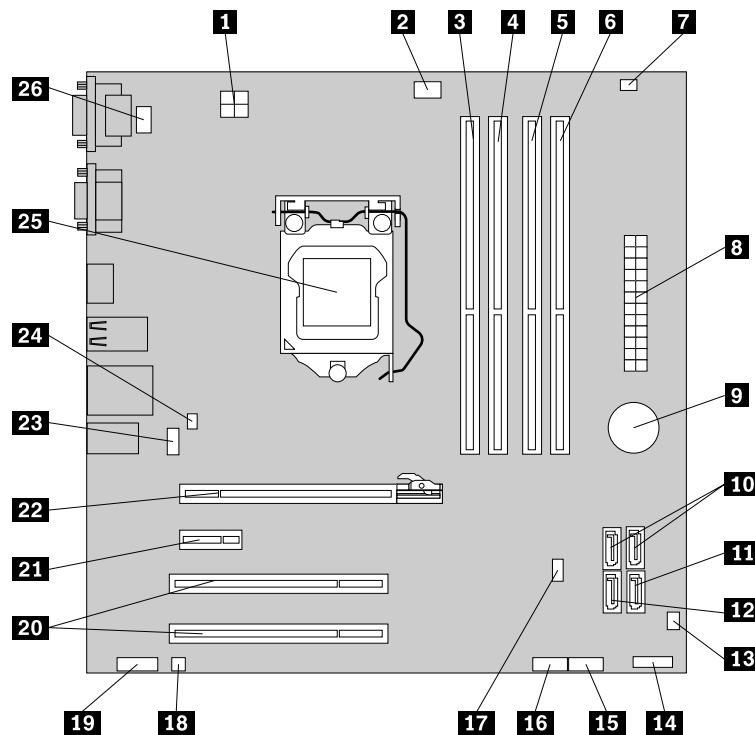
Figure 3. System board part locations

1 4-pin power connector

2 Microprocessor fan connector

3 Memory slot 1 (DIMM1)

4 Memory slot 2 (DIMM2)

5 Memory slot 3 (DIMM3)

6 Memory slot 4 (DIMM4)

7 Thermal sensor connector

8 24-pin power connector

9 Battery

14 Front panel connector for power switch and LED indicators

15 Front USB connector 1 (for connecting USB port 1 and 2 on the front bezel)

16 Front USB connector 2 (for connecting additional USB devices)

17 Clear CMOS (Complementary Metal Oxide Semiconductor) /Recovery jumper

18 Internal speaker connector

19 Front audio connector (for connecting the microphone and headphone connectors on the front bezel)

20 PCI card slots (2)

21 PCI Express x1 card slot

22 PCI Express x16 graphics card slot

10 SATA connectors 1 and 2 (SATA 3.0 connectors)	**23** Rear fan connector
11 SATA connector 3 (SATA 2.0 connector)	**24** Cover presence switch connector (Intrusion switch connector)
12 eSATA connector	**25** Microprocessor
13 Front fan connector	**26** PS/2 keyboard and mouse connector

Internal components

Figure 4 "Component locations" on page 12 shows the locations of the various components in your server. To remove the server cover and access the inside of the server, see "Removing the server cover" on page 17.
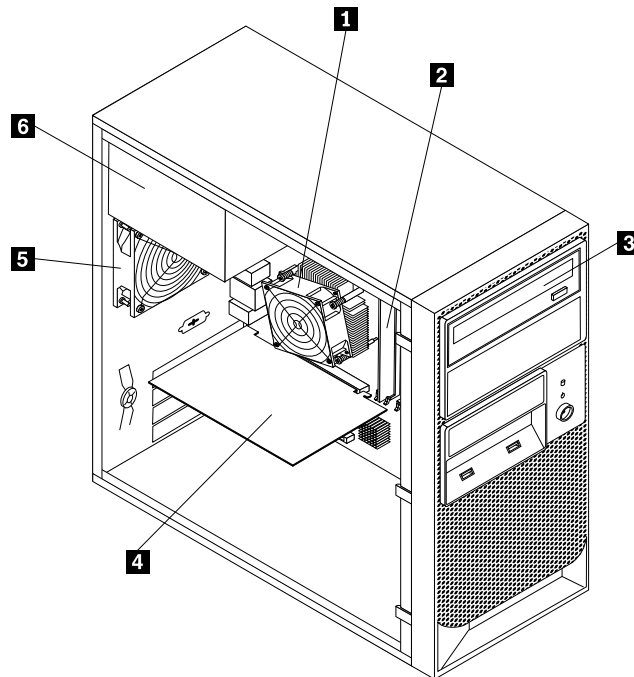
Figure 4. Component locations

1 Heat sink and fan assembly	**4** PCI card
2 Memory module	**5** Rear fan assembly
3 Optical drive	**6** Power supply assembly

Internal drives

Internal drives are devices that your server uses to read and store data. You can add drives to your server to increase storage capacity and enable your server to read other types of media. Internal drives are installed in bays. In this manual, the bays are referred to as bay 1, bay 2, and so on.

Figure 5 "Drive bay locations" on page 13 shows the locations of the drive bays.
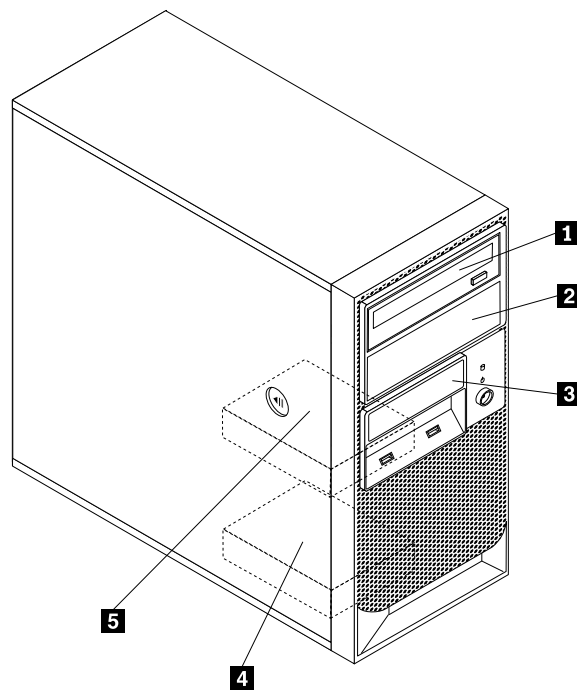
Figure 5. Drive bay locations

The following list describes the type and size of the drive that you can install in each bay:

1 Bay 1 - Optical drive bay (with an optical drive installed on some models)

2 Bay 2 - Optical drive bay

3 Bay 3 - Card reader drive bay

4 Bay 4 - Secondary SATA hard disk drive bay

5 Bay 5 - Primary SATA hard disk drive bay (with a 3.5-inch SATA hard disk drive installed)

Machine type and model label

The machine type and model label identifies your computer. When you contact Lenovo for help, the machine type and model information helps support technicians to identify your computer and provide faster service.

The following is a sample of the machine type and model label.
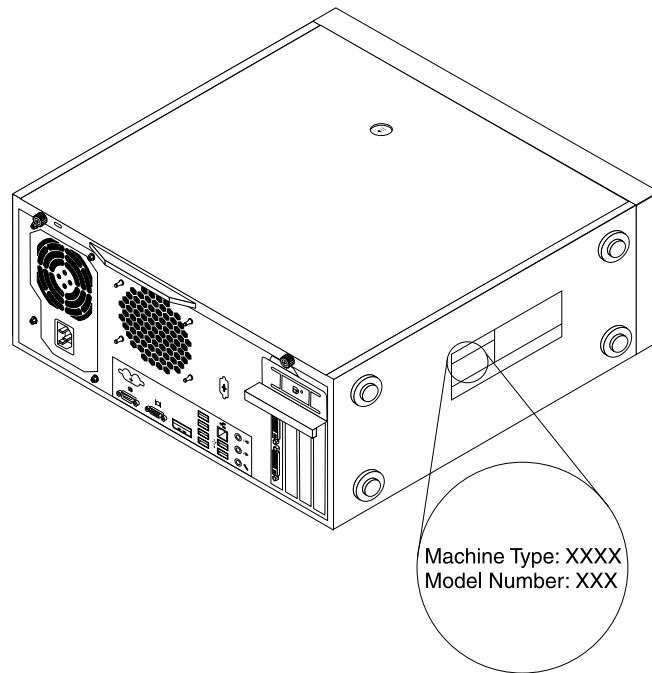
Figure 6. Machine type and model label

Chapter 5. Installing, removing, or replacing hardware

This chapter provides instructions on how to install, remove, or replace hardware for your server.

This chapter contains the following topics:

Guidelines

This section provides some guidelines that you should read and understand before using your server.

Basic guidelines

Before you use the server, be sure to read and understand the following guidelines:

- Be sure to read and understand the *Safety Information* and the *Warranty and Support Information* at http://www.lenovo.com/support, and "Guidelines" on page 15. The 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, do the following:

    1. Go to http://www.lenovo.com/support.
    2. Click **Download & Drivers → ThinkServer** and then follow the instructions on the Web page to download firmware updates for your server.

- Before you install optional hardware devices, make sure that the server is working correctly. If an operating system is installed, turn on the server and make sure that the operating system starts. If no operating system is installed, make sure that a message BOOTMGR is missing is displayed, indicating that an operating system was not found but the server is working correctly. If the server is not working correctly, refer to Chapter 7 "Troubleshooting and diagnostics" on page 75 for detailed diagnostic information.

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

- If you must turn on the server while the server 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 drives.

- Have a small flat-blade screwdriver available.

- To view the error LEDs on the system board and internal components, leave the server connected to power.

- 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 USB devices. However, you must turn off the server before performing any steps that involve installing, removing, or replacing adapter cables or non-hot-swap optional devices or components.

- After completing any installation, removal, or replacement procedure, reinstall all safety shields, guards, labels, and ground wires.

- For a list of supported optional devices for the server, go to http://www.lenovo.com/thinkserver.

- When working inside the server, you might find some tasks easier if you lay the server on its side. You might need to first pivot the foot stands inward and then lay the computer on its side.

System reliability guidelines

To help ensure proper cooling and system reliability, make sure that you follow these guidelines:

- Every drive bay has an internal drive installed or an Electro Magnetic Compatibility (EMC) shield installed.

- If the server has redundant power, every power supply bay has a power supply assembly installed.

- Leave adequate space around the server to make sure that the server cooling system works well.

- Properly route the cables. For some options, such as PCI cards, follow the cabling instructions that come with the options.

- Make sure that you replace a failing fan within 48 hours.

- When replacing a hot-swap drive, install the new hot-swap drive within two minutes of removal.

- Do not remove any air duct or air baffles while the server is running. Operating the server without the air duct or air baffles might cause the microprocessor to overheat.

- The second microprocessor socket always contains either a microprocessor socket cover or a microprocessor and heat sink assembly.

Handling static-sensitive devices

Attention:
Do not open the static-protective package containing the new part until the defective part has been removed from the server and you are ready to install the new part. Static electricity, although harmless to you, can seriously damage server components and parts.

When you handle server parts and components, take these precautions to avoid static-electricity damage:

- Limit your movement. Movement can cause static electricity to build up around you.

- Wear an electrostatic-discharge wrist strap, if one is available.

- Always carefully handle the parts and other components (such as PCI cards, memory modules, system boards, and microprocessors) by its edges or its frame. Do not touch solder joints, pins, or exposed circuitry.

- Prevent others from touching the parts and other computer components.

- Before you replace a new part, touch the static-protective package containing the new part to a metal expansion-slot cover or other unpainted metal surface on the server for at least two seconds. This reduces static electricity from the package and your body.

- Remove the new part from the static-protective package and directly install it in the server without placing it on any other surface. If it is hard for you to do this in your specific situation, place the static-protective package of the new part on a smooth, level surface, and then place the new part on the static-protective package.
- Do not place the part on the server cover or other metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Removing the server cover

Attention:
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
http://www.lenovo.com/support

This section provides instructions on how to remove the server cover.

CAUTION:

Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

To remove the server cover, do the following:

1. Remove any media from the drives and turn off all attached devices and the server.
2. Disconnect all power cords from electrical outlets.
3. Disconnect the power cords, Input/Output (I/O) cables, and any other cables that are connected to the server. See "Front view" on page 9 and "Rear view" on page 9.
4. Remove any locking device that secures the server cover, such as a padlock or an integrated cable lock. See "Integrated cable lock" on page 51and "Padlock" on page 51.
5. Remove the two thumbscrews that secure the server cover.

6. Press the cover-release button on the side of the server and slide the cover to the rear of the server to remove the cover.
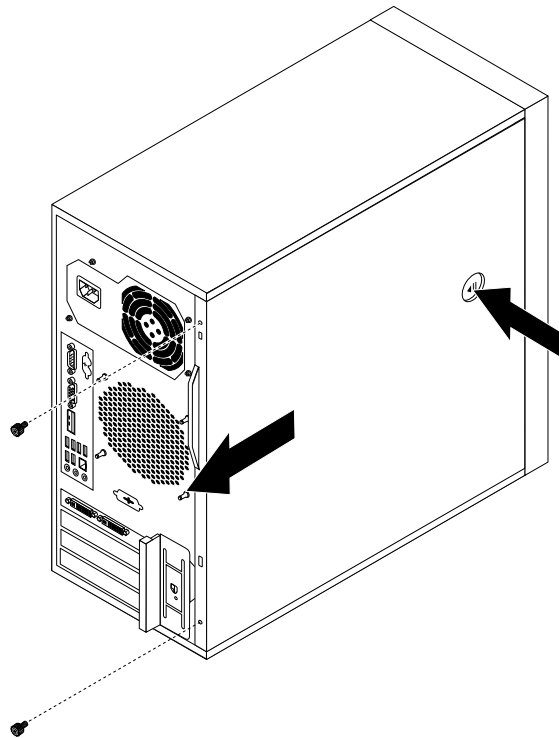
Figure 7. Removing the server cover

Removing and reinstalling the front bezel

Attention:
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
http://www.lenovo.com/support

This section provides instructions on how to remove and reinstall the front bezel.

To remove and reinstall the front bezel, do the following:
1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 17.

3. Remove the front bezel by releasing the three plastic tabs on the left side and pivoting the front bezel outward.
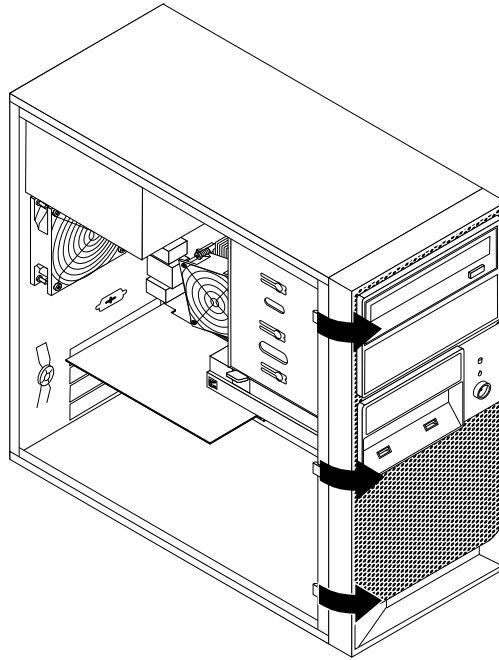
Figure 8. Removing the front bezel

4. To reinstall the front bezel, align the three plastic tabs on the right side of the front bezel with the corresponding holes in the chassis, then pivot the front bezel inward until it snaps into position on the left side.
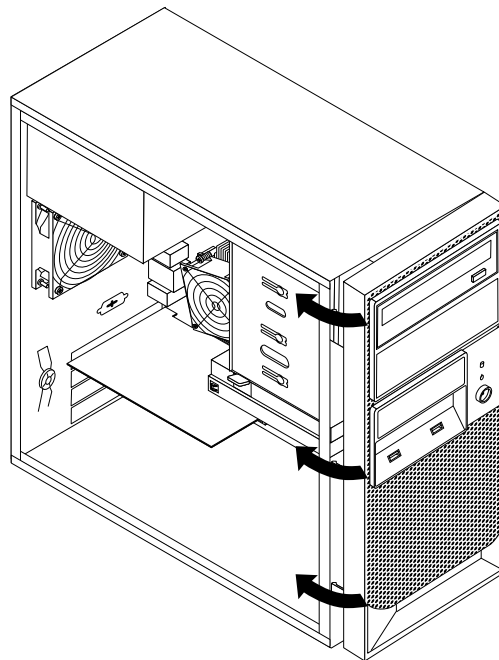
Figure 9. Reinstalling the front bezel

What to do next:

• To work with another piece of hardware, go to the appropriate section.

• To complete the installation or replacement, go to "Completing the parts replacement" on page 48.

Installing, removing, or replacing optional hardware devices

This section provides instructions on how to install, remove, or replace optional hardware devices for your server. You can expand the capabilities of your server by adding memory modules, PCI cards, or drives, and maintain your server by replacing the failing optional hardware devices. If you are replacing an optional hardware device, perform the removal procedure and then perform the installation procedure for the optional hardware device that you want to replace.

Installing or replacing a PCI card

Attention:
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
http://www.lenovo.com/support

This section provides instructions on how to install or replace a PCI card.

Your server has two standard PCI card slots, one PCI Express x1 card slot, and one PCI Express x16 card slot.

To install or replace a PCI card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See "Removing the server cover" on page 17.

3. At the rear of the server, press the release button **1** to open the PCI card latch **2**.
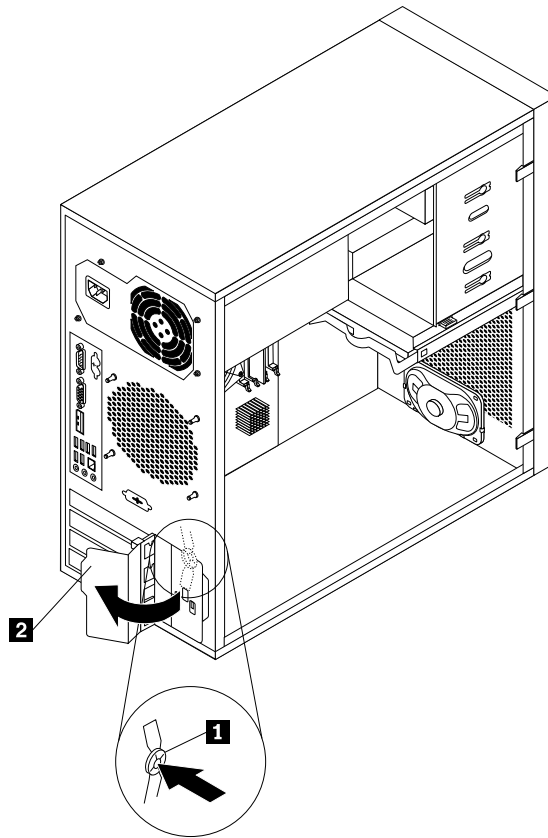
Figure 10. Opening the PCI card latch

4. If you are installing a PCI card, remove the appropriate metal slot cover. If you are replacing an old PCI card, grasp the old card that is currently installed and gently pull it out of the slot.

