



ThinkCentre User Guide



ThinkThink**ThinkCentre**Think

Machine Types: 6136, 6139, 7187, 7345, 7348, 7356, 7359, 7479, 7626,
7629, 7637, 8338, 8820, and 9961

lenovo

ThinkCentre User Guide

Note

Before using this information and the product it supports, be sure to read and understand the *ThinkCentre Safety and Warranty Guide* and "Notices," on page 61.

Second Edition (May 2009)

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Important safety information

CAUTION:

Before using this manual, be sure to read and understand all the related safety information for this product. Refer to the *ThinkCentre Safety and Warranty Guide* that you received with this product for the latest safety information. Reading and understanding this safety information reduces the risk of personal injury and or damage to your product.

If you no longer have a copy of the *ThinkCentre Safety and Warranty Guide*, you can obtain a Portable Document Format (PDF) version from the Lenovo® Support Web site at:

<http://www.lenovo.com/support>

Chapter 1. Product overview

This chapter provides an introduction to the features and options that are available for your computer. You can expand the capabilities of your computer by adding memory modules, drives, or adapter cards. When installing or replacing an option, use these instructions along with the instructions that come with the option.

Important: Before you install or replace any option, be sure to read and understand the “Important safety information” first. These precautions and guidelines will help you work safely.

Note: Use only computer parts provided by Lenovo.

Features

This section provides an overview of the computer features and preinstalled software.

System information

The following information covers a variety of models. For information about your specific model, use the Setup Utility program. See Chapter 4, “Using the Setup Utility,” on page 43.

Microprocessor

- Intel® Celeron® processor
- Intel Core™ 2 Duo processor
- Intel Core 2 Quad processor
- Intel Pentium® dual-core processor
- Internal cache (size varies by model type)

Memory

- Supports two DDR3 DIMMs (double data rate 3 dual inline memory modules)
- Flash memory for system programs (varies by model type)

Internal drives

- Optical drive
- SATA (Serial Advanced Technology Attachment) internal hard disk drive (some models)
- Solid State Drive (SSD) (some models)

Video subsystem

Integrated graphics for a VGA (Video Graphics Array) connector and DisplayPort connector

Audio subsystem

- Audio line-in connector, audio line-out connector, and microphone connector on the rear panel
- High Definition (HD) with ADI 1882 Audio Codec
- Microphone connector and headphone connector on the front panel
- Mono internal speaker (some models)

Connectivity

- 10/100/1000 Mbps integrated Ethernet controller
- PCI (Peripheral Component Interconnect) V.90 Data/Fax modem (some models)

System management features

- Ability to store power-on self-test (POST) hardware test results
- Automatic power-on startup
- ASF 2.0 (Alert Standard Format)
- Intel Active Management Technology (AMT) (some models)
- Intel matrix storage manager
- Preboot Execution Environment (PXE) and Dynamic Host Configuration Protocol (DHCP)
- Remote Administration
- Secure Managed Client (SMC) (some models)
- System Management (SM) BIOS 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 features

- Eight USB connectors (two on the front panel and six on the rear panel)
- Ethernet connector
- One DisplayPort connector
- One optional 9-pin serial port
- One VGA monitor connector
- Standard keyboard connector (some models)
- Standard mouse connector (some models)
- Three audio connectors (audio line-in, audio line-out, and microphone) on the rear panel
- Two audio connectors (microphone and headphone) on the front panel

Expansion

- One hard disk drive bay
- One optical drive bay
- One 32-bit PCI adapter card slot

Power

- 130-watt power adapter
- Automatic 50/60 Hz input frequency switching
- Advanced Configuration and Power Interface (ACPI) support

Security features

- Computrace
- Cover presence switch (also called intrusion switch, some models)
- Diskette drive and hard disk drive I/O control
- Hard Disk User Password
- Keyboard with fingerprint reader (some models, see the ThinkVantage® Productivity Center program for more information)
- Power-On Password (POP) and Privileged Access Password (PAP) for BIOS access
- Serial and parallel port I/O control
- Startup sequence control
- Startup without diskette drive, keyboard, or mouse
- Support for the addition of an integrated cable lock (Kensington lock)
- Trusted Platform Module (TPM)
- Unattended start mode
- USB individual switch on/off

Preinstalled software

Your computer might come with preinstalled software. If it does, an operating system, device drivers to support built-in features, and other support programs are included.

Operating system, preinstalled

Microsoft® Windows Vista®

Notes:

1. Computer models without an internal hard disk drive do not have an operating system preinstalled.
2. The Windows Vista operating system might not be available or supported in all countries or regions.