   Notes:

   a. The PCI card fits tightly into the card slot. If necessary, alternate moving each side of the card a small and equal amount until it is completely removed from the card slot.

   b. If the PCI card is held in place by a retaining latch, press the card retaining latch **1** as shown to disengage the latch. Grasp the PCI card and gently pull it out of the card slot.
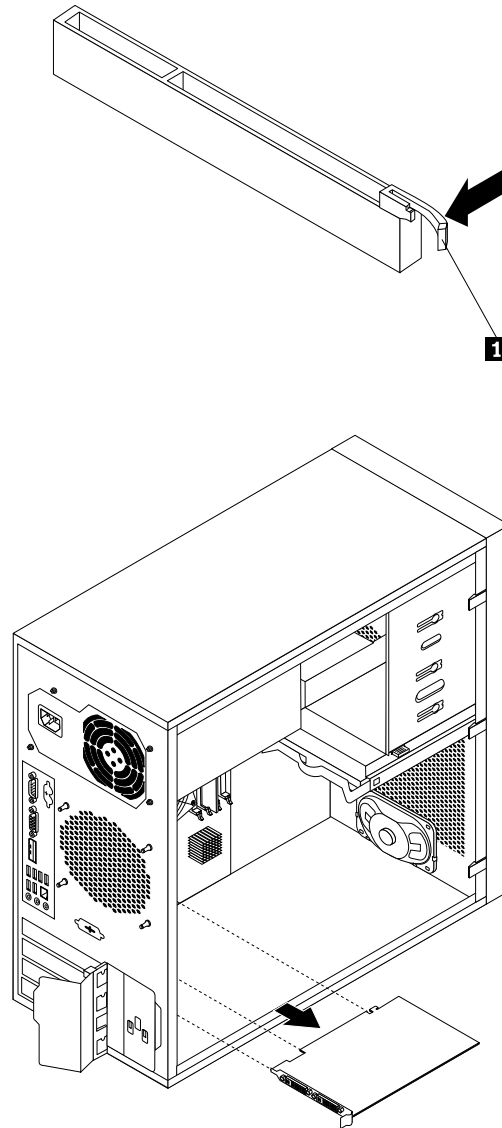
Figure 11. Removing a PCI card

5. Remove the new PCI card from its static-protective package.

6. Install the new PCI card into the appropriate slot on the system board. See "Locating parts on the system board" on page 11.

   Note: If you are installing a PCI Express x16 card, make sure the memory slot retaining clips are closed before you install the PCI Express x16 card.

7. Pivot the PCI card latch to the closed position to secure the PCI card.

Figure 12. Installing a PCI card

What to do next:

• To work with another piece of hardware, go to the appropriate section.

• To complete the installation or replacement, go to "Completing the parts replacement" on page 48.

# Installing or removing the Ethernet card

Attention:
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
http://www.lenovo.com/support

This section provides instructions on how to install or remove the Ethernet card. Use any documentation that came with the Ethernet card and follow those instructions in addition to the instructions in this section.

To install or remove the Ethernet card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See "Removing the server cover" on page 17.

3. Lay the server on its side for easier operation.

4. The Ethernet card is a kind of PCI card. See "Installing or replacing a PCI card" on page 20 and follow those instructions to install or remove the Ethernet card.

5. If you are instructed to return the removed Ethernet card to the manufacturer, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

If you are using the Microsoft Windows operating systems, you need to install the device driver for the Ethernet card. To install the device driver on Windows operating systems, do the following:

1. Save any open documents and exit all applications.

2. Insert the *ThinkServer EasyStartup* DVD that came with your server into the DVD drive.

   Note: You do not need to use the driver disc that came with the Ethernet card.

3. Right-click **My Computer** and select **Properties**. The System Properties window opens.

4. On the **Hardware** tab, click the **Device Manager** button. The Device Manager window opens.

5. Expand **Network adapters** and then right-click one of the Ethernet cards (PRO/1000PT or the yellow question mark).

6. Select **Update Driver...**. The Hardware Update Wizard program opens.

7. Select **Install the software automatically (Recommended)** and click **Next** to continue.

8. Follow the instructions on the screen.

What to do next:

• To work with another piece of hardware, go to the appropriate section.

• To complete the installation, go to "Completing the parts replacement" on page 48.

Installing or removing a memory module

> **Attention:**
> Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
> http://www.lenovo.com/support

This section provides instructions on how to install or remove a memory module.

Your server has four slots for installing or replacing DDR3 UDIMMs that provide up to a maximum of 16 GB system memory. When installing or replacing a memory module, use the following guidelines:

• Use 1 GB, 2 GB, or 4 GB DDR3 UDIMMs in any combination up to a maximum of 16 GB.

• Install memory modules in the sequence of DIMM 1, DIMM 3, DIMM 2, and DIMM 4. See "Locating parts on the system board" on page 11.

To install or replace a memory module, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See "Removing the server cover" on page 17.

3. Lay the server on its side for easier access to the system board.

4. Locate the memory slots. See "Locating parts on the system board" on page 11.

5. Remove any parts that might prevent your access to the memory slots. Depending on your server model, you might need to remove the PCI Express x16 graphics card for easier access to the memory slots. See "Installing or replacing a PCI card" on page 20.

6. Depending on whether you are installing or replacing a memory module, do one of the following:

• If you are replacing an old memory module, open the retaining clips and gently pull the memory module out of the memory slot.
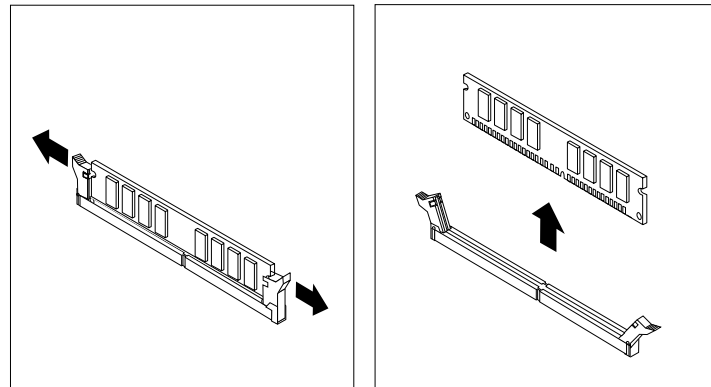
Figure 13. Removing a memory module

• If you are installing a new memory module, open the retaining clips of the memory slot into which you want to install the memory module.
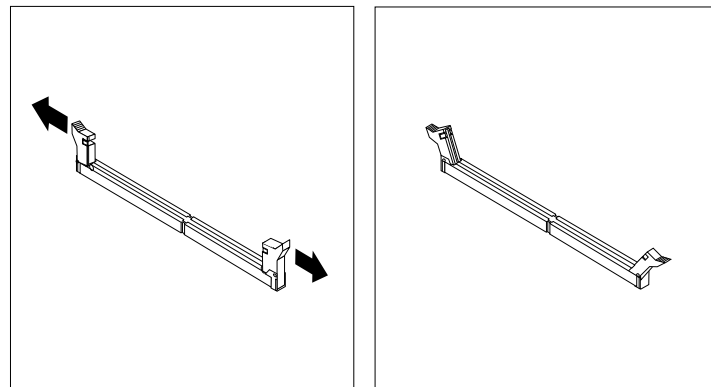
Figure 14. Opening the retaining clips

7. Touch the static-protective package that contains the new memory module to any unpainted metal surface on the outside of the server. Then, remove the new memory module from the package.

8. Position the new memory module over the memory slot. Make sure that the notch **1** on the new memory module is aligned with the key **2** in the memory slot. Then, press the new memory module straight down into the memory slot until the retaining clips close and the new memory module snaps into position.

   Note: If there is a gap between the memory module and the retaining clips, the memory module has not been correctly installed. Open the retaining clips, remove the memory module, and then reinstall it into the slot.
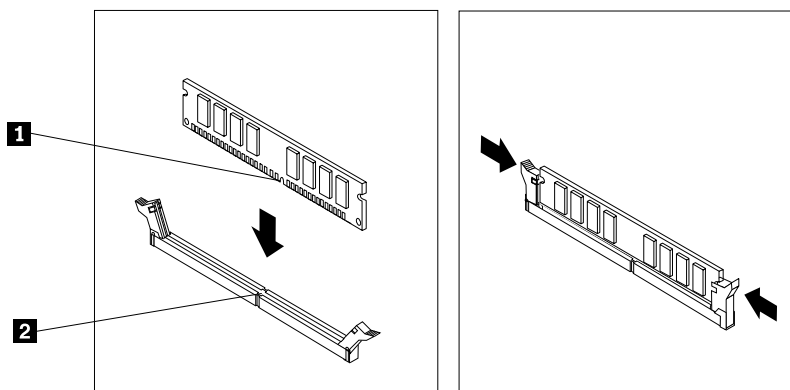
Figure 15. Installing a memory module
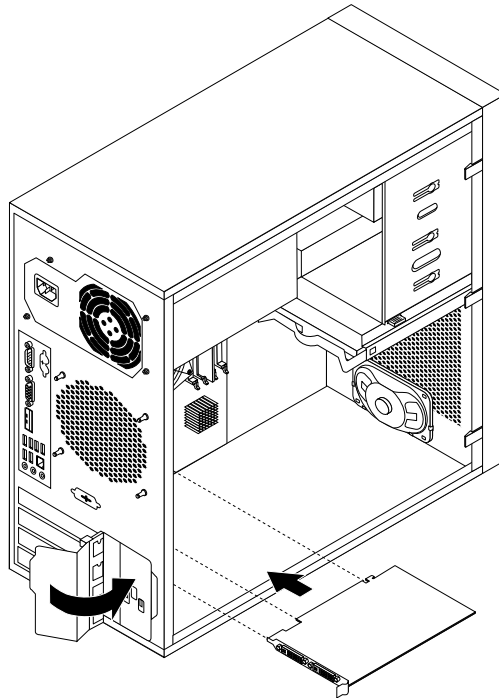
9. Reinstall the PCI Express x16 graphics card if you have removed it.

What to do next:

- To work with another piece of hardware, go to the appropriate section.

- To complete the installation or replacement, go to "Completing the parts replacement" on page 48.

Installing or replacing the optical drive

> **Attention:**
> Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
> http://www.lenovo.com/support

This section provides instructions on how to install or replace the optical drive.

To install or replace an optical drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See "Removing the server cover" on page 17.

3. Remove the front bezel. See "Removing and reinstalling the front bezel" on page 18.

4. Depending on whether you are installing or replacing an optical drive, do one of the following:

   - If you are installing a secondary optical drive, remove the plastic panel in the front bezel for the drive bay you want to use. If there is a metal static shield installed in the drive bay, remove the metal static shield.

- If you are replacing an optical drive, disconnect the signal cable and the power cable from the rear of the optical drive, press the blue release button and then slide the optical drive out of the front of the server.
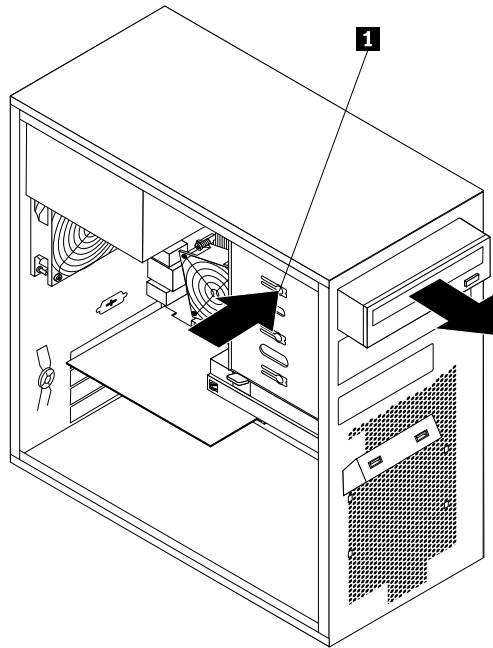
Figure 16. Removing the optical drive

5. Slide the new optical drive with the optical drive retainer **1** installed into the drive bay from the front of the server until the optical drive snaps into position.
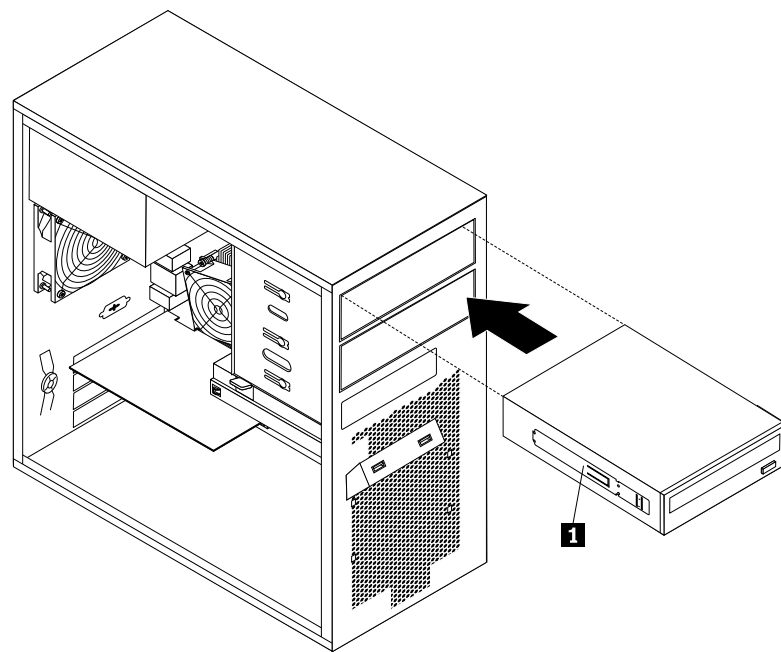
Figure 17. Installing the optical drive

6. Reinstall the front bezel. See "Removing and reinstalling the front bezel" on page 18.

7. Connect one end of the signal cable to the optical drive and the other end to an available SATA connector on the system board. See "Locating parts on the system board" on page 11. Then, locate an available five-wire power connector and connect it to the SATA drive.
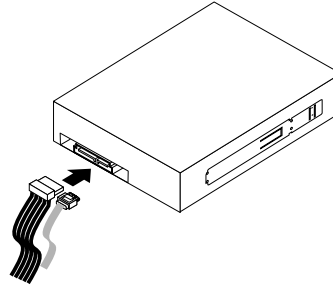
Figure 18. Connecting a SATA optical drive

What to do next:

- To work with another piece of hardware, go to the appropriate section.

- To complete the installation or replacement, go to "Completing the parts replacement" on page 48.

Replacing the primary hard disk drive

Attention:
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
http://www.lenovo.com/support

This section provides instructions on how to replace the primary hard disk drive.

To replace the primary hard disk drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See "Removing the server cover" on page 17.

3. Locate the primary hard disk drive. See "Locating parts on the system board" on page 11.

4. Disconnect the signal cable and the power cable from the rear of the hard disk drive.

5. Press the blue release tab **1** downward, slide the hard disk drive cage **2** to the rear of the server, and then pivot it outward to completely remove the drive cage from the chassis. Then, pull on the blue handle **3** to remove the hard disk drive from the drive cage.
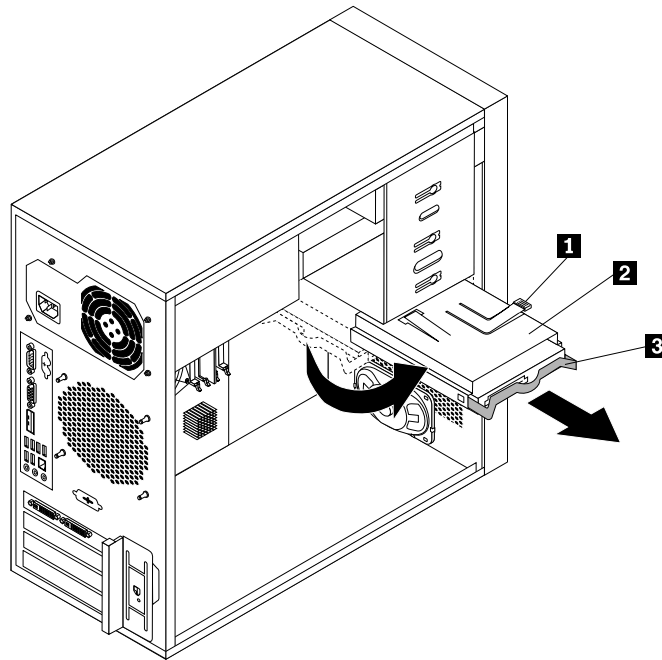
Figure 19. Removing the primary hard disk drive

6. Flex the sides of the blue bracket to remove the hard disk drive from the bracket.
7. To install a new hard disk drive into the blue bracket, flex the sides of the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the hard disk drive. Do not touch the circuit board **5** on the bottom of the hard disk drive.

   Note: If you are installing a 2.5-inch hard disk drive, install the hard disk drive into a 2.5-inch to 3.5-inch hard disk drive tray first and then install the tray into the blue bracket.
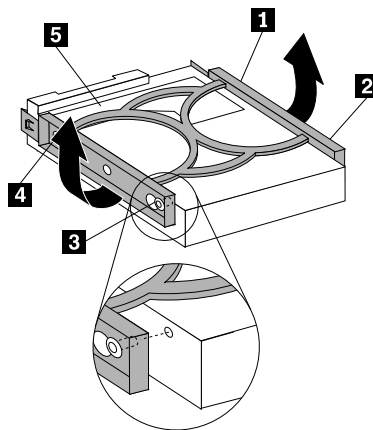
Figure 20. Installing the hard disk drive into the bracket

8. Slide the new hard disk drive with the blue bracket into the drive cage until it snaps into position and align the hard disk drive cage pivot pin with the slot **1** in the upper drive cage. Then, slide the hard disk drive cage into the chassis. Press down on the metal latch **2** and pivot the hard disk drive cage into place. Then, slide the drive cage to the front of the server until it snaps into position.

   Note: There are two arrows, one on the upper drive cage and one on the hard disk drive cage. The arrows are aligned when the hard disk drive is in the correct position.
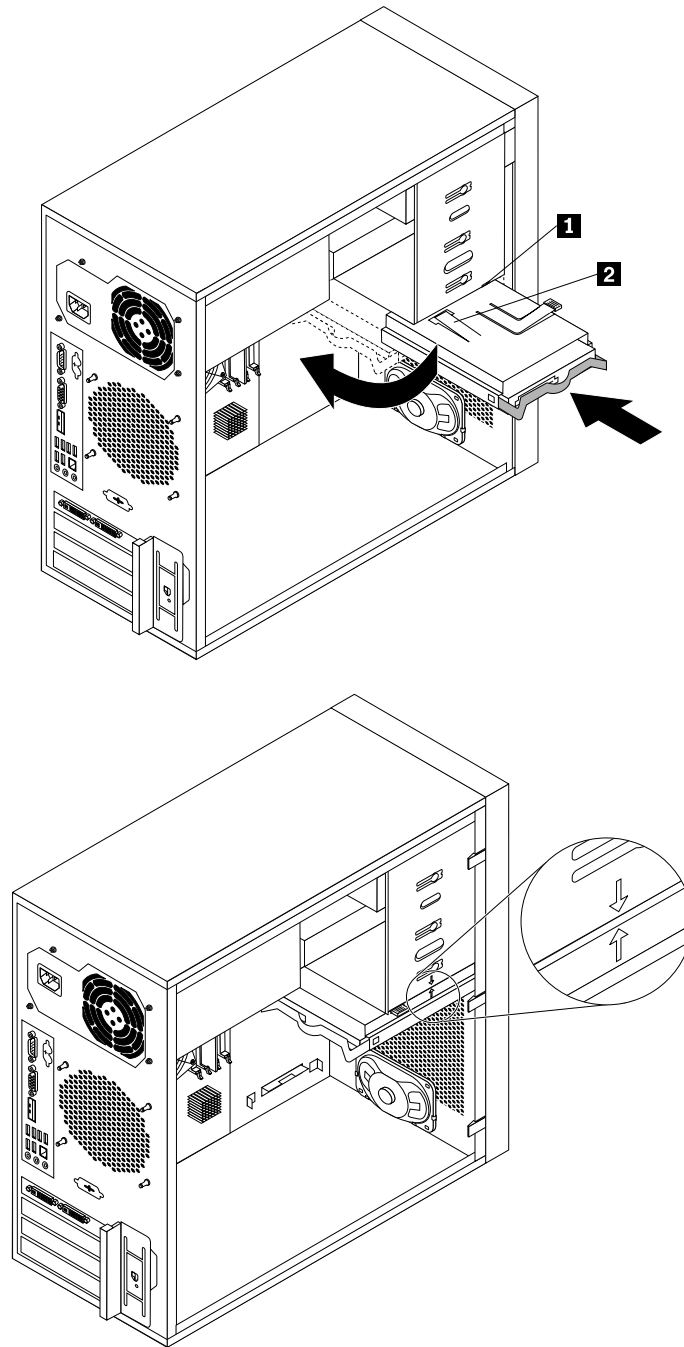
Figure 21. Installing the primary hard disk drive

9. Connect one end of the signal cable to the hard disk drive and the other end to an available SATA connector on the system board. See "Locating parts on the system board" on page 11. Then, locate an available five-wire power connector and connect it to the hard disk drive.
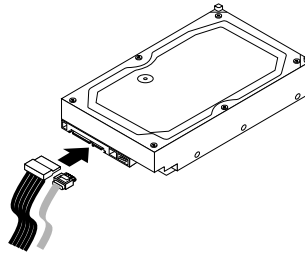
Figure 22. Connecting a SATA hard disk drive

What to do next:

- To work with another piece of hardware, go to the appropriate section.

- To complete the replacement, go to "Completing the parts replacement" on page 48.

Installing or replacing the secondary hard disk drive

Attention:
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
http://www.lenovo.com/support

To install or replace the secondary hard disk drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See "Removing the server cover" on page 17.

3. Locate the secondary hard disk drive. See "Locating parts on the system board" on page 11 and "Internal drives" on page 13.

4. If you are replacing the secondary hard disk drive, disconnect the signal cable and the power cable from the hard disk drive.

5. Press the release button **1** to release the hard disk drive cage and then lift the hard disk drive cage out of the chassis.
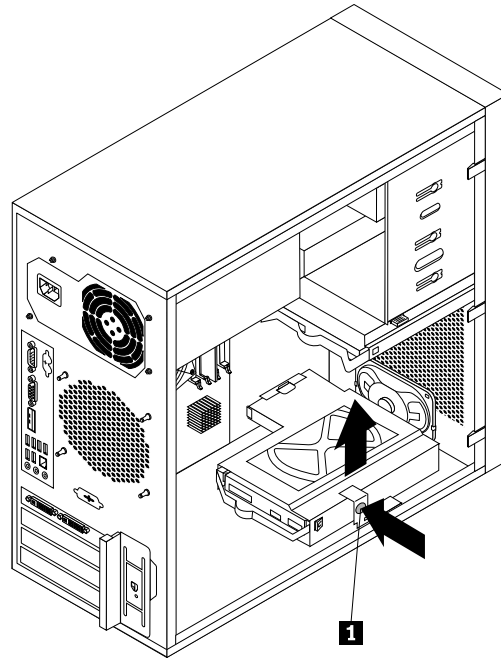
Figure 23. Removing the secondary hard disk drive

6. Pull on the blue handle to release and remove the hard disk drive from the hard disk drive cage.
7. Flex the sides of the blue bracket to remove the hard disk drive from the bracket.
8. To install the secondary hard disk drive, flex the sides of the bracket properly and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the hard disk drive. Do not touch the circuit board **5** on the bottom of the hard disk drive.

   Note: If you are installing a 2.5-inch hard disk drive, install the hard disk drive into a 2.5-inch to 3.5-inch hard disk drive tray first and then install the tray into the blue bracket.
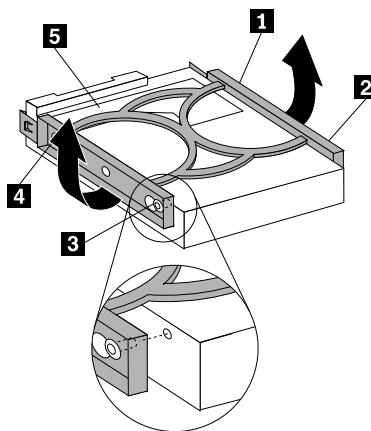
Figure 24. Installing the hard disk drive into the bracket

9. Slide the new hard disk drive with the blue bracket into the secondary hard disk drive cage until it snaps into position.

10. Slide the hard disk drive cage with the new hard disk drive into the chassis until it is directly underneath the metal tab **1**.
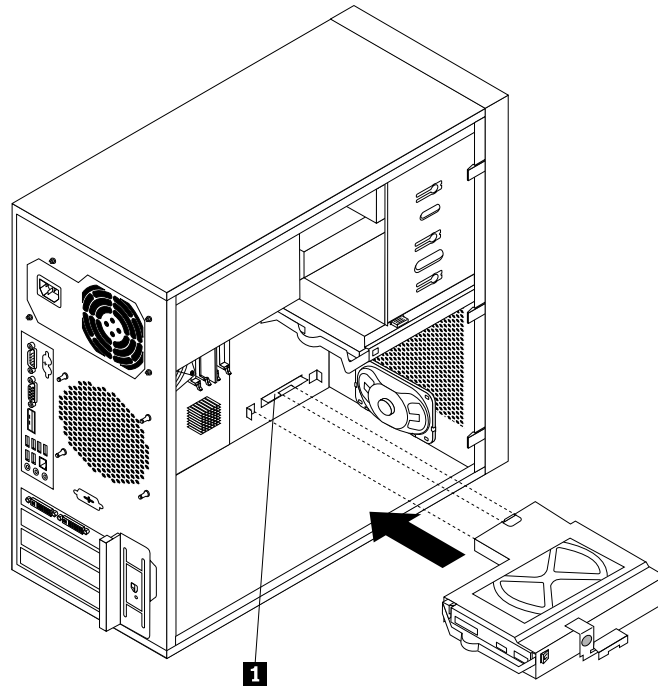
Figure 25. Installing the secondary hard disk drive

11. Press the hard disk drive cage downward until it snaps into position. Make sure that the hard disk drive cage is secured in the chassis.
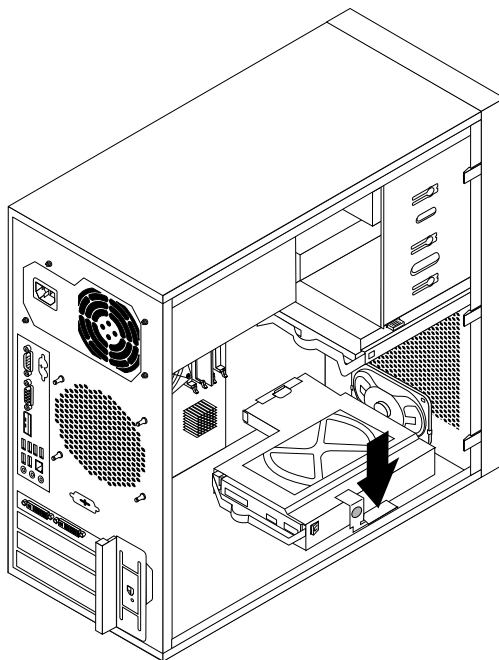
Figure 26. Installing the secondary hard disk drive

12. Connect one end of the signal cable to the hard disk drive and the other end to an available SATA connector on the system board. See "Locating parts on the system board" on page 11. Then, locate an available five-wire power connector and connect it to the hard disk drive.
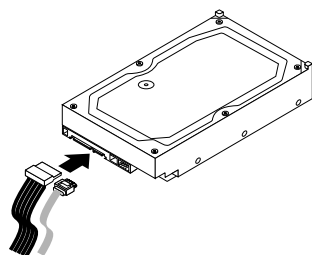
Figure 27. Connecting a SATA hard disk drive

Installing, removing, or replacing hardware devices

This section provides instructions on how to install, remove, or replace hardware devices for your server. You can maintain your server by replacing the failing hardware devices. If you are replacing a hardware device, perform the removal procedure and then perform the installation procedure for the hardware device that you want to replace.

Replacing the power supply assembly

Attention:
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
http://www.lenovo.com/support

This section provides instructions on how to replace the power supply assembly.

Although there are no moving parts in your server after the power cord has been disconnected, the following warnings are required for your safety and proper Underwriters Laboratories (UL) certification.
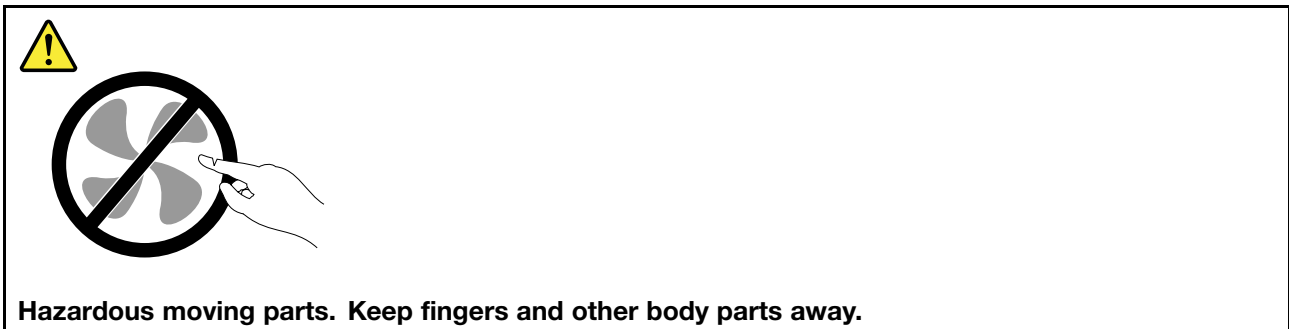
⚠️**DANGER**

Hazardous moving parts. Keep fingers and other body parts away.

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.

To replace the power supply assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See "Removing the server cover" on page 17.

3. Lay the server on its side and disconnect the power supply assembly cables from the system board and all drives. See "Locating parts on the system board" on page 11.

4. Remove the four screws at the rear of the chassis that secure the power supply assembly.
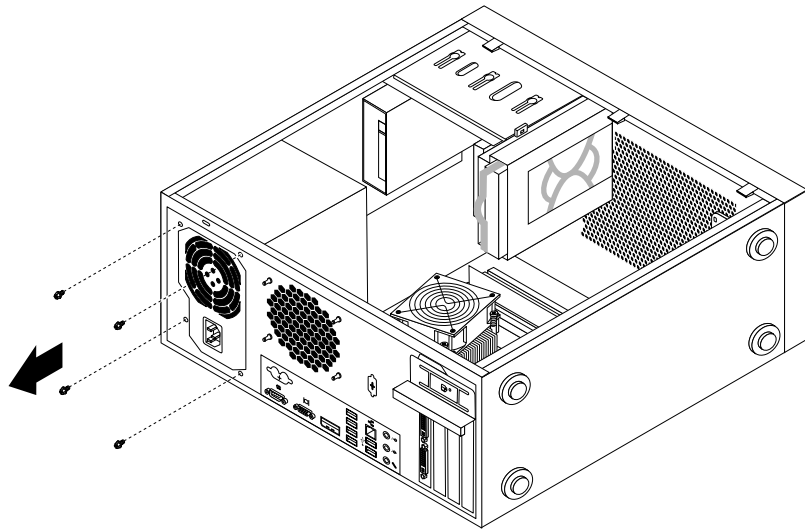
Figure 28. Removing the screws that secure the power supply assembly

5. Slide the power supply assembly a little bit forward and then remove it from the chassis.
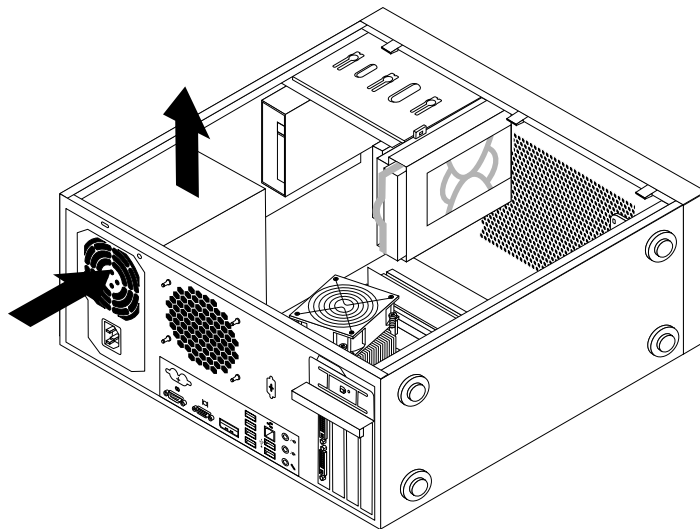
Figure 29. Removing the power supply assembly

6. Ensure that the new power supply assembly is the correct replacement.
7. Install the new power supply assembly into the chassis so that the screw holes in the power supply assembly align with those in the chassis.
8. Install and tighten the four screws to secure the power supply assembly.

   Note: Use only screws provided by Lenovo.

9. Reconnect the power supply assembly cables to the system board and each of the drives.
10. Secure the power supply assembly cables with the cable clips and ties in the chassis.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to "Completing the parts replacement" on page 48.

Replacing the heat sink and fan assembly

Attention:
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
http://www.lenovo.com/support

This section provides instructions on how to replace the heat sink and fan assembly.

CAUTION:

Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

To replace the heat sink and fan assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 17.
3. Lay the server on its side for easier access to the system board.
4. Locate the heat sink and fan assembly. See "Locating parts on the system board" on page 11.
5. Disconnect the heat sink and fan assembly cable from the microprocessor fan connector on the system board. See "Locating parts on the system board" on page 11.

6. Follow this sequence to remove the four screws that secure the heat sink and fan assembly to the system board:

   a. Partially remove screw **1**, then fully remove screw **2**, and then fully remove screw **1**.

   b. Partially remove screw **3**, then fully remove screw **4**, and then fully remove screw **3**.

   Note: Carefully remove the four screws from the system board to avoid any possible damage to the system board. The four screws cannot be removed from the heat sink and fan assembly.
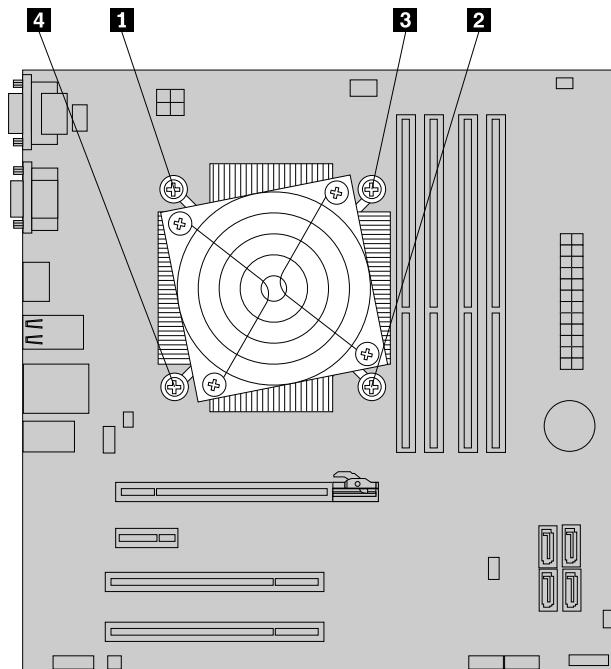
Figure 30. Removing the heat sink and fan assembly

7. Lift the failing heat sink and fan assembly off the system board.

   Notes:

   a. You might have to gently twist the heat sink and fan assembly to free it from the microprocessor.

   b. While handling the heat sink and fan assembly, do not touch the thermal grease on the bottom of it.

8. Place the new heat sink and fan assembly on the system board so that the four screws on the heat sink and fan assembly are aligned with the corresponding holes on the system board. Make sure that you properly place the heat sink and fan assembly so that you can easily connect the heat sink and fan assembly cable to the microprocessor fan connector on the system board.

9. Follow this sequence to install the four screws to secure the new heat sink and fan assembly. See Figure 30 "Removing the heat sink and fan assembly" on page 38.

   a. Partially tighten screw **1**, then fully tighten screw **2**, and then fully tighten screw **1**.

   b. Partially tighten screw **3**, then fully tighten screw **4**, and then fully tighten screw **3**.

   Note: Do not over-tighten the screws.

10. Connect the heat sink and fan assembly cable to the microprocessor fan connector on the system board. See "Locating parts on the system board" on page 11.

What to do next:

• To work with another piece of hardware, go to the appropriate section.

• To complete the replacement, go to "Completing the parts replacement" on page 48.

Replacing the front audio and USB assembly

Attention:
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
http://www.lenovo.com/support

This section provides instructions on how to replace the front audio and USB assembly.

To replace the front audio and USB assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See "Removing the server cover" on page 17.

3. Remove the front bezel. See "Removing and reinstalling the front bezel" on page 18.

4. Disconnect the front audio and USB assembly cable from the system board. See Chapter 4 "Locating parts, controls, and connectors" on page 9.

5. Note the front audio and USB assembly cable routing and remove the screw that secures the front audio and USB assembly. Then, remove the front audio and USB assembly from the chassis.
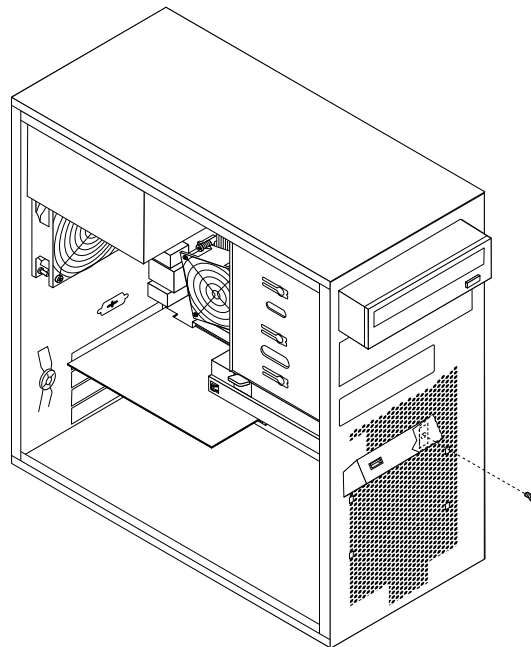
Figure 31. Removing the front audio and USB assembly

6. Route the new front audio and USB assembly through the hole in the chassis.

7. Position the new front audio and USB assembly to the chassis so that the screw hole in the new front audio and USB assembly is aligned with the corresponding hole in the chassis.