Operating systems, certified or tested for compatibility¹ (varies by model type)

- Linux®
- Microsoft Windows® XP

1. The operating systems listed here are being certified or tested for compatibility at the time this publication goes to press. Additional operating systems might be identified by Lenovo as compatible with your computer following the publication of this booklet. Corrections and additions to this list are subject to change. To determine if an operating system has been certified or tested for compatibility, check the Web site of the operating system vendor.

Specifications

This section lists the physical specifications for your computer.

Dimensions

Width: 275 mm (10.83 inches)

Height: 80 mm (3.15 inches)

Depth: 238 mm (9.37 inches)

Weight

Maximum configuration as shipped: 4.18 kg (9.22 lbs)

Environment

Air temperature:

Operating: 10° to 35°C (50° to 95°F)

Non-operating: -40° to 60°C (-40° to 140°F) (with package)

Non-operating: -10° to 60°C (14° to 140°F) (without package)

Humidity:

Operating: 10% to 80% (10% per hour, non condensing)

Non-operating: 10% to 90% (10% per hour, non condensing)

Maximum 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)

Electrical input

Input voltage:

Low range:

Minimum: 100 V AC

Maximum: 127 V AC

Input frequency range: 50 to 60 Hz

Voltage-selection switch setting: 115 V AC

High range:

Minimum: 200 V AC

Maximum: 240 V AC

Input frequency range: 50 to 60 Hz

Voltage-selection switch setting: 230 V AC

Software overview

This section describes the software preinstalled on the computer models that have an internal hard disk drive and an operating system from Lenovo.

Software provided with your Windows operating system

This section describes the Windows applications included with your computer.

Software provided by Lenovo

The following software applications are provided by Lenovo to help you improve productivity and reduce the cost associated with maintaining your computer. Software provided with your computer might vary depending on your model.

ThinkVantage Productivity Center: The ThinkVantage Productivity Center program guides you to a host of information and tools to help you set up, understand, maintain, and enhance your computer.

ThinkVantage Rescue and Recovery: The ThinkVantage Rescue and Recovery[®] (RnR) program is a one button recovery and restore solution that includes a set of self recovery tools to help users diagnose computer problems, get help, and recover from system crashes quickly, even if the primary operating system will not start.

ThinkVantage Client Security Solution: The ThinkVantage Client Security Solution (CSS) program is available on select Lenovo computers. It helps protect your information, including vital security information like passwords, encryption keys, and electronic credentials, while guarding against unauthorized user access to data.

ThinkVantage System Update: The ThinkVantage System Update (TVSU) program helps you keep the software on your system up-to-date, by downloading and installing software packages (TVT applications, device drivers, BIOS flashes, and other third party applications). Some examples of software that you should keep updated are programs provided by Lenovo, such as the Rescue and Recovery program and the Productivity Center program.

ThinkVantage Power Manager: The ThinkVantage Power Manager program provides convenient, flexible, and complete power management for your ThinkCentre[®] computer. By using the ThinkVantage Power Manager program, you can adjust your power settings to achieve the best balance between system performance and power saving.

Fingerprint Software: The integrated fingerprint reader provided on some keyboards enables you to enroll your fingerprint and associate it with your power-on password, hard disk drive password, and Windows password. As a result, fingerprint authentication can replace passwords and enable simple and secure user access. A fingerprint reader keyboard is available with select computers or can be purchased for computers that support this option.

Lenovo System Toolbox

The Lenovo System Toolbox diagnostic program is preinstalled on your hard disk drive. This diagnostic program works through the Windows operating system to diagnose hardware problems and report operating-system-controlled settings that can cause hardware failures. See “Lenovo System Toolbox” on page 53 for more information.

PC-Doctor for Windows PE

The PC-Doctor for Windows PE diagnostic program is preinstalled on your hard disk drive. It is part of the Rescue and Recovery workspace on each Lenovo computer to diagnose hardware problems and report operating-system-controlled settings that can cause hardware failures. Use the PC-Doctor for Windows PE if you are unable to start the Windows operating system or if the Lenovo System Toolbox has not been successful in isolating a possible problem. See “PC-Doctor for Windows PE” on page 53 for more information.

Adobe Reader

The Adobe Reader is a tool used to view, print, and search PDF documents.

See “Online Books folder” on page 57 for more information about accessing the online books and the Lenovo Web site.

Antivirus software

Your computer comes with antivirus software that you can use to detect and eliminate viruses. Lenovo provides a full version of antivirus software on your hard disk drive with a free 30-day subscription. After 30 days, you must renew the license to continue receiving the antivirus program updates.