8. Install the screw to secure the new front audio and USB assembly in place.

9. Connect the new front audio and USB assembly cables to the system board. See Chapter 4 "Locating parts, controls, and connectors" on page 9.

10. Reinstall the front bezel. See "Removing and reinstalling the front bezel" on page 18.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to "Completing the parts replacement" on page 48.

Replacing the front fan assembly

> **Attention:**
> Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
> http://www.lenovo.com/support

Depending on the model type, your server might have a front fan assembly installed. This section provides instructions on how to replace the front fan assembly.

To replace the front fan assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 17.
3. Remove the front bezel. See "Removing and reinstalling the front bezel" on page 18.
4. Disconnect the front fan assembly cable from the power fan connector on the system board. See "Locating parts on the system board" on page 11.

   Note: If your server has a secondary hard disk drive installed, remove the secondary hard disk drive to get easier access to the power fan connector on the system board. See "Installing or replacing the secondary hard disk drive" on page 31.

5. Release the two tabs **1** that attach the front fan assembly to the chassis as shown and then completely remove the front fan assembly from the chassis.
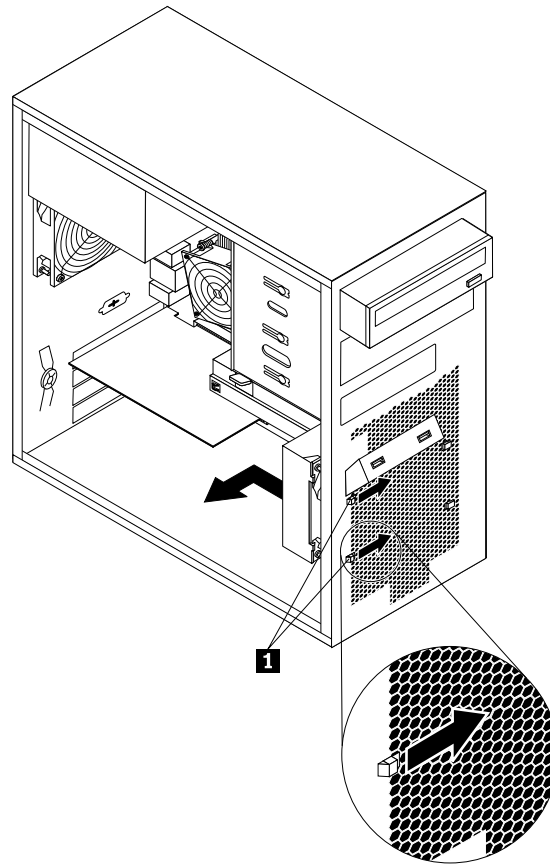
Figure 32. Removing the front fan assembly

6. Insert the two tabs **2** of the new front fan assembly into the corresponding holes in the chassis, and press the other two tabs **1** through the holes until the front fan assembly is secured in place.
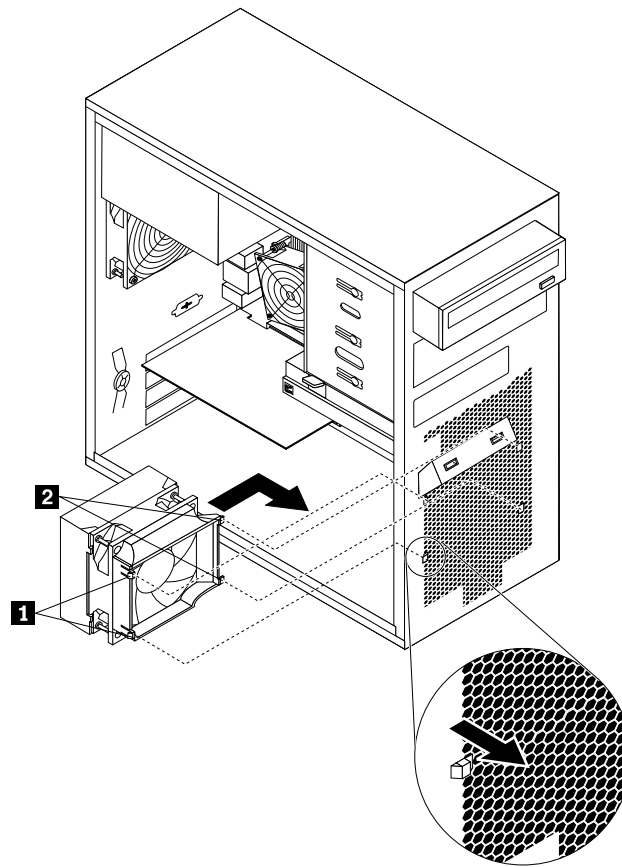
Figure 33. Installing the front fan assembly

7. Connect the new front fan assembly cable to the power fan connector on the system board. See "Locating parts on the system board" on page 11.

What to do next:

- To work with another piece of hardware, go to the appropriate section.

- To complete the replacement, go to "Completing the parts replacement" on page 48.

Replacing the rear fan assembly

Attention:
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
http://www.lenovo.com/support

This section provides instructions on how to replace the rear fan assembly.

To replace the rear fan assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See "Removing the server cover" on page 17.

3. Locate the rear fan assembly. See "Internal components" on page 12.

4. Disconnect the rear fan assembly cable from the system fan connector on the system board. See "Locating parts on the system board" on page 11.

5. The rear fan assembly is attached to the chassis by four rubber mounts. Remove the rear fan assembly by cutting the rubber mounts and gently pulling the rear fan assembly out of the chassis.
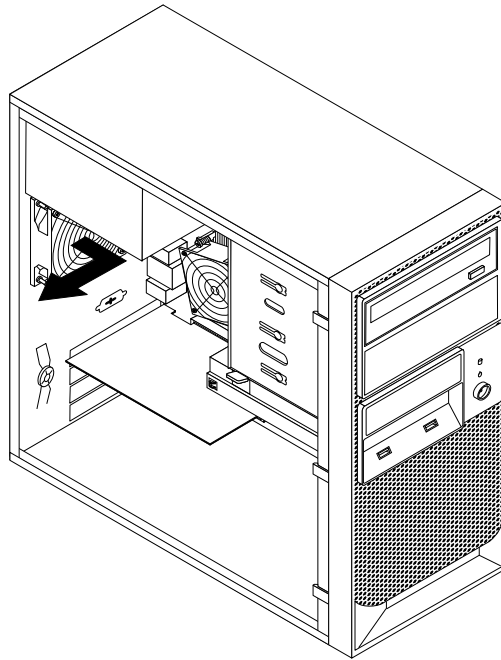
Figure 34. Removing the rear fan assembly

6. Install the new rear fan assembly by aligning the new rubber mounts with the corresponding holes in the chassis and push the rubber mounts through the holes.

   Note: The new rear fan assembly will have four new rubber mounts attached.

7. Carefully pull on the tips of the rubber mounts until the new rear fan assembly is secured in place.
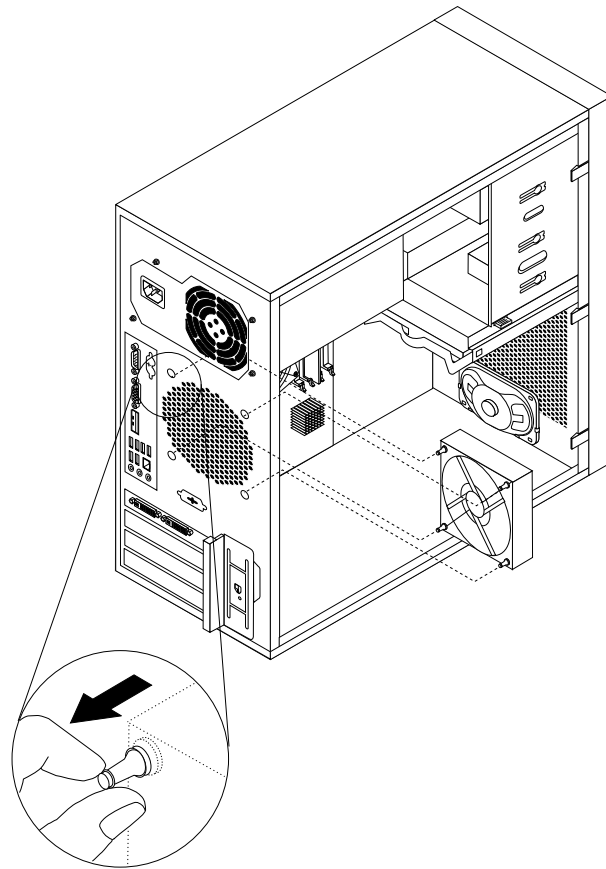
Figure 35. Installing the rear fan assembly

8. Connect the new rear fan assembly cable to the system fan connector on the system board. See "Locating parts on the system board" on page 11.

What to do next:

• To work with another piece of hardware, go to the appropriate section.

• To complete the replacement, go to "Completing the parts replacement" on page 48.

Replacing the microprocessor

Attention:
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
http://www.lenovo.com/support

This section provides instructions on how to replace the microprocessor.

CAUTION:

The heat sink and microprocessor might be very hot. Turn off the computer and wait three to five minutes to let the computer cool before removing the computer cover.

To replace the microprocessor, do the following:

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.

2. Remove the computer cover. See "Removing the server cover" on page 17.

3. Lay the computer on its side for easier access to the system board.

4. Locate the system board and disconnect all cables connected to the system board. See "Locating parts on the system board" on page 11.

5. Remove the heat sink and fan assembly. See "Replacing the heat sink and fan assembly" on page 37.

   Note: Place the heat sink and fan assembly on its side so that the thermal grease on the bottom of it does not get in contact with anything.

6. Lift the small handle **1** and open the retainer **2** to access the microprocessor **3**.
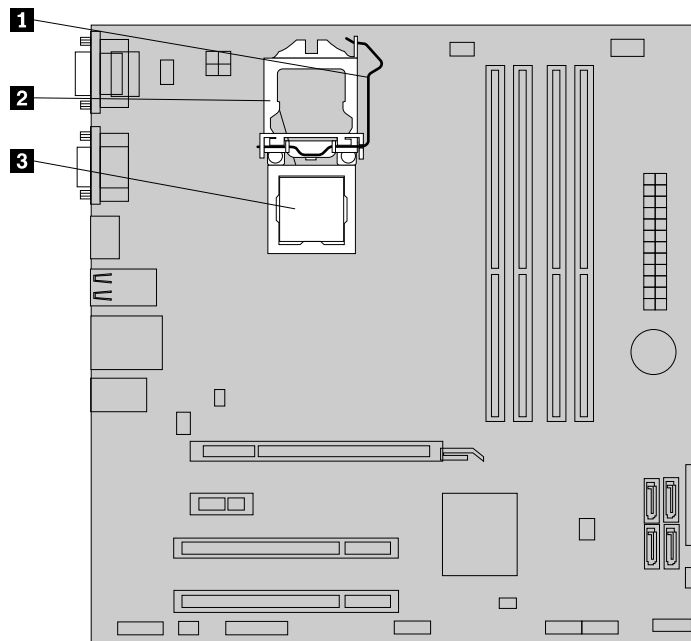
Figure 36. Accessing the microprocessor

7. Lift the microprocessor straight up and out of the microprocessor socket.
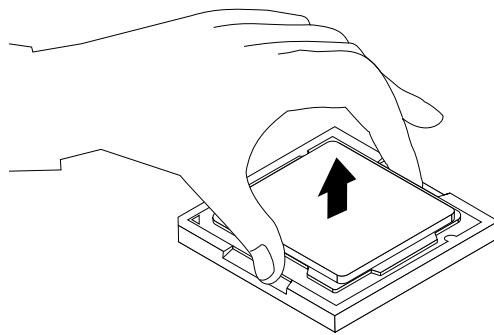
Figure 37. Removing the microprocessor

Notes:

a. Your microprocessor and socket might look different from the one illustrated.

b. Note the orientation of the microprocessor in the socket. You can either look for the small triangle **1** on one corner of the microprocessor or note the orientation of the notches **2** on the microprocessor. This is important when installing the new microprocessor on the system board.
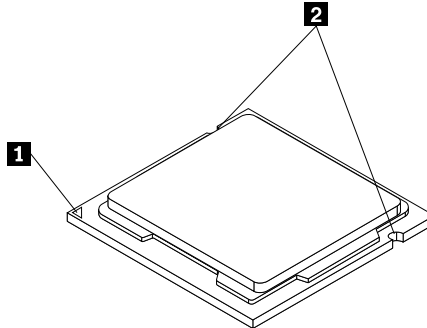
c. Touch only the edges of the microprocessor. Do not touch the gold contacts on the bottom.

d. Do not drop anything onto the microprocessor socket while it is exposed. The socket pins must be kept as clean as possible.

8. Make sure that the small handle is in the raised position and the microprocessor retainer is fully open.

9. Remove the protective cover that protects the gold contacts of the new microprocessor.

10. Hold the new microprocessor by its sides and align the small triangle on one corner of the new microprocessor with the corresponding small triangle on one corner of the microprocessor socket.

11. Lower the new microprocessor straight down into the microprocessor socket on the system board.
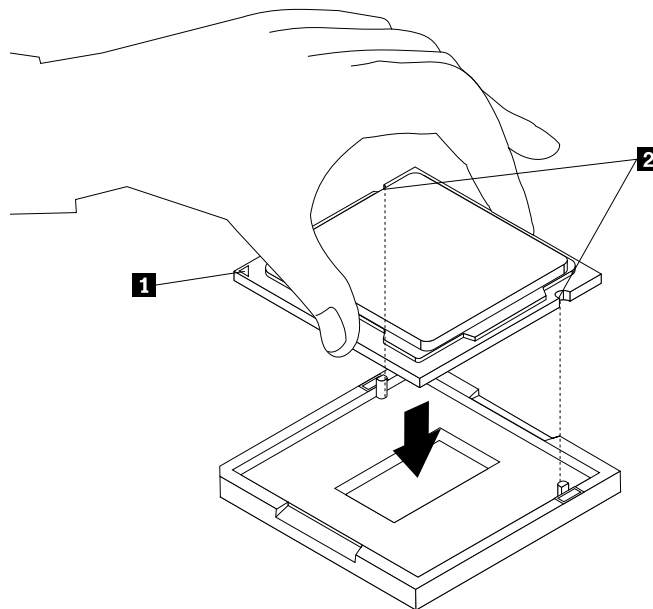
Figure 38. Installing the microprocessor

12. Close the microprocessor retainer and lock it into position with the small handle to secure the new microprocessor in the socket.

13. Reinstall the heat sink and fan assembly. See "Replacing the heat sink and fan assembly" on page 37.

14. Reconnect all cables that were disconnected from the system board.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to "Completing the parts replacement" on page 48.

Replacing the system board battery

> **Attention:**
> Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that came with your product, and "Guidelines" on page 15. To obtain a copy of the publications, go to:
> http://www.lenovo.com/support

This section provides instructions on how to replace the system board battery.

Your server has a special type of memory that maintains the date, time, and configuration information for built-in features. The system board battery keeps this information active when you turn off the server.

The system board battery normally requires no charging or maintenance throughout its life; however, no battery lasts forever. If the system board battery fails, the date, time, and configuration information, including passwords, are lost. An error message is displayed when you turn on the server.

Be sure to consider the following information when you replace the battery in the server:

- You must replace the battery with a lithium battery of the same type from the same manufacturer.
- To avoid possible danger, be sure to read and understand the following safety statement.
- After you replace the system board battery, you must reset passwords, system date and time, and reconfigure the server.

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.

To replace the system board battery, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 17.
3. Locate the system board battery. See Chapter 4 "Locating parts, controls, and connectors" on page 9.

4. Remove the old system board battery.
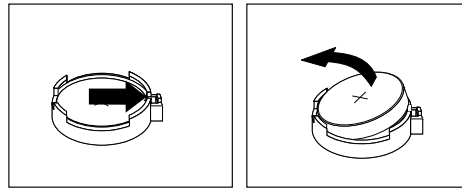
Figure 39. Removing the old system board battery

5. Install the new system board battery.
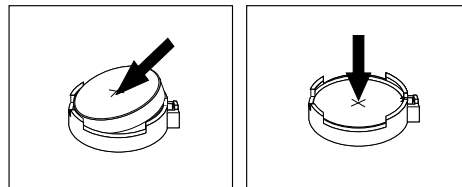
Figure 40. Installing the new system board battery

6. Reinstall the computer cover and connect the cables. See "Completing the parts replacement" on page 48.

   Note: When the computer is turned on for the first time after the battery is replaced, an error message might be displayed. This is normal after replacing the battery.

7. Turn on the computer and all attached devices.

8. Use the Setup Utility program to set the date, time, and any passwords. See Chapter 6 "Configuring the server" on page 53.

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

What to do next:

• To work with another piece of hardware, go to the appropriate section.

• To complete the replacement, go to "Completing the parts replacement" on page 48.

Completing the parts replacement

After completing the installation or replacement for all parts, you need to reinstall the server cover and reconnect cables.

To reinstall the server cover and reconnect cables to your server, do the following:

1. Make sure that all components have been reassembled correctly and that no tools or loose screws are left inside your server. See "Internal components" on page 12 for the locations of various components in your server.

2. If you have removed the front bezel, reinstall it. See "Removing and reinstalling the front bezel" on page 18.

3. Make sure that the cables are routed correctly before reinstalling the server cover. Keep cables clear of the hinges and sides of the server chassis to avoid interference with reinstalling the server cover.

4. Position the server cover on the chassis so that the rail guides on the bottom of the server cover engage the rails on the chassis. Then, slide the cover to the front of the server until it snaps into position.
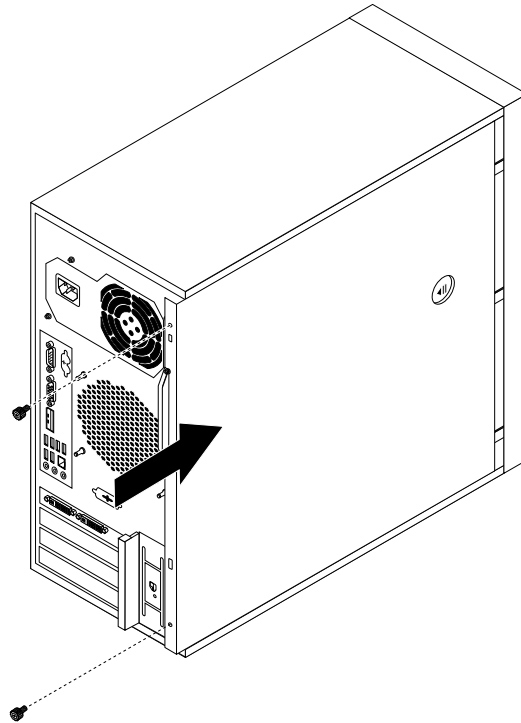
Figure 41. Reinstalling the server cover

5. Install the screws to secure the server cover.
6. Lock the server cover if you have a server cover lock. See "Integrated cable lock" on page 51 or "Padlock" on page 51.
7. Reconnect the external cables and power cords to the server. See "Front view" on page 9 and "Rear view" on page 9.
8. Depending on the parts you installed or replaced, you might need to confirm the updated information in the Setup Utility program. Refer to Chapter 6 "Configuring the server" on page 53.

Note: In most areas of the world, Lenovo requires the return of the defective Customer Replaceable Unit (CRU). Information about this will come with the CRU or will come a few days after the CRU arrives.

Connecting the cables

Attention: To prevent damage to equipment, connect the power cords after completing the parts replacement.

If the server cables and connector panel have color-coded connections, match the color of the cable end with the color of the connector. For example, match a blue cable end with a blue panel connector, a red cable end with a red connector, and so on. See "Rear view" on page 9 for an illustration of the I/O connectors on the rear of the server.

Turning on the server

When the server is connected to an ac power source but is not turned on, the operating system does not run, and all core logic except for the service processor (the integrated management module) is shut down;

however, the server can respond to requests to the service processor, such as a remote request to turn on the server.

After the server is connected to an ac power source, you can turn on the server by pressing the power button.

Turning off the server

When you turn off the server and leave it connected to an ac power source, the server can respond to requests to the service processor, such as a remote request to turn on the server. To remove all power from the server, you must disconnect the power cord from the server.

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

Statement 5

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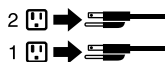
The server can be turned off in any of the following ways:

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will turn off automatically.
- You can press the power 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 button for more than four seconds to turn off the server.
- The server can be turned off through the Shutdown on LAN feature.
- The integrated management module (IMM) can turn off the server as an automatic response to a critical system failure.

Connecting external devices

If you install a supported optional adapter, you can attach external devices to the server.

To attach an external device, do the following:

Note: If you are attaching an external device, see the documentation that comes with the device for information about cabling.

1. Read and understand the *Safety Information* at http://www.lenovo.com/support, and "Guidelines" on page 15.
2. Turn off the server and all attached devices.
3. Follow the instructions that come with the device to prepare it for installation and to connect it to the server.

Updating the server configuration

When you start the server for the first time after you install or remove an internal option or external device, you might receive a message saying that the configuration has changed. The Setup Utility program starts automatically so that you can save the new configuration settings.

Some options have device drivers that you must install. For information about installing device drivers, see the documentation that comes with each option.

You can obtain device drivers for operating systems that are not preinstalled at http://www.lenovo.com/support. Installation instructions are provided in readme files with the device driver files.

Installing security features

There are several security options available to help you prevent hardware theft and unauthorized access to your server. In addition to physical locks, you can also prevent unauthorized use of your server by a software lock that locks the keyboard until a correct password is typed in.

Note: Make sure that any security cables you installed do not interfere with other server cables.

Integrated cable lock

An integrated cable lock, sometimes referred to as the Kensington lock, can be used to secure your server to a desk, table, or other non-permanent fixture. The cable lock attaches to the integrated cable lock slot at the rear of your server and is operated with a key. The cable lock also locks the buttons used to remove the server cover. This is the same type of lock used with many notebook computers. You can order an integrated cable lock directly from Lenovo by searching for *Kensington* at:
http://www.lenovo.com/support

Padlock

Your server is equipped with a padlock loop so that the cover cannot be removed when a padlock is installed.

Password protection

To deter unauthorized use of your server, you can use the Setup Utility program to set a password. When you turn on your server, you are prompted to type the password. The server cannot be used until a valid password is typed in. Refer to Chapter 6 "Configuring the server" on page 53 for more information.

Chapter 6. Configuring the server

The following configuration programs come with the server:

- **Setup Utility**
  The Setup Utility program is part of the server firmware. You can use the Setup Utility program to view your server configuration, change the startup device sequence, set the date and time, and set passwords. For information about using this program, see "Using the Setup Utility program" on page 53.
- **ThinkServer EasyStartup**
  For information about the ThinkServer EasyStartup program, see "Using the ThinkServer EasyStartup program" on page 72.
- **EasyUpdate Firmware Updater**
  For information about the EasyUpdate Firmware Updater program, see "Using the EasyUpdate Firmware Updater program" on page 71.

Using the Setup Utility program

The Setup Utility program is used to view and change the configuration settings of your computer, regardless of which operating system you are using. However, the operating system settings might override any similar settings in the Setup Utility program.

Starting the Setup Utility program

To start the Setup Utility program, do the following:

1. Make sure your computer is turned off.
2. Repeatedly press and release the F1 key when turning on the computer. When you hear multiple beeps or see a logo screen, release the F1 key.

   Note: If a Power-On Password or an Administrator Password has been set, the Setup Utility program menu will not be displayed until you type the correct password. For more information, see "Using passwords" on page 66.

When the POST detects that the hard disk drive has been removed from your computer or the memory module size has decreased, an error message will be displayed when you start the computer and you will be prompted to do one of the following:

- Press F1 to enter the Setup Utility program. After you enter the Setup Utility program, press F10 to save the settings and exit the Setup Utility program. The error message will not be displayed again.
- Press F2 to bypass the error message and log in to the operating system.

Introduction of the BIOS items

The following tables list all the main menus and items in the Setup Utility program.

Notes:

- Some items might vary due to BIOS updates.
- Some items are displayed on the menu only if the server supports the corresponding features.
- The default settings are already optimized for you. Use the default value for any item you are not familiar with. Do not change the value of unfamiliar items or items that are not mentioned in this topic to avoid unexpected problems. If you consider changing the server configuration, proceed with extreme caution. Setting the configuration incorrectly might cause unexpected results.

- Lenovo provides the BIOS update utility on the Lenovo Web site. You can download the BIOS image and follow the instructions on the Web site to update the BIOS. See "Updating system programs" on page 72. After updating the BIOS, all the BIOS settings become the default settings of the updated BIOS version. You need to check and reconfigure the BIOS settings for your specific needs.
- If you have changed any hardware in the server, you might need to reflash the BIOS and the RDX.

Table 3. Items under the Setup Utility program menu

Item	Description
Main	Set the basic BIOS parameters. See Table 4 "Items under the **Main** menu" on page 54.
Devices	Set the device parameters. See Table 7 "Items under the **Devices** menu" on page 55.
Advanced	Set the advanced BIOS parameters. See Table 14 "Items under the **Advanced** menu" on page 58.
Power	Set the power parameters. See Table 18 "Items under the **Power** menu" on page 61.
Security	Set the security parameters. See Table 20 "Items under the **Security** menu" on page 62.
Startup	From the currently detected boot devices, select the first boot device for system initialization. See Table 25 "Items under the **Startup** menu" on page 65.
Exit	Exit the Setup Utility program. See Table 26 "Items under the **Exit** menu" on page 66.

Table 4. Items under the **Main** menu

Item	Option or description
System Summary	Enter the submenu to view all the options. See Table 5 "Submenus under the **System Summary** menu" on page 55.
System Time & Date	Enter the submenu to view all the options. See Table 6 "Submenus under the **System Time & Date** menu" on page 55.
System Brand ID	Product Name
Machine Type and Model	Version
System Serial Number	Serial Number
Asset Tag	Asset Tag Number
System UUID	UUID
Ethernet MAC Address	XX-XX-XX-XX-XX-XX / Not Available
BIOS Revision Level	BIOS Version
BIOS Date (MM/DD/YYYY)	
Language	[English] / Français / Chinese
Notes:	
• [ ] indicates the default setting.	
• The default BIOS language is English. You can change it to French or Chinese on the **Main** menu.	

Table 5. Submenus under the **System Summary** menu

Item	Option or description
CPU Type	Show the CPU brand and CPU type.
CPU Speed	Show the CPU speed.
CPU Core Count	
Installed Memory	Show the total size of memory installed on the system board.
Memory Bus Speed	
Active Video	IGD/PEG/PCI
Onboard Audio	[Enabled] / Disabled
Onboard Ethernet	[Enabled] / Disabled
Fan 1	Operating / Not Operating
Fan 2	Operating / Not Operating
SATA Drive 0	None / Device type: Device model number
SATA Drive 1	None / Device type: Device model number
SATA Drive 2	None / Device type: Device model number
SATA Drive 3	None / Device type: Device model number
Note: [ ] indicates the default setting.	

Table 6. Submenus under the **System Time & Date** menu

Item	Option	Description
System Time	HH:MM:SS	Set the system time.
System Date (MM / DD / YYYY)	MM / DD / YYYY	Set the system date.

Table 7. Items under the **Devices** menu

Item	Description
Serial Port Setup	Enter the submenu to view all the options. See Table 8 "Submenus under the **Serial Port Setup** menu" on page 56.
USB Setup	Enter the submenu to view all the options. See Table 9 "Submenus under the **USB Setup** menu" on page 56.
ATA Drive Setup	Enter the submenu to view all the options. See Table 10 "Submenus under the **ATA Drive Setup** menu" on page 56.
Video Setup	Enter the submenu to view all the options. See Table 11 "Submenus under the **Video Setup** menu" on page 57.
Audio Setup	Enter the submenu to view all the options. See Table 12 "Submenus under the **Audio Setup** menu" on page 57.
Network Setup	Enter the submenu to view all the options. See Table 13 "Submenus under the **Network Setup** menu" on page 58.
Note: Do not change the value of any unfamiliar items under the **Devices** menu.	

Table 8. Submenus under the **Serial Port Setup** *menu*

Item	Option	Description
Serial Port1 Address	Disabled, [3F8/IRQ4], 2F8/IRQ3, 3E8/IRQ4, 2E8/IRQ3	Disable or select settings for Serial Port 1.
Note: [ ] indicates the default setting.		

Table 9. Submenus under the **USB Setup** *menu*

Item	Option	Description
USB Support	[Enabled] / Disabled	Enable or disable USB functions. If it is disabled, no USB device can be used.
USB Legacy Support	[Enabled] / Disabled	Enable or disable the USB legacy support. When the USB legacy support is disabled, the USB keyboard and mouse will not function unless the device driver is installed.
Front USB Ports	[Enabled] / Disabled	Enable or disable front USB ports.
Rear USB Ports	[Enabled] / Disabled	Enable or disable rear USB ports.
USB Port 1	[Enabled] / Disabled	Enable or disable USB port 1.
USB Port 2	[Enabled] / Disabled	Enable or disable USB port 2.
USB Port 3	[Enabled] / Disabled	Enable or disable USB port 3.
USB Port 4	[Enabled] / Disabled	Enable or disable USB port 4.
USB Port 5	[Enabled] / Disabled	Enable or disable USB port 5.
USB Port 6	[Enabled] / Disabled	Enable or disable USB port 6.
USB Port 7	[Enabled] / Disabled	Enable or disable USB port 7.
USB Port 8	[Enabled] / Disabled	Enable or disable USB port 8.
Note: [ ] indicates the default setting.		

Table 10. Submenus under the **ATA Drive Setup** *menu*

Item	Option	Description
External SATA Port	[Enabled] / Disabled	Enable or disable the external SATA port.
SATA Controller	[Enabled] / Disabled	Enable or disable the SATA controller.
Configure SATA as	IDE / [AHCI] / RAID	Select this option to configure your system ATA drive. **Note:** Device driver support is required for AHCI and RAID. Depending on how the hard disk image was installed, changing this setting may prevent the system from booting.
Native Mode Operation	[Enabled] / Disabled	Enable or disable native mode for ATA.

Table 10. Submenus under the **ATA Drive Setup** *menu (continued)*

Item	Option	Description
Hard Disk Pre-delay	[Disabled] / 3 Seconds / 6 Seconds / 9 Seconds / 12 Seconds / 15 Seconds / 21 Seconds / 30 Seconds	Force the BIOS to delay the initialization of hard disk drives for up to 30 seconds. The delay provides your hard disk drives more time to spin up before the BIOS initializes them.
Note: [ ] indicates the default setting.		

Table 11. Submenus under the **Video Setup** *menu*

Item	Option	Description
Select Active Video	IGD / PEG / PCI / [Auto]	Select the primary video device that will be used for graphic output. If you select **Auto**, the system will prioritize video devices in the following sequence: PEG (PCI-e Graphics Device), PCI (PCI Graphics Device), and IGD (Internal Graphics Device). **Notes:** When you select **IGD**, the following items will be hidden: • Pre-Allocated Memory Size • Total Graphics Memory • Multi-Monitor Support
Pre-Allocated Memory Size	32 MB / 64 MB / [128 MB]	Memory allocated to IGD.
Total Graphics Memory	128MB / 256 MB / [Maximum]	Total memory allocated to graphics devices. **Note:** This function works only when you are using the Windows XP operating system on your server.
Multi-Monitor Support	Enabled / [Disabled]	Enable or disable the multi-monitor support function.
Note: [ ] indicates the default setting.		

Table 12. Submenus under the **Audio Setup** *menu*

Item	Option	Description
Onboard Audio Controller	[Enabled] / Disabled	Enable or disable the onboard audio controller.
Note: [ ] indicates the default setting.		

Table 13. Submenus under the **Network Setup** *menu*

Item	Option	Description
Onboard Ethernet Controller	[Enabled] / Disabled	Enable or disable the onboard Ethernet controller. **Note:** If you select **Disabled**, the Intel AMT related functions will be disabled.
Boot Agent	[PXE] / SMC / Disabled	Load the onboard PXE (Preboot Execution Environment) or SMC (Secure Managed Client). This feature enables the server to boot from a server image.
Note: [ ] indicates the default setting.		

Table 14. Items under the **Advanced** *menu*

Item	Description
CPU Setup	Enter the submenu to view all the options. See Table 15 "Submenus under the **CPU Setup** menu" on page 58.
Intel® Manageability	Enter the submenu to view all the options. See Table 16 "Submenus under the **Intel® Manageability** menu" on page 60.
Note: The above options might vary depending on the type of the microprocessor.	

Table 15. Submenus under the **CPU Setup** *menu*

Item	Option	Description
Intel® SpeedStep™ Technology	[Enabled] / Disabled	Enable or disable the Intel SpeedStep technology. This technology enables the system to dynamically adjust processor voltage and core frequency, which can result in decreased average power consumption and decreased average heat production.
Core Multi-Processing	[Enabled] / Disabled	Enable or disable the multi-core processing function.
Hyper Threading Technology	[Enabled] / Disabled	Enable or disable the Hyper Threading technology. This technology enables multiple logical processors within the same processor core to share execution resources and cache hierarchy.
Execute-Disable Bit	[Enabled] / Disabled	Enable or disable the Execute-Disable Bit function. This technology can prevent certain classes of malicious buffer overflow attacks if your server operating systems support this technology.

Table 15. Submenus under the **CPU Setup** *menu (continued)*

Item	Option	Description
Intel® Virtualization Technology	Enabled / [Disabled]	Enable or disable the Intel Virtualization technology. This technology can provide additional capacity for hardware computing. If you set this feature to **Enabled**, you have to turn off the server and disconnect the power cord from electrical outlet, and then reconnect the power cord and turn on the server to have this feature take effect.
VT-d	Enabled / [Disabled]	Enable or disable VT-d. VT-d support on Intel platforms provides the capability to ensure improved isolation of I/O resources for greater reliability, security, and availability.
TxT	Enabled / [Disabled]	Enable or disable TxT (Trusted Execution Technology). This technology provides hardware-based mechanisms that help protect against software-based attacks and protect the confidentiality and integrity of data stored or created on client computers. This setting might impact system performance. **Note:** If TxT is set to **Enabled**, the TCG security feature will be set to **Active** automatically.
C State Support	C1 / C1C3 / [C1C3C6]	Select supported CPU power management status to minimize the idle power consumption of the processor. • C1: C1 only • C1C3: C1 and C3 • C1C3C6: C1, C3, and C6
Turbo Mode	[Enabled] / Disabled	Enable or disable the Turbo mode. This function enables the processor to assess its own thermals, current, and power to come up with a dynamic upper limit on its frequeccy benefit.
CPU ID		
Microcode Revision (MM / DD / YYYY)	(MM / DD / YYYY)	

Notes:

1. [ ] indicates the default setting.

2. The above options might vary depending on the type of the microprocessor.

Table 16. Submenus under the **Intel® Manageability** *menu*

Item	Option	Description
Intel® Manageability Control	[Enabled] / Disabled	Enable or disable Intel Manageability Control. When this function is disabled: • If the system is provisioned, MEBx (Management Engine BIOS Extension) will be unprovisioned firstly. **Note:** When you are prompted to unprovision MEBx, press **YES**. • The manageability functions will be disabled. You can go into MEBx or the BIOS to re-enable this function.
Intel® Manageability Reset	Enabled / [Disabled]	Enable or disable the Intel Manageability Reset function. When this function is enabled, Intel Manageability settings will be reset to defaults. The MEBx password will also be reset.
Press <Ctrl-P> to enter MEBx	[Enabled] / Disabled	Enable or disable the Press <Ctrl-P> to enter MEBx function. This function provides platform-level configuration options for you to configure the Management Engine (ME) platform.
SOL Configuration		Enter the submenu to view all the options. See Table 17 "Submenus under the **SOL Configuration** menu" on page 60.
Notes: 1. [ ] indicates the default setting. 2. The above options might vary depending on the type of the microprocessor.		

Table 17. Submenus under the **SOL Configuration** *menu*

Item	Option	Description
SOL Configuration	Console types: • VT100 • VT100 , 8 bit • PC-ANSI, 7bit • PC-ANSI • [VT100+] • VT-UTF8 • ASCII	Select a console type.
Notes: 1. [ ] indicates the default setting. 2. The above options might vary depending on the type of the microprocessor.		

*Table 18. Items under the **Power** menu*

Item	Option	Description
After Power Loss	Power Off / Power On / [Last State]	This field shows whether the system will stay on after ac power is removed and then restored. • Select **Power On** if you are using a power strip to turn the system on. • Select **Power Off** if you want the system to remain off after the power is restored. • Select **Last State** to have the system return to the previous state.
Enhanced Power Saving Mode	[Disabled] / Enabled	Enable or disable Enhanced Power Saving Mode. When this function is enabled, the system will enter Enhanced Power Saving Mode when it is powered off. The total power consumption will be lower when it is turned off. **Note:** When Enhanced Power Saving Mode is enabled, only the Wake Up on Alarm function is supported. The Intel Manageability Management function cannot be used.
Smart Performance Choice	[Better Acoustic Performance] / Better Thermal Performance	Enable the system to enter the lower acoustic level or better thermal level.
Automatic Power On		Enter the submenus to view all the options. See Table 19 "Submenus under the **Automatic Power On** menu" on page 61.
Note: [ ] indicates the default setting.		