For more information about updating your antivirus software, refer to the Access Help online help system. See “Access Help” on page 58 for instructions on how to open the online help system.

Locations

Locating connectors on the front of your computer

Figure 1 shows the location of the connectors on the front of your computer.

Note: Not all computer models have the following connectors.

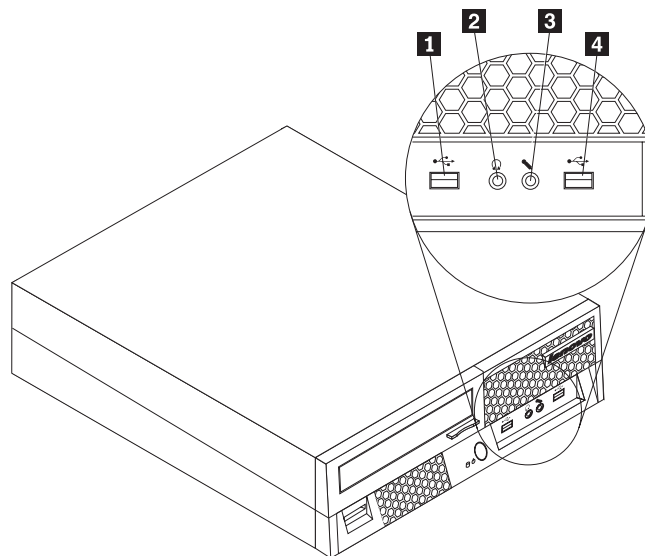


Figure 1. Front connector locations

- | | |
|------------------------------|-------------------------------|
| 1 USB connector | 3 Microphone connector |
| 2 Headphone connector | 4 USB connector |

Locating connectors on the rear of your computer

Figure 2 shows the location of the connectors on the rear of your computer. Some connectors on the rear of your computer are color-coded to help you determine where to connect the cables on your computer.

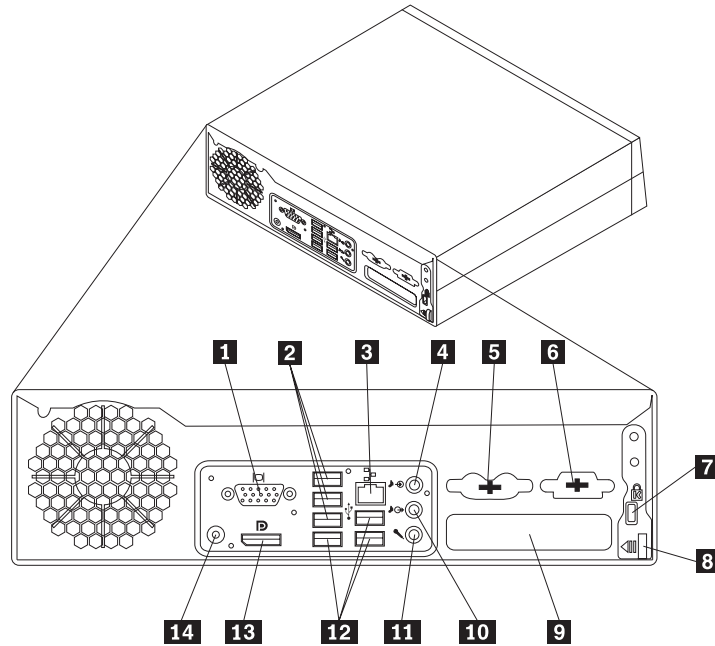


Figure 2. Rear connector locations

- | | |
|---|--------------------------------------|
| 1 VGA monitor connector | 8 Cover-release button |
| 2 USB connectors (3) | 9 PCI adapter card slot |
| 3 Ethernet connector | 10 Audio line-out connector |
| 4 Audio line-in connector | 11 Microphone connector |
| 5 Standard mouse and keyboard connectors (some models) | 12 USB connectors (3) |
| 6 Serial port (some models) | 13 DisplayPort connector |
| 7 Cable lock slot | 14 AC power adapter connector |

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 is connected between the audio line-out connector of the device and the audio line-in connector of the computer.
Audio line-out connector	Used to send audio signals from the computer 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 computer within FCC Class B limits, use a Category 5 Ethernet cable.
Microphone connector	Used to attach a microphone to your computer 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.
Standard keyboard connector	Used to attach a keyboard that uses a standard keyboard connector.
Standard mouse connector	Used to attach a mouse, a trackball, or other pointing devices that use a standard mouse connector.
USB connector	Used to attach a device that requires a Universal Serial Bus (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 components

To open the computer cover, see “Opening the computer cover” on page 12.

Figure 3 shows the location of the various components in your computer.

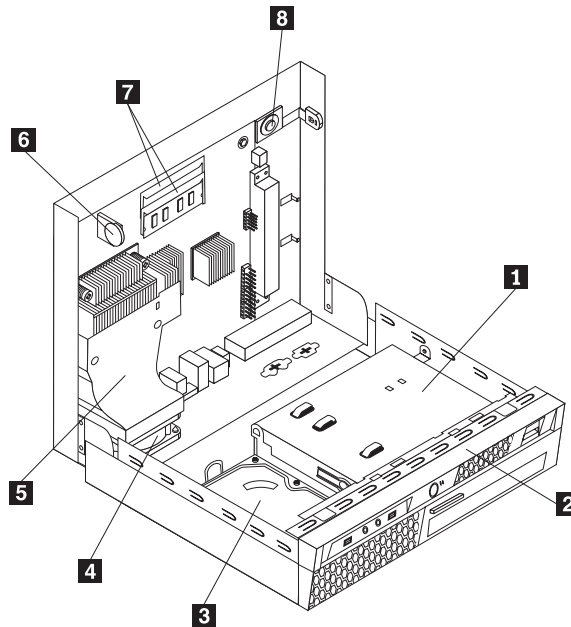


Figure 3. Component locations

- | | |
|--|---|
| 1 Optical drive | 5 Heat sink |
| 2 Front bezel | 6 Battery |
| 3 Hard disk drive (some models) | 7 Memory slots (2) |
| 4 System fan assembly | 8 Internal speaker (some models) |

Locating parts on the system board

The system board (sometimes called the planar or motherboard) is the main circuit board in your computer. It provides basic computer functions and supports a variety of devices.

Figure 4 shows the location of the parts on the system board.