*Table 19. Submenus under the **Automatic Power On** menu*

Item	Option	Description
Wake on LAN	Primary / [Automatic] / Disabled	Enable or disable the Wake on LAN function and control which startup sequence to use after a Wake on LAN event. **Note:** This item controls the wake-up event from onboard LAN and PCI LAN.
Wake from PCI Modem	[Primary] / Automatic / Disabled	Enable or disable the Wake from PCI Modem function and control which startup sequence to use after a PCI modem wake-up event.

Table 19. Submenus under the **Automatic Power On** *menu (continued)*

Item	Option	Description
Wake from Serial Port Ring	[Primary] /Automatic / Disabled	Enable or disable the Wake from Serial Port Ring function and controls which startup sequence to use after a serial port wake-up event.
Wake from PCI Device	[Primary] / Automatic / Disabled	Enable or disable the Wake from PCI Device function and control which startup sequence to use after a PCI device wake-up event.
Wake Up on Alarm	Single Event / Daily Event / Weekly Event / [Disabled]	Enable or disable the Wake up on Alarm function. This function enables you to turn on your system on a day of the month, a day of the week, or daily. **Note:** Values in these fields might be overridden by the operating system.
Startup Sequence	[Primary] / Automatic	Select the startup sequence after a Wake Up on Alarm event.
Alarm Time (HH:MM:SS)	[00]:00:00	Specify the time when the system is to wake up.
Alarm Date (MM/DD/YYYY)	[01] / 01 / 1999	Specify the date when the system is to wake up.
Alarm Day of Week	[Sunday] / Monday / Tuesday / Wednesday /Thursday / Friday / Saturday	Select the day of the week when the system is to wake up.
Note: [ ] indicates the default setting.		

Table 20. Items under the **Security** *menu*

Item	Option	Description
Hardware Password Manager	[Enabled] / Disabled	
Current setting	Registered / Disabled / [Enabled]	
Administrator Password	Not Installed / Installed	
Power-On Password	Not Installed / Installed	
Set Administrator Password	Enter	Configure this item to set, change, or delete the Administrator Password. To set a password, use characters a-z and 0-9. Passwords are not case sensitive. **Note:** To delete the Administrator Password, clear the corresponding fields for each password.
Set Power-On Password	Enter	Configure this item to set, change, or delete the Administrator Password. To set a password, use characters a-z and 0-9. Passwords are not case sensitive. **Note:** To delete the Power-On Password, clear the corresponding fields for each password.

Table 20. *Items under the* **Security** *menu (continued)*

Item	Option	Description
Require Admin Password when Flashing	Yes / [No]	If **No** is selected, the Administrator Password will not be required when updating the system software.
Require POP on Restart	Yes / [No]	If **No** is selected, the Power-On Password will only be required when the system is started with a cold boot.
Hard Disk Password		Enter the submenus to view all the options. See Table 21 "Submenus under the **Hard Disk Password** menu" on page 63.
Fingerprint Setup		Enter the submenus to view all the options. See Table 22 "Submenus under the **Fingerprint Setup** menu" on page 64.
TCG Feature Setup		Enter the submenus to view all the options. See Table 23 "Submenus under the **TCG Feature Setup** submenu" on page 64.
System Event Log		Enter the submenus to view all the options. See Table 24 "Submenus under the **System Event Log** menu" on page 64.
Configuration Change Detection	Enabled / [Disabled]	Enable or disable Configuration Change Detection.
Note: [ ] indicates the default setting.		

Table 21. *Submenus under the* **Hard Disk Password** *menu*

Item	Option	Description
SATA Drive 0 Password	[Disabled] / User / User + Master	The Hard Disk Password prevents unauthorized users from accessing the data on the hard disk drive. In addition to the User Password, an optional Master Password can be used to recover the hard disk drive if the User Password is lost. **Note:** If multiple hard disk drives are present, it is recommended to set the same password for all the hard disk drives.
SATA Drive 1 Password	[Disabled] / User / User + Master	The Hard Disk Password prevents unauthorized users from accessing the data on the hard disk drive. In addition to the User Password, an optional Master Password can be used to recover the hard disk drive if the User Password is lost. **Note:** If multiple hard disk drives are present, it is recommended to set the same password for all the hard disk drives.

Table 21. Submenus under the **Hard Disk Password** *menu (continued)*

Item	Option	Description
Require HDP on Restart	Yes / [No]	If **No** is selected, the Hard Disk Password will only be required when the system is started with a cold boot. **Note:** It is highly recommended to set this value to **Yes** to achieve the highest level of security.
Note: [ ] indicates the default setting.		

Table 22. Submenus under the **Fingerprint Setup** *menu*

Item	Option	Description
Preboot Authentication	[Enabled] / Disabled	Enable or disable the fingerprint reader function for BIOS password input.
Erase Fingerprint Data	Yes / [No]	Select whether to clear fingerprint data stored in a fingerprint reader.
Note: [ ] indicates the default setting.		

Table 23. Submenus under the **TCG Feature Setup** *submenu*

Item	Option	Description
TCG Security Feature	Active / [Inactive] / Disabled	Change the TCG Security Feature settings. • **Active**: The feature is fully functional. • **Inactive**: The feature is visible, but is not functional. • **Disabled**: The feature is hidden and not functional. **Note:** When you set it as **Inactive** or **Disabled**, the TxT will be set to **Disabled** automatically.
Clear TCG Security Feature	Yes / [No]	Select whether to clear TCG Security Feature settings.
Note: [ ] indicates the default setting.		

Table 24. Submenus under the **System Event Log** *menu*

Item	Description
View System Event Log	View the system event log.
Clear System Event Log	Clear the system event log.

*Table 25. Items under the **Startup** menu*

Item	Option	Description
Primary Boot Sequence		This sequence is used when the system starts normally. Press the Up and Down arrow keys to select a device.
Automatic Boot Sequence		This sequence is used when a communication device wakes the system up. Press the Up and Down arrow keys to select a device.
Error Boot Sequence		This sequence is used when the BIOS determines that an error has occurred. Press the Up and Down arrow keys to select a device.
Boot Mode	[Auto] / UEFI / Legacy	Choose boot policy: • **Auto**: The system will prioritize boot options in bootable devices by running UEFI boot options first and then processing Legacy boot options. • **UEFI**: The system will boot from UEFI bootable devices only. • **Legacy**: The system will boot from Legacy bootable devices only.
Quick Boot	[Enabled] / Disabled	Select **Enabled** to obtain the fastest boot time. Select **Disabled** to test for a stuck key during the POST and you may hear a beep after POST completes.
Boot Up Num-Lock Status	[On] / Off	This field indicates the state of the NumLock feature of the keyboard after startup. • If NumLock is **On**, the keys on the keyboard will act as numeric keys. • If NumLock is **Off**, the keys on the keyboard will act as cursor keys.
Keyboardless Operation	Enabled / [Disabled]	Enable or disable the keyboardless operation. This function enables the system to function without a keyboard. It is commonly used when the system has been set up as a network server. **Note:** If it is enabled, systems without keyboards will not display keyboard errors during the POST.
Option Keys Display	[Enabled] / Disabled	Enable or disable the Option Keys Display function. When this function is enabled, the system software option key (such as the F1 key) prompts will be displayed. **Note:** Disabling the prompts will not affect the function of a specific key.

Item	Option	Description
Option Keys Display Style	[Normal] / Legacy	Control the prompts displayed on the POST logo screen. • **Normal**: During the POST, this message will be displayed: `To interrupt normal startup, press Enter.` • **Legacy**: During the POST, this message will be displayed: `Press F1 to enter Setup and press F12 to display Boot Menu.`
Startup Device Menu Prompt	[Enabled] / Disabled	Enable or disable the Startup Device Menu Prompt. This function enables the Startup Device Menu to be displayed by pressing F12 after the server is turned on. The Startup Device Menu enables the sequence of startup devices to be temporarily changed.
Note: [ ] indicates the default setting.		

*Table 26. Items under the **Exit** menu*

Item	Description
Save Changes and Exit	Exit the Setup Utility program after saving the changes.
Discard Changes and Exit	Exit the Setup Utility program without saving any changes.
Load Optimal Defaults	Restore/Load default values for all the setup options.

Viewing and changing settings

The Setup Utility program menu lists various items about the system configuration. To view or change settings, start the Setup Utility program. See "Starting the Setup Utility program" on page 53. Then, follow the instructions on the screen.

You can use either the keyboard or the mouse to navigate through BIOS menu choices. The keys used to perform various tasks are displayed at the bottom of each screen.

Using passwords

By using the Setup Utility program, you can set passwords to prevent unauthorized access to your computer and data. The following types of passwords are available:

• Power-On Password

• Administrator Password

• Hard Disk Password

You do not have to set any passwords to use your computer. However, using passwords improves computing security. If you decide to set any passwords, read the following sections.

Password considerations

A password can be any combination of up to 64 alphabetic and numeric characters. For security reasons, it is recommended to use a strong password that cannot be easily compromised. To set a strong password, use the following guidelines:

- Have at least eight characters in length
- Contain at least one alphabetic character and one numeric character
- Setup Utility program and hard disk drive passwords are not case sensitive
- Not be your name or your user name
- Not be a common word or a common name
- Be significantly different from your previous passwords

Power-On Password

When a Power-On Password is set, you are prompted to type a valid password each time the computer is turned on. The computer cannot be used until the valid password is typed in.

Administrator Password

Setting an Administrator Password deters unauthorized users from changing configuration settings. If you are responsible for maintaining the configuration settings of several computers, you might want to set an Administrator Password.

When an Administrator Password is set, you are prompted to type a valid password each time you try to access the Setup Utility program. The Setup Utility program cannot be accessed until a valid password is typed in.

If both the Power-On Password and Administrator Password are set, you can type either password. However, you must use your Administrator Password to change any configuration settings.

Hard Disk Password

Setting a Hard Disk Password prevents unauthorized access to the data on the hard disk drive. When a Hard Disk Password is set, you are prompted to type a valid password each time you try to access the hard disk drive.

Notes:

- After you set a Hard Disk Password, your data on the hard disk drive is protected even if the hard disk drive is removed from one computer and installed in another.
- If the Hard Disk Password is forgotten, there is no way to reset the password or recover data from the hard disk drive.

Setting, changing, and deleting a password

To set, change, or delete a password, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 53.
2. From the Setup Utility program main menu, select **Security**.
3. Depending on the password type, select **Set Power-On Password**, **Set Administrator Password**, or **Hard Disk Password**.
4. Follow the instructions on the right side of the screen to set, change, or delete a password.

   Note: A password can be any combination of up to 64 alphabetic and numeric characters. For more information, see "Password considerations" on page 67.

Erasing lost or forgotten passwords (clearing CMOS)

This section provides instructions on how to erase lost or forgotten passwords, such as a user password.

To erase a lost or forgotten password, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See "Removing the server cover" on page 17.

3. Locate the Clear CMOS /Recovery jumper on the system board. See "Locating parts on the system board" on page 11.

4. Remove all parts and disconnect all cables that might prevent your access to the Clear CMOS /Recovery jumper.

   Note: If your server has a secondary hard disk drive installed, remove the secondary hard disk drive to access the Clear CMOS /Recovery jumper. See "Installing or replacing the secondary hard disk drive" on page 31.

5. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).

6. Reinstall all parts and reconnect all cables that have been removed.

7. Reinstall the server cover and reconnect the server power cord. See "Completing the parts replacement" on page 48.

8. Turn on the server and leave it on for approximately 10 seconds. Then, turn off the server by holding the power switch for approximately five seconds.

9. Repeat step 1 through step 4.

10. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).

11. Reinstall all parts and reconnect all cables that have been removed.

12. Reinstall the server cover and connect the power cords. See "Completing the parts replacement" on page 48.

Enabling or disabling a device

This section provides information on how to enable or disable user access to the following devices:

USB Setup	Use this option to enable or disable a USB connector. When a USB connector is disabled, the device connected to the USB connector cannot be used.
SATA Controller	When this feature is set to **Disabled**, all devices connected to the SATA connectors (such as hard disk drives or the optical drive) are disabled and cannot be accessed.
External SATA Port	When this option is set to **Disabled**, the device connected to the External SATA connector cannot be accessed.

To enable or disable a device, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 53.

2. From the Setup Utility program main menu, select **Devices**.

3. Depending on the device you want to enable or disable, do one of the following:

   • Select **USB Setup** to enable or disable a USB device.

   • Select **ATA Drive Setup** to enable or disable an internal or external SATA device.

4. Select the desired settings and press Enter.

5. Press F10 to save changes and exit the Setup Utility program. See "Exiting from the Setup Utility program" on page 69.

Selecting a startup device

If your computer does not start up from a device such as the disc or hard disk drive as expected, do one of the following to select the startup device you want.

Selecting a temporary startup device

Use this procedure to select a temporary startup device.

Note: Not all discs and hard disk drives are bootable.

1. Turn off your computer.
2. Repeatedly press and release the F12 key when turning on the computer. When the "Please select boot device" window opens, release the F12 key.
3. Select the desired startup device and press Enter. The computer will start up from the device you selected.

Note: Selecting a startup device from the "Please select boot device" window does not permanently change the startup sequence.

Selecting or changing the startup device sequence

To view or permanently change the configured startup device sequence, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 53.
2. From the Setup Utility program main menu, select **Startup**.
3. Select the devices for the Primary Startup Sequence, the Automatic Startup Sequence, and the Error Startup Sequence. Read the information displayed on the right side of the screen.
4. Press F10 to save changes and exit the Setup Utility program. See "Exiting from the Setup Utility program" on page 69.

Exiting from the Setup Utility program

After you finish viewing or changing settings, press Esc to return to the Setup Utility program main menu. You might have to press Esc several times. Do one of the following:

- If you want to save the new settings, press F10 to save and exit the Setup Utility program.
- If you do not want to save the settings, select **Exit ➔ Discard Changes and Exit**.
- If you want to return to the default settings, press F9 to load the default settings.

Configuring RAID

This topic provides information about how to configure Redundant Array of Independent Disks (RAID) for your server.

Note: The information about configuring RAID in this topic is applicable only in a Windows environment. For information about configuring RAID in a Linux environment, contact your Linux software provider.

RAID level

Your server must have the minimum number of SATA hard disk drives installed for the supported level of RAID to function:

- RAID Level 0 – Striped disk array
  - Two hard disk drives minimum
  - Better performance without fault tolerance
- RAID Level 1 – Mirrored disk array

- Two hard disk drives minimum
- Improved read performance and 100% redundancy

To install a secondary hard disk drive, refer to "Installing or replacing the secondary hard disk drive" on page 31.

Configuring the system BIOS to enable SATA RAID functionality

This section describes how to configure the system BIOS to enable SATA RAID functionality.

Note: Use the arrow keys on the keyboard to make selections.

To enable SATA RAID functionality, do the following:
1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 53.
2. Select **Devices → ATA Drive Setup**.
3. Select **Configure SATA as** and press Enter.
4. Select **RAID Mode** and press Enter.
5. Press F10 to save changes and exit the Setup Utility program.

Creating RAID volumes

This section describes how to use the Intel Matrix Storage Manager option ROM configuration utility to create RAID volumes.

To create RAID volumes, do the following:
1. Press Ctrl+I when prompted to enter the Intel Matrix Storage Manager option ROM configuration utility during system startup.
2. Use the up and down arrow keys to select **Create RAID Volume** and press Enter.
3. Type a proper RAID volume name in the **Name** field and press Tab.
4. Use the arrow keys to select a RAID level in the **RAID Level** field and press Tab.
5. If appropriate, use the arrow keys to select a stripe size in the **Stripe Size** field and press Tab.
6. Type a volume size in the **Capacity** field and press Tab.
7. Press Enter to initiate volume creation.
8. When prompted, press Y to accept the warning message and create the volume.
9. If desired, return to step 2 to create additional RAID volumes.
10. When finished, select **Exit** and press Enter.

Deleting RAID volumes

This section describes how to use the Intel Matrix Storage Manager option ROM configuration utility to delete RAID volumes.

To delete RAID volumes, do the following:
1. Press Ctrl+I when prompted to enter the Intel Matrix Storage Manager option ROM configuration utility during system startup.
2. Use the up and down arrow keys to select **Delete RAID Volume** and press Enter.
3. Use the arrow keys to select the RAID volume to be deleted and press Delete.
4. When prompted, press Y to confirm the deletion of the selected RAID volume. Deleting a RAID volume will reset the hard disk drives to non-RAID.
5. After deleting a RAID volume, you can:

- Return to step 2 to delete additional RAID volumes.
- See "Creating RAID volumes" on page 70 for RAID volume creation.
- Use the up and down arrow keys to select **Exit** and press Enter.

Resetting disks to non-RAID

This section describes how to reset your hard disk drives to non-RAID.

To reset your hard disk drives to non-RAID, do the following:

1. Press Ctrl+I when prompted to enter the Intel Matrix Storage Manager option ROM configuration utility during system startup.
2. Use the up and down arrow keys to select **Reset Disks to Non-RAID** and press Enter.
3. Use the arrow keys and the space key to mark individual physical hard disk drives to be reset, and then press Enter to complete the selection.
4. When prompted, press Y to confirm the reset action.
5. After resetting the hard disk drives to non-RAID, you can:

    - See "Deleting RAID volumes" on page 70 for RAID volume deletion.
    - See "Creating RAID volumes" on page 70 for RAID volume creation.
    - Use the up and down arrow keys to select **Exit** and press Enter.

Updating the firmware

The firmware in the server is periodically updated and is available for download on the Lenovo Support Web site. Go to http://www.lenovo.com/support to check for the latest level of firmware, such as the BIOS ROM file and RAID FW files.

When you replace a device in the server, you might have to either update the server with the latest version of the firmware that is stored in memory on the device or restore the pre-existing firmware from a diskette or CD image.

- The BIOS ROM file is stored in flash on the system board.
- The onboard SATA software RAID firmware is integrated into the BIOS ROM on the system board.

The Ethernet firmware is downloadable at http://www.lenovo.com/support.

Using the EasyUpdate Firmware Updater program

ThinkServer EasyUpdate Firmware Updater is a software application that enables you to maintain your system firmware up-to-date and helps you avoid unnecessary outages. Firmware Updater updates the server system and adapter firmware.

To update your system, do the following:

1. Go to http://www.lenovo.com/support.
2. Click **Download & Drivers → ThinkServer** and then follow the instructions on the Web page to download the ISO image for the EasyUpdate Firmware Updater program.
3. Burn the ISO image to a disc.
4. Set the optical drive as the first boot device and insert the disc into the optical drive. The server will proceed directly to the User Interface Application's introductory screen.
5. Read the messages and instructions displayed on the introductory screen. Then, click **Next** to proceed to the list of firmware updates available on the optical media.

6. Click **Apply** to begin the updates (click **Cancel** if you want to abort the updates and exit). All updates will run to completion, with each updater's native user interface kept visible to the user. When the User Interface Application regains control, you will see the results screen.

Before distributing the firmware update to other servers, ensure that your server can restart successfully without encountering hardware problems.

Notes:

1. If you have changed any hardware (except the hard disk drives) in the server, you must reflash the BIOS and the RDX.

2. After updating the BIOS, all the BIOS settings become the default settings of the updated BIOS version. You need to check and reconfigure the BIOS settings for your specific needs.

Using the ThinkServer EasyStartup program

The *ThinkServer EasyStartup* DVD simplifies the process of configuring your RAID controllers and installing an operating system. The program works in conjunction with your Windows operating-system installation disc to automate the process of installing the operating systems and associated device drivers.

If you did not receive a *ThinkServer EasyStartup* DVD with your server, you can download an image from the Lenovo Support Web site at: http://www.lenovo.com/support.

The EasyStartup program has the following features:

- Self-booting DVD
- Easy-to-use, language-selectable interface
- Integrated help system
- Automatic hardware detection
- RAID configuration utility
- Device drivers provided based on the server model and detected devices
- Selectable partition size and file system
- Support for multiple operating systems
- Installing the operating system and device drivers in an unattended mode to save time
- Creating a reuseable response file that can be used with similarly configured Lenovo servers to make future installations even faster

Updating system programs

This chapter provides information about updating the POST and BIOS, and how to recover from a POST and BIOS update failure.

Using system programs

System programs are the basic layer of software built into your computer. System programs include the POST, the BIOS, and the Setup Utility program. The POST is a set of tests and procedures that are performed each time you turn on your computer. The BIOS is a layer of software that translates instructions from other layers of software into electrical signals that the computer hardware can execute. You can use the Setup Utility program to view or change the configuration settings of your computer. See "Using the Setup Utility program" on page 53 for detailed information.

Your computer system board has a module called electrically erasable programmable read-only memory (EEPROM, also referred to as flash memory). You can easily update the POST, the BIOS, and the Setup

Utility program by starting your computer with a system-program-update disc or running a special update program from your operating system.

Lenovo might make changes and enhancements to the POST and BIOS. When updates are released, they are available as downloadable files on the Lenovo Web site at http://www.lenovo.com. Instructions for using the POST and BIOS updates are available in a TXT file that is included with the update files. For most models, you can download either an update program to create a system-program-update disc or an update program that can be run from the operating system.

Updating (flashing) the BIOS from a disc

This section provides instructions on how to update (flash) the BIOS from a disc.

Note: You can download a self-starting bootable disc image (known as an ISO image) with the system program updates to create a system-program-update disc. Go to:
http://www.lenovo.com/support

To update (flash) the BIOS from a disc, do the following:

1. Turn off your computer.
2. Repeatedly press and release the F12 key when turning on the computer. When the **Startup Device Menu** opens, release the F12 key.
3. On the **Startup Device Menu**, select the desired optical drive as the startup device. Then, insert the disc into this optical drive and press Enter. The update begins.
4. When prompted to change the serial number, it is suggested that you do not make this change by pressing N. However, if you do want to change the serial number, press Y, then type in the serial number and press Enter.
5. When prompted to change the machine type and model, it is suggested that you do not make this change by pressing N. However, if you do want to change the machine type and model, press Y, then type in the machine type and model and press Enter.
6. Follow the instructions on the screen to complete the update. After the update is completed, remove the disc from the optical drive.

Updating (flashing) the BIOS from your operating system

Note: Because Lenovo makes constant improvements to its Web sites, the Web page contents are subject to change without notice, including the contents referenced in the following procedure.

To update (flash) the BIOS from your operating system, do the following:

1. Go to http://www.lenovo.com/support.
2. Do the following to locate the downloadable files for your machine type:
   a. In the **Enter a product number** field, type your machine type and click **Go**.
   b. Click **Downloads and drivers**.
   c. Select **BIOS** from the **Refine results** drop-down list box to easily locate all the BIOS related links.
   d. Click the BIOS update link.
3. Click the TXT file that contains the instructions for updating (flashing) the BIOS from your operating system.
4. Print these instructions. This is very important because these instructions will not be displayed on the screen after the download begins.
5. Follow the printed instructions to download, extract, and install the update.

Recovering from a POST/BIOS update failure

If the power to your computer is interrupted while the POST and BIOS is being updated, your computer might not restart correctly. If this happens, perform the following procedure to recover from the POST and BIOS update failure. This procedure is commonly called Boot-block Recovery.

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.

2. Remove the computer cover. See "Removing the server cover" on page 17.

3. Locate the Clear CMOS /Recovery jumper on the system board. See "Locating parts on the system board" on page 11.

4. Remove any cables that impede access to the Clear CMOS /Recovery jumper.

5. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).

6. Reconnect any cables that were disconnected and reinstall the PCI card if removed.

7. Reinstall the computer cover and reconnect the power cords for the computer and monitor to electrical outlets. See "Completing the parts replacement" on page 48.

8. Turn on the computer and then insert the POST and BIOS update (flash update) disc into the optical drive. The recovery session begins. The recovery session will take two to three minutes. During this time, you will hear a series of beeps.

9. After the recovery session is completed, the series of beeps will end, and the system will automatically turn off. Remove the disc from the optical drive before the system completely turns off.

10. Repeat step 1 through step 4.

11. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).

12. Reconnect any cables that were disconnected and reinstall the PCI card if removed.

13. Reinstall the computer cover and reconnect any cables that were disconnected.

14. Turn on the computer to restart the operating system.

Chapter 7. Troubleshooting and diagnostics

This chapter describes some basic troubleshooting and diagnostic programs. If your server problem is not described here, see Chapter 9 "Help and service" on page 81 for additional troubleshooting resources.

This chapter provides information about the following topics:

- "Basic troubleshooting" on page 75
- "PC-Doctor for DOS" on page 76

Basic troubleshooting

The following tables provide information to help you troubleshoot your server problems.

Note: If you cannot correct the problem, have the server serviced. For a list of service and support telephone numbers, refer to the *Warranty and Support Information* document at: http://www.lenovo.com/support/phone

General problems

The following table describes the general problems and suggested actions to correct detected problems.

Symptom	Action
The server does not start when you press the power switch.	Verify that: • The power cord is correctly connected to the rear of the server and to a working electrical outlet. • If your server has a secondary power switch on the rear of the server, make sure that it is switched on. • The power indicator on the front of the server is on. • The server voltage matches the voltage available at the electrical outlet for your country or region.
The monitor screen is blank.	Verify that: • The monitor signal cable is correctly connected to the monitor and to the appropriate monitor connector on the server. • The monitor power cord is correctly connected to the monitor and to a working electrical outlet. • The monitor is turned on and the brightness and contrast controls are set correctly. • The server voltage matches the voltage available at the electrical outlet for your country or region. • If your server has two monitor connectors, be sure to use the connector on the graphics card.
The operating system does not start.	Verify that: • The startup sequence includes the device where the operating system resides. Usually, the operating system is on the hard disk drive. For more information, see "Selecting a startup device" on page 69.
The server beeps multiple times before the operating system starts.	Verify that no keys are stuck.

EasyStartup problems

The following table describes the EasyStartup problems and suggested actions to correct detected problems.

Table 27. ***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* **to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).**	
Symptom	**Action**
The *ThinkServer EasyStartup* DVD will not start.	• Make sure the server supports the EasyStartup program and has a startable (bootable) DVD drive. • If the startup (boot) sequence settings have been changed, make sure the DVD drive is first in the startup sequence. • If more than one DVD drive is installed, make sure that only one DVD drive is set as the primary drive. Start the EasyStartup DVD from the primary DVD drive.
The operating system installation program continuously loops.	Make more space available on the hard disk drive.
The EasyStartup program will not start the operating system medium.	Make sure that the operating system medium is supported by the EasyStartup program. See the *EasyStartup User Guide* for a list of supported operating system versions. The *EasyStartup User Guide* and compatibility notes are available through the EasyStartup program.

PC-Doctor for DOS

You can also download the latest version of the PC-Doctor for DOS diagnostic program from http://www.lenovo.com/support. The PC-Doctor for DOS diagnostic program runs independently of the Windows operating system. Use the PC-Doctor for DOS diagnostic program if you are unable to start the Windows operating system. You can run the PC-Doctor for DOS diagnostic program from a diagnostic disc that you created.

Creating a diagnostic disc

This section provides instructions on how to create a diagnostic disc.

To create a diagnostic disc, do the following:

1. Download a self-starting bootable CD/DVD image (known as an ISO image) of the diagnostic program from the following Web site:
   http://www.lenovo.com/support

2. Use any CD/DVD burning software to create a diagnostic disc with the ISO image.

Running the diagnostic program from a diagnostic disc

This section provides instructions on how to run the diagnostic program from a diagnostic disc that you created.

To run the diagnostic program from a diagnostic disc that you created, do the following:

1. Turn off your server.

2. Repeatedly press and release the F12 key when turning on the server. When the "Please select boot device" window opens, release the F12 key.

3. Select the optical drive that you want to use as the first boot device.

4. Insert the diagnostic disc into the optical drive and press Enter. The diagnostic program opens.

5. Follow the instructions on the screen to select the diagnostic test you want to run.

   Note: For additional help, press the F1 key.

6. Remove the diagnostic disc from the optical drive when you complete the diagnostic process.

Chapter 8. Information resources

You can use the information in this section to access useful resources relating to your computing needs.

Safety and Warranty

The *Safety Information* and the *Warranty and Support Information* at http://www.lenovo.com/support contain information on safety, setup, warranty, and notices. Read and understand all safety information before using this product.

Lenovo Web site (http://www.lenovo.com)

The Lenovo Web site provides up-to-date information and services to help you buy, upgrade, and maintain your computer. You can also do the following:

- Shop for desktop, workstation, and notebook computers, monitors, projectors, upgrades and accessories for your computer, and special offers.

- Purchase additional services, such as support for hardware, operating systems, application programs, network setup and configuration, and custom installations.

- Purchase upgrades and extended hardware repair services.

- Download the latest device drivers and software updates for your computer model.

- Access the online manuals for your products.

- Access the Lenovo Limited Warranty.

- Access troubleshooting and support information for your computer model and other supported products.

- Find the service and support phone numbers for your country or region.

- Find a Service Provider located near you.

Lenovo Support Web site

Technical support information is available at:
http://www.lenovo.com/support

This portal is updated with the latest information about the following subjects:

Downloads and Drivers	Download drivers, flash BIOS, and update your software.
Warranty	Check your warranty status and upgrade your warranty.
Technical Support	Click **Need Help?** for self-help tips to help diagnose a problem.
ThinkVantage	Learn more about ThinkVantage software to improve productivity and reduce cost.
Lenovo Forums	Search the community knowledge base for your computer to share and discover information with other users.
User Guides & Manuals	Read or print any publications related to your product.

Chapter 9. Help and service

This topic contains information about obtaining help and service.

Using the documentation

If you experience a problem with your computer, see Chapter 7 "Troubleshooting and diagnostics" on page 75. For information on additional resources to help you troubleshoot your computer problem, see Chapter 8 "Information resources" on page 79.

If you suspect a software problem, see the documentation that comes with the operating system or software program, including readme files and online help.

You can also get the latest technical information and download device drivers and updates from the Lenovo Support Web site at:
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.

The following services are available during the warranty period:

- **Problem determination** - Trained service 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) that apply to your hardware available.

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 *ThinkStation Safety and Warranty Guide* that comes with your computer for information about your warranty type and duration. You must retain your proof of purchase to obtain warranty service.

For a list of the Lenovo Support phone numbers for your country or region, go to http://www.lenovo.com/support/phone or refer to the *ThinkStation Safety and Warranty Guide* that comes 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 your hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

Using other services

If you travel with your computer or relocate it to a country where your desktop or notebook computer 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://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

Appendix A. Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service.

Lenovo may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

Lenovo (United States), Inc.
1009 Think Place - Building One
Morrisville, NC 27560
U.S.A.
Attention: Lenovo Director of Licensing

LENOVO PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. Lenovo may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

The products described in this document are not intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. The information contained in this document does not affect or change Lenovo product specifications or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Lenovo or third parties. All information contained in this document was obtained in specific environments and is presented as an illustration. The result obtained in other operating environments may vary.

Lenovo may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk.

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 estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Trademarks

The following terms are trademarks of Lenovo in the United States, other countries, or both:

Lenovo
The Lenovo logo
ThinkServer

Microsoft, Windows, and Windows Server are trademarks of the Microsoft group of companies.

Intel and Intel SpeedStep are trademark of Intel Corporation in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.

Polyvinyl Chloride (PVC) cable and cord notice

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

Recycling information

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. For information on recycling Lenovo products, go to:
http://www.lenovo.com/lenovo/environment/recycling

環境配慮に関して

本機器またはモニターの回収リサイクルについて

企業のお客様が、本機器が使用済みとなり廃棄される場合は、資源有効
利用促進法の規定により、産業廃棄物として、地域を管轄する県知事あ
るいは、政令市長の許可を持った産業廃棄物処理業者に適正処理を委託
する必要があります。また、弊社では資源有効利用促進法に基づき使用
済みパソコンの回収および再利用・再資源化を行う「PC 回収リサイク
ル・サービス」を提供しています。詳細は、
http://www.lenovo.com/social_responsibility/us/en/sustainability/
ptb_japan.htmlをご参照ください。

また、同法により、家庭で使用済みとなったパソコンのメーカー等に
よる回収再資源化が 2003 年 10 月 1 日よりスタートしました。詳細は、
http://www.lenovo.com/social_responsibility/us/en/sustainability/
ptb_japan.htmlをご参照ください。

重金属を含む内部部品の廃棄処理について

本機器のプリント基板等には微量の重金属（鉛など）が使用されてい
ます。使用後は適切な処理を行うため、上記「本機器またはモニターの
回収リサイクルについて」に従って廃棄してください。

Collecting and recycling a disused Lenovo computer or monitor

If you are a company employee and need to dispose of a Lenovo computer or monitor that is the property of the company, you must do so in accordance with the Law for Promotion of Effective Utilization of Resources. Computers and monitors are categorized as industrial waste and should be properly disposed of by an industrial waste disposal contractor certified by a local government. In accordance with the Law for Promotion of Effective Utilization of Resources, Lenovo Japan provides, through its PC Collecting and Recycling Services, for the collecting, reuse, and recycling of disused computers and monitors. For details, visit the Lenovo Web site at www.ibm.com/jp/pc/service/recycle/pcrecycle/. Pursuant to the Law for Promotion of Effective Utilization of Resources, the collecting and recycling of home-used computers and monitors by the manufacturer was begun on October 1, 2003. This service is provided free of charge for home-used computers sold after October 1, 2003. For details, visit the Lenovo Web site at www.ibm.com/jp/pc/service/recycle/personal/.

Disposing of Lenovo computer components

Some Lenovo computer products sold in Japan may have components that contain heavy metals or other environmental sensitive substances. To properly dispose of disused components, such as a printed circuit board or drive, use the methods described above for collecting and recycling a disused computer or monitor.

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 property. 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/recycling or contact your local waste disposal facility.

US & Canada Only

廢電池請回收

EU
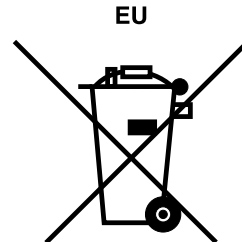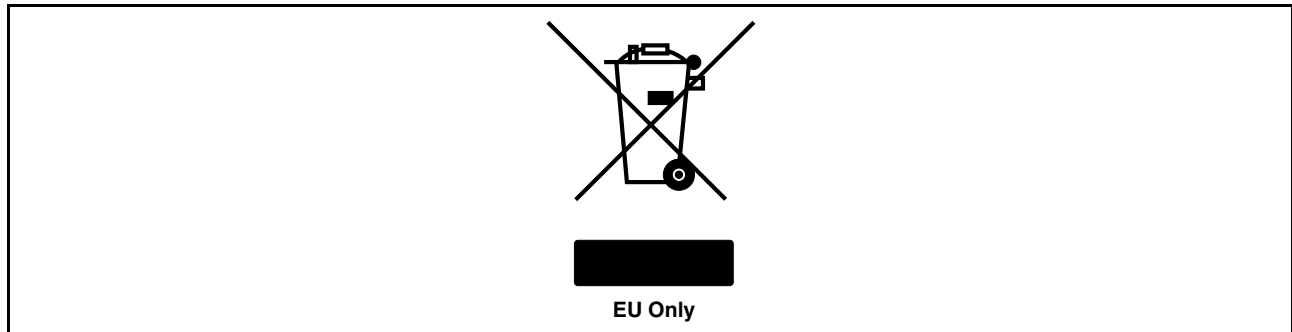
Requirements for Batteries Containing Perchlorate

The following statement applies to users in the state of California, U.S.A.

Perchlorate material: Special handling may apply. Go to:
http://www.dtsc.ca.gov/hazardouswaste/perchlorate

Important information for the European Directive 2002/96/EC

EU Only

The Waste Electrical and Electronic Equipment (WEEE) mark applies only to countries within the European Union (EU) and Norway. Appliances are 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. Users of electrical and electronic equipment (EEE) with the WEEE marking per Annex IV of the WEEE Directive must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, recovery of WEEE and minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. For additional WEEE information go to: http://www.lenovo.com/lenovo/environment.

Le marquage des déchets d'équipements électriques et électroniques (DEEE) s'applique uniquement aux pays de l'Union européenne (EU) et à la Norvège. Les appareils sont marqués conformément à la Directive 2002/96/CE du Conseil Européen relative aux déchets d'équipements électriques et électroniques (DEEE). Cette directive, applicable à l'ensemble des pays de l'Union européenne, concerne la collecte et le recyclage des appareils usagés. Ce marquage est apposé sur différents produits pour indiquer que ces derniers ne doivent pas être jetés, mais récupérés en fin de vie, conformément à cette directive. Les utilisateurs d'équipements électriques et électroniques portant le marquage DEEE, conformément à l'Annexe IV de la Directive DEEE, ne doivent pas mettre au rebut ces équipements comme des déchets municipaux non triés, mais ils doivent utiliser la structure de collecte mise à disposition des clients pour le retour, le recyclage et la récupération des déchets d'équipements électriques et électroniques, afin de réduire tout effet potentiel des équipements électriques et électroniques sur l'environnement et la santé en raison de la présence possible de substances dangereuses dans ces équipements. Pour plus d'informations sur les équipements électriques et électroniques, consultez le site http://www.lenovo.com/lenovo/environment.

Die WEEE-Kennzeichnung gilt nur in Ländern der Europäischen Union und in Norwegen. Geräte werden gemäß der Richtlinie 2002/96/EC der Europäischen Union über Elektro- und Elektronikaltgeräte (WEEE) gekennzeichnet. Die Richtlinie regelt die Rückgabe und Wiederverwertung von Altgeräten innerhalb der Europäischen Union. Mit dieser Kennzeichnung versehene Altgeräte dürfen gemäß dieser Richtlinie nicht weggeworfen werden, sondern müssen zurückgegeben werden. Anwender von Elektro- und Elektronikgeräten mit der WEEE-Kennzeichnung dürfen diese gemäß Annex IV der WEEE-Richtlinie nach ihrem Gebrauch nicht als allgemeinen Hausmüll entsorgen. Stattdessen müssen diese Geräte im verfügbaren Sammelsystem zurückgegeben werden und damit einem Recycling- oder Wiederherstellungsprozess zugeführt werden, bei dem mögliche Auswirkungen der Geräte auf die Umwelt und den menschlichen Organismus aufgrund gefährlicher Substanzen minimiert werden. Weitere Informationen zur Entsorgung von Elektro- und Elektronikaltgeräten finden Sie unter der Adresse: http://www.lenovo.com/lenovo/environment.

La marca de Residuos de equipos eléctricos y electrónicos (WEEE) se aplica sólo a los países pertenecientes a la Unión Europea (UE) y a Noruega. Los aparatos se etiquetan conforme a la Directiva Europea 2002/96/EC relativa a los residuos de equipos eléctricos y electrónicos (WEEE). La directiva determina el marco para devolver y reciclar los aparatos usados según sea aplicable en toda la Unión Europea. Esta etiqueta se

aplica a varios productos para indicar que el producto no se va a desechar, sino que va ser reclamado por esta Directiva, una vez termine su ciclo de vida. Los usuarios de los equipos eléctricos y electrónicos (EEE) con la marca WEEE por el Anexo IV de la Directiva WEEE no deben tratar los EEE como desperdicios municipales no clasificados, una vez terminado su ciclo de vida, sino que deben utilizar el marco de recogida disponible para devolver, reciclar y recuperar los WEEE y minimizar los posibles efectos de los EEE en el medio ambiente y en la salud debidos a la presencia de substancias peligrosas. Para obtener información adicional acerca de WEEE consulte el sitio: http://www.lenovo.com/lenovo/environment.

Il marchio WEEE (Waste Electrical and Electronic Equipment) viene applicato soltanto ai paesi all'interno dell'unione europea (EU) e norvegia. Le apparecchiature vengono etichettate in accordo con la direttiva europea 2002/96/EC riguardande lo smaltimento di apparecchiatura elettrica ed alettronica (WEEE). Le direttive determinano la procedura di restituzione e di riciclaggio delle apparecchiature usate in conformità con le normative dell'unione europea. Questa classificazione viene applicata a vari prodotti per indicare che il prodotto stesso non deve essere gettato ma riscattato al termine dell'utilizzo per quasta direttiva. Gli utenti di apparecchiature elettriche o elettroniche (EEE) marchiate WEEE secondo Annex IV della direttiva WEEE non devono disporre di fine utilizzo EEE come rifiuto, municipale non classificato, ma deve essere utilizzata la procedura di classificazione disponibile per il riscatto, riciclo, recupero del WEEE e minimizzare qualsiasi potenziale effetto della EEE sull'ambiente e sulla salute umana dovuto alla presenza di sostanze pericolose. Per ulteriori informazioni sulla WEEE visitare il sito: http://www.lenovo.com/lenovo/environment.

A marca REEE (Resíduos de Equipamentos Eléctricos e Electrónicos) aplica-se apenas aos Estados Membros da União Europeia e à Noruega. Os aparelhos eléctricos deverão ser identificados em conformidade com a Directiva Europeia 2002/96/CE relativa a REEE (Resíduos de Equipamentos Eléctricos e Electrónicos). A Directiva determina o enquadramento normativo relativamente à devolução e reciclagem de aparelhos eléctricos utilizados, conforme aplicável no espaço da União Europeia. Esta etiqueta deverá ser aposta em diversos produtos para indicar que os mesmos não poderão ser deitados fora, mas sim recuperados no final da respectiva vida útil, de acordo com a referida Directiva. Os utilizadores de equipamentos eléctricos e electrónicos (EEE) com a marca REEE em conformidade com o Anexo IV da Directiva REEE não poderão deitar fora os EEE no final da respectiva vida útil como lixo municipal não separado, devendo sim utilizar a estrutura de recolha que lhes tenha sido disponibilizada para efeitos de devolução, reciclagem e recuperação de REEE, por forma a minimizar potenciais efeitos dos EEE sobre o ambiente e saúde pública resultantes da presença de substâncias perigosas. Para obter informações adicionais acerca da REEE consulte o sítio da web: http://www.lenovo.com/lenovo/environment.

Het WEEE-merkteken (Waste Electrical and Electronic Equipment) geldt alleen voor landen binnen de Europese Unie (EU) en Noorwegen. Apparaten worden van een merkteken voorzien overeenkomstig Europese Richtlijn 2002/96/EC inzake afgedankte elektrische en elektronische apparatuur (waste electrical and electronic equipment, WEEE). Deze richtlijn bepaalt het raamwerk voor het retourneren en recyclen van gebruikte apparatuur, zoals van toepassing binnen de Europese Unie. Dit merkteken wordt aangebracht op diverse producten om aan te geven dat het product in kwestie niet dient te worden weggegooid, maar dat het aan het eind van de levenscyclus krachtens deze Richtlijn dient te worden geretourneerd. Gebruikers van elektrische en elektronische apparaten (EEE) welke zijn voorzien van het WEEE-merkteken zijn gehouden aan Annex IV van de WEEE Richtlijn en mogen gebruikte EEE niet weggooien als ongesorteerd afval, maar dienen gebruik te maken van het inzamelproces voor het teruggeven, recyclen en terugwinnen van WEEE dat voor hen beschikbaar is, en dienen de mogelijke effecten die EEE ten gevolge van de aanwezigheid van schadelijke stoffen kunnen hebben op het milieu en de volksgezondheid, tot een minimum te beperken. Voor meer informatie over WEEE gaat u naar: http://www.lenovo.com/lenovo/environment.

WEEE-mærkningen (Waste Electrical and Electronic Equipment) gælder kun for lande i EU samt Norge. Udstyr mærkes i henhold til EU's direktiv 2002/96/EF om affald af elektrisk og elektronisk udstyr (WEEE). Direktivet fastlægger de rammer, der gælder for returnering og genbrug af brugt udstyr i EU. Mærkaten påsættes forskellige produkter for at angive, at produktet ikke må smides væk, når det er udtjent, men skal genvindes i henhold til dette direktiv. Brugere af elektrisk og elektronisk udstyr (EEE), der er mærket med WEEE-mærket som angivet i Bilag IV til WEEE-direktivet, må ikke bortskaffe brugt EEE som usorteret husholdningsaffald, men skal bruge den indsamlingsordning, der er etableret, så WEEE kan returneres,

genbruges eller genvindes. Formålet er at minimere den eventuelle påvirkning af miljøet og menneskers sundhed som følge af tilstedeværelsen af skadelige stoffer. Der er flere oplysninger om affald af elektrisk og elektronisk udstyr på adressen http://www.lenovo.com/lenovo/environment.

Sähkö- ja elektroniikkalaiteromu (Waste electrical and electronic equipment, WEEE) -merkintä koskee vain Euroopan unionin (EU) jäsenmaita ja Norjaa. Sähkö- ja elektroniikkalaitteet merkitään Euroopan parlamentin ja neuvoston direktiivin 2002/96/EY mukaisesti. Kyseinen direktiivi määrittää Euroopan Unionin alueella käytössä olevat palautus- ja kierrätyskäytännöt. WEEE-merkintä laitteessa osoittaa, että direktiivin ohjeiden mukaan tuotetta ei tulisi hävittää sen elinkaaren päässä, vaan se tulee toimittaa uusiokäyttöön. Käyttäjien, joiden sähkö- ja elektroniikkalaitteissa on tämä sähkö- ja elektroniikkalaiteromun direktiivin liitteen IV mukainen merkintä, tulee kierrättää kyseiset laitteet käytettävissä olevien resurssien mukaan ja varmistaa, että niistä tai niissä käytetyistä materiaaleista ei aiheudu haittaa ympäristölle tai ihmisten terveydelle. Sähkö- ja elektroniikkalaitteita ei saa hävittää sekajätteen mukana. Lisätietoja sähkö- ja elektroniikkalaiteromun uusiokäytöstä on WWW-sivustossa http://www.lenovo.com/lenovo/environment.

WEEE-merket (Waste Electrical and Electronic Equipment) gjelder bare for land i Den europeiske union (EU) og Norge. Utstyr merkes i henhold til EU-direktiv 2002/96/EF om avfall fra elektrisk og elektronisk utstyr (WEEE). Direktivet fastsetter rammene for retur og resirkulering av brukt utstyr innenfor EU. Dette merket benyttes på forskjellige produkter for å angi at produktet ikke må kastes, men må behandles i henhold til dette direktivet ved slutten av produktets levetid. Brukere av elektrisk og elektronisk utstyr (EEE) som er merket med WEEE-merket ifølge vedlegg IV i WEEE-direktivet, må ikke kaste utstyret som usortert husholdningsavfall, men må bruke de tilgjengelige innsamlingssystemene for retur, resirkulering og gjenvinning av kassert elektrisk og elektronisk utstyr for å redusere en eventuell skadelig virkning av elektrisk og elektronisk utstyr på miljø og helse, som skyldes skadelige stoffer. Du finner mer informasjon om WEEE på denne adressen: http://www.lenovo.com/lenovo/environment.

Značka odpadní elektrická a elektronická zařízení (OEEZ;
Waste Electrical and Electronic Equipment - WEEE) se týká
pouze zemí Evropské Unie (EU) a Norska.
Zařízení jsou označena v souladu s evropskou směrnicí
2002/96/EC, která se týká likvidace starých elektrických
a elektronických zařízení (OEEZ). Směrnice určuje pravidla
pro vrácení a recyklaci použitých zařízení, která jsou platná
v Evropské Unii. Tímto štítkem se označují různá zařízení.
Označuje, že produkt nesmí být vyhozen do běžného
odpadu, ale po skončení životnosti vrácen podle této
směrnice. Uživatelé takovýchto zařízení označených značkou
OEEZ podle dodatku IV směrnice OEEZ nesmí na konci
životnosti vyhodit zařízení jako netříděný odpad, ale musí
použít dostupnou sběrnou síť, aby bylo zařízení recyklováno
a aby byly minimalizovány možné dopady zařízení na
prostředí a zdraví lidí (zařízení může obsahovat nebezpečné
látky). Další informace o značce OEEZ (WEEE) naleznete na
webové stránce: http://www.lenovo.com/lenovo/environment.

廃電気電子機器指令 (WEEE) マークは EU 諸国とノルウェー
にのみ適用されます。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。WEEE
指令の付則 (Annex) IV 規則によりマークされた電気/電子
機器 (EEE) の使用者は、使用済みの電気・電子機器を地方
自治体の無分別ゴミとして廃棄することは許されず、
機器に含まれる有害物質が環境や人体へ与える悪影響を最小
に抑えるためにお客様が利用可能な廃電気・電子機器の返却、
リサイクル、あるいは再生のための回収方法を利用しなけれ
ばなりません。WEEE の詳細については、次のWebサイトを参
照してください。
Http://www.lenovo.com/lenovo/environment

To σήμα WEEE (Waste Electrical and Electronic Equipment)
χρησιμοποιείται μόνο σε χώρες της Ευρωπαϊκής Ένωσης
και στη Νορβηγία. Στις συσκευές τοποθετούνται ετικέτες
που αφορούν την απόρριψη ηλεκτρικών και ηλεκτρονικών
εξαρτημάτων σύμφωνα με την Ευρωπαϊκή Οδηγία
2002/96/EC. Η Οδηγία αυτή καθορίζει το πλαίσιο για
την επιστροφή και την ανακύκλωση χρησιμοποιημένων
συσκευών που ισχύει σε όλη την Ευρωπαϊκή Ένωση.
Η ετικέτα τοποθετείται σε διάφορα προϊόντα για να υποδείξει
ότι μετά το μόνιμο τερματισμό της χρήσης του το προϊόν,
σύμφωνα με την Οδηγία, πρέπει να ανακυκλωθεί και όχι να
απορριφθεί. Οι χρήστες ηλεκτρικών και ηλεκτρικών
εξαρτημάτων (electrical and electronic equipment - EEE)
που φέρουν το σήμα WEEE σύμφωνα με το Παράρτημα IV
της εν λόγω Οδηγίας, δεν πρέπει να απορρίπτουν τα
εξαρτήματα αλλά να χρησιμοποιούν το διαθέσιμο πλαίσιο
συλλογής για την επιστροφή, ανακύκλωση και ανάκτηση των
εξαρτημάτων με σκοπό την ελαχιστοποίηση δυνητικών
επιρροών στο περιβάλλον και την ανθρώπινη υγεία εξαιτίας
της παρουσίας επικίνδυνων ουσιών στα εξαρτήματα αυτά.
Για περισσότερες πληροφορίες σχετικά με τις κατάλληλες
ενέργειες συλλογής και κατεργασίας ηλεκτρονικών συσκευών
και εξαρτημάτων, επισκεφθείτε την ιστοσελίδα:
http://www.lenovo.com/lenovo/environment.

A WEEE (leselejtezett elektromos és elektronikus berendezések)
jelzés csak az EU tagállamaira és Norvégiára vonatkozik.
A berendezések a leselejtezett elektromos és elektronikus
berendezésekre (WEEE) vonatkozó 2002/96/EC számú EU
direktívának való megfelelést tanúsító címkével vannak ellátva.
A direktíva a használt berendezések visszavételének és
újrahasznosításának keretrendszerét határozza meg az Európai
Unión belül. A különböző termékeken látható címke azt jelenti,
hogy a terméket az élettartamának végén nem szabad kidobni,
hanem a direktívának megfelelően kell visszanyerni. A WEEE
jelzésű elektromos és elektronikai felszerelések (EEE)
felhasználóinak, a WEEE direktíva IV. függelékének megfelelően
nem szabad vegyes házi szemétként kidobniuk az eszközöket
(EEE), hanem a vásárlók számára rendelkezésre álló, meglévő
begyűjtési keretrendszert felhasználva kell gondoskodniuk az
elektromos hulladék (WEEE) visszajuttatásáról és
újrahasznosításáról, valamint minimalizálniuk kell az eszközök
(EEE) lehetséges hatásait a környezetre és az emberi
egészségre, a veszélyek megelőzése érdekében.

További WEEE információk:
http://www.lenovo.com/lenovo/environment.

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the server to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If Lenovo determines that the levels of particulates or gases in your environment have caused damage to the server, Lenovo may condition provision of repair or replacement of servers or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 28. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days
[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. [2] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction. [3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.	

Restriction of Hazardous Substances Directive (RoHS)

This topic provides statements about the Restriction of Hazardous Substances Directive (RoHS).

China RoHS

有毒有害物质或元素名称及含量标识

Toxic / Hazardous Substances and Elements Table

部件名称 (Parts)	有毒有害物质或元素					
	铅（Pb）	汞（Hg）	镉（Cd）	六价铬 （Cr（VI）	多溴联苯 （PBB）	多溴二苯醚 （PBDE）
机架 chassis	O	O	O	O	O	O
外部盖板 external covers	O	O	O	O	O	O
机械组合件 mechanical assemblies	O	O	O	O	O	O
空气传动设备 air moving devices	X	O	O	O	O	O
冷却组合件 cooling assembly	X	O	O	O	O	O
内存模块 memory modules	X	O	O	O	O	O
处理器模块 processor modules	X	O	O	O	O	O
键盘 keyboard	X	O	O	O	O	O
调制解调器 modem	X	O	O	O	O	O
监视器 monitor	X	X	O	O	O	O
鼠标 mouse	X	O	O	O	O	O
电缆组合件 cable assemblies	X	O	O	O	O	O
电源 power supply	X	O	O	O	O	O
存储设备 storage device	X	O	O	O	O	O
电池匣组合件 battery pack assembly	X	O	O	O	O	O
电池 batteries	X	O	O	O	O	O
有 mech 的电路卡 circuit cards with mechs	X	O	O	O	O	O
无 mech 的电路卡 circuit cards w/o mechs	X	O	O	O	O	O
激光器 laser	X	O	O	O	O	O

O：指示部件的所有均质材料中有毒和危险物质的含量均低于 SJ/T 11363-2006 中所描述的浓度限制要求。
O: indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in SJ/T 11363-2006.

X：指示至少有一种部件均质材料中的有毒和危险物质的含量超过 SJ/T 11363-2006 中所描述的浓度限制要求。
X: indicates that the content of the toxic and hazardous substance in at least one homogeneous material of the part exceeds the concentration limit requirement as described in SJ/T 11363-2006.

环保使用期限（EPUP）的免责条款：EPUP 规定的具体期限仅为符合中华人民共和国的相应的法律规定，并非代表 Lenovo 向客户提供保证或负有任何义务。EPUP 中假定客户按照操作手册在正常情况下使用本产品。对于本产品中配备的某些组合件（例如，装有电池的组合件）的 EPUP，其效力可能低于本产品的 EPUP。

Environmental Protection Use Period (EPUP) Disclaimer: The number provided as the EPUP is provided solely to comply with applicable laws of the People's Republic of China. It does not create any warranties or liabilities on behalf of Lenovo to customer. The EPUP assumes that the product will be used under normal conditions in accordance with the Lenovo operating manual. Certain assemblies inside this product (for example, assemblies that contain a battery) may have an EPUP which is lower than the EPUP on this product.

Turkish statement of compliance

The Lenovo product meets the requirements of the Republic of Turkey Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (EEE).

Türkiye EEE Yönetmeliğine Uygunluk Beyanı

Bu Lenovo ürünü, T.C. Çevre ve Orman Bakanlığı'nın "Elektrik ve
Elektronik Eşyalarda Bazı Zararlı Maddelerin Kullanımının
Sınırlandırılmasına Dair Yönetmelik (EEE)" direktiflerine uygundur.

EEE Yönetmeliğine Uygundur.

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 emission notices

This topic includes electronic emission notices.

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant
to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful
interference in a residential installation. This equipment generates, uses, and can radiate radio frequency
energy and, if not installed and used in accordance with the instructions, may cause harmful interference
to radio communications. However, there is no guarantee that interference will not occur in a particular
installation. If this equipment does cause harmful interference to radio or television reception, which can be
determined by turning the equipment off and on, the user is encouraged to try to correct the interference by
one or more of the following measures:
• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult an authorized dealer or service representative for help.

Lenovo is not responsible for any radio or television interference caused by using other than specified or
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 B emission compliance statement

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

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

European Union - Compliance to the Electromagnetic Compatibility Directive

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 installation of option cards from other manufacturers.

This product has been tested and found to comply with the limits for Class B Information Technology Equipment according to European Standard EN 55022. The limits for Class B equipment were derived for typical residential environments to provide reasonable protection against interference with licensed communication devices.

CE

German Class B compliance statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse B 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 B 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 Betriebsmitteln
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 B.

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 B.

Korea Class B compliance statement

B급 기기 (가정용 방송통신기자재)
이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다

Japan VCCI Class B compliance statement

この装置は, クラスB情報技術装置です。 この装置は,家庭環境で使用することを目的としていますが, この装置がラジオやテレビジョン受信機に近接して使用されると, 受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。 VCCI-B

Japan compliance statement for products which connect to the power mains with rated current less than or equal to 20 A per phase

日本の定格電流が 20A/相 以下の機器に対する高調波電流規制
高調波電流規格 JIS C 61000-3-2 適合品

Lenovo product service information for Taiwan

台灣 Lenovo 產品服務資訊如下：
荷蘭商聯想股份有限公司台灣分公司
台北市信義區信義路五段七號十九樓之一
服務電話：0800-000-702

Index