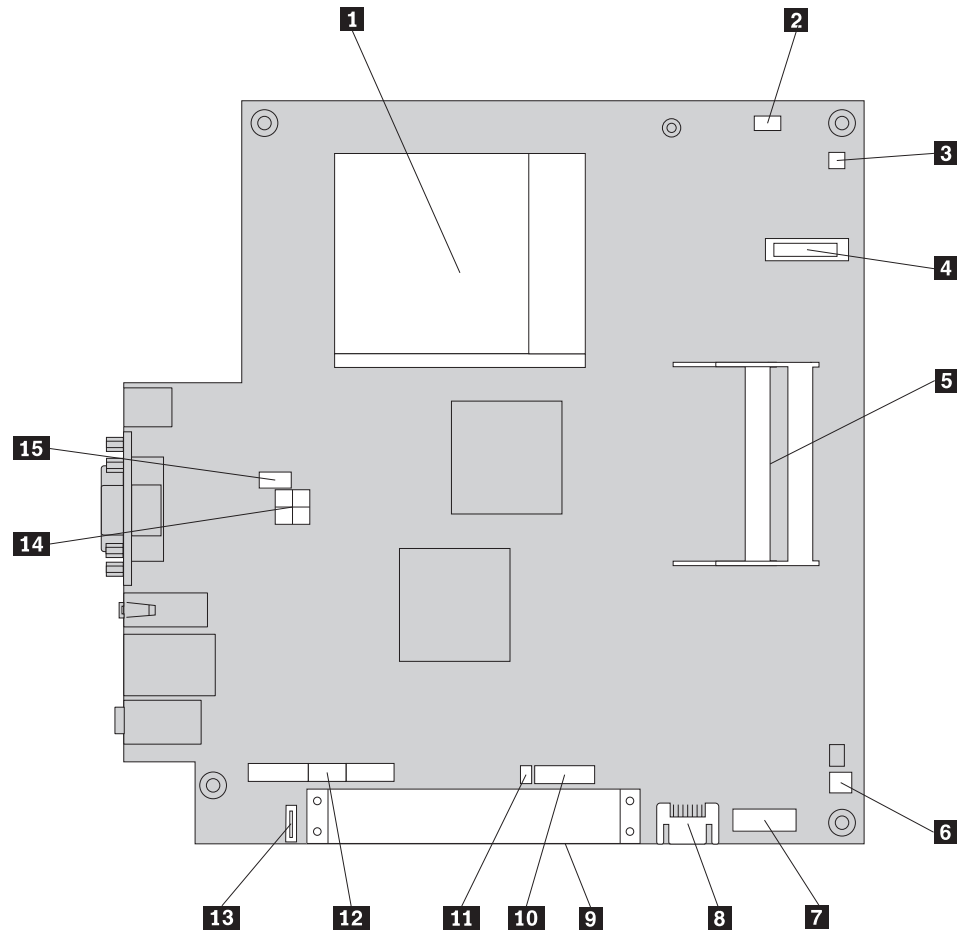


Figure 4. System board parts locations

- | | |
|---|--|
| 1 Microprocessor | 9 PCI adapter card slot |
| 2 Clear CMOS (Complementary Metal Oxide Semiconductor)/Recovery jumper | 10 Front USB connector 2 |
| 3 Thermal sensor connector | 11 Intrusion switch connector/Cover presence switch connector |
| 4 Battery | 12 Front I/O and LED/Switch header |
| 5 Memory slots (2) | 13 eSATA connector |
| 6 Internal speaker connector | 14 Internal power distribution connector |
| 7 Serial (COM) connector | 15 Fan connector |
| 8 SATA connectors (2) | |

Chapter 2. Installing options and replacing hardware

This chapter provides instructions for installing options and replacing hardware for your computer. You can expand the capabilities of your computer by adding memory modules, adapter cards, or drives. When installing or replacing an option, use these instructions along with the instructions that come with the option.

Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- Always handle parts and other computer components carefully. Handle adapter cards, memory modules, system boards, and microprocessors by the edges. Never touch any 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 part to a metal expansion-slot cover or other unpainted metal surface on the computer for at least two seconds. This reduces static electricity in the package and your body.
- When possible, remove the new part from the static-protective packaging, and install it directly in the computer without setting the part down. When this is not possible, place the static-protective package that the part came in on a smooth, level surface and place the part on it.
- Do not place the part on the computer cover or other metal surface.

Installing options and replacing hardware

This section provides introductions for installing options and replacing hardware for your computer. When installing or replacing an option, use these instructions along with the instructions that come with the option.

Attention

Do not open your computer or attempt any repair before reading and understanding the "Important safety information" in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, go to: <http://www.lenovo.com/support>

Note: Use only computer parts provided by Lenovo.

Installing external options

External speakers, a printer, or a scanner can be connected to your computer. For some external options, you must install additional software in addition to making the physical connection. When installing an external option, see “Locating connectors on the front of your computer” on page 6 and “Locating connectors on the rear of your computer” on page 7 to identify the required connector, and then use the instructions that come with the option to help you make the connection and install any software or device drivers that are required for the option.

Opening the computer cover

This section provides instructions on how to open the computer cover.

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 opening the computer cover.

Important

Be sure to read and understand “Handling static-sensitive devices” on page 11 before opening the computer cover.

To open the computer cover:

1. Remove any media from the drives, shut down your operating system, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Disconnect the cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables that are connected to the computer. See “Locating connectors on the front of your computer” on page 6 and “Locating connectors on the rear of your computer” on page 7.
4. Remove any locking devices that lock the computer cover-release button, such as a cable lock.

- Carefully lift and position the computer upside down as shown in 6.
- Pivot the cover-release button **1** on the rear of the computer and then open the computer cover as shown.

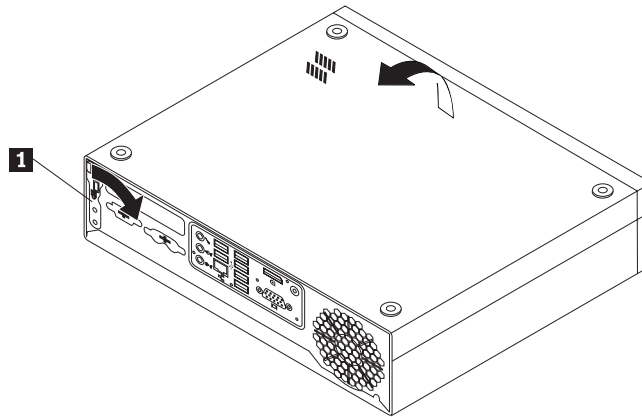


Figure 5. Opening the computer cover

Installing or replacing a memory module

Attention

Do not open your computer or attempt any repair before reading and understanding the “Important safety information” in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, go to: <http://www.lenovo.com/support>

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

Your computer has two slots for installing SODIMMs (small outline dual inline memory modules) that provide up to a maximum of 4 GB of system memory.

When installing memory modules, the following rules apply:

- Use 1.8 V, 200-pin DDR3 SDRAM (double data rate 3 synchronous dynamic random access memory).
- Use 1 GB or 2 GB memory modules in any combination up to a maximum of 4 GB.

To install or replace a memory module:

1. Open the computer cover. See “Opening the computer cover” on page 12.
2. Locate the memory slots. See “Locating parts on the system board” on page 10.

3. If you are replacing an old memory module, open the retaining clips and remove the memory module being replaced as shown.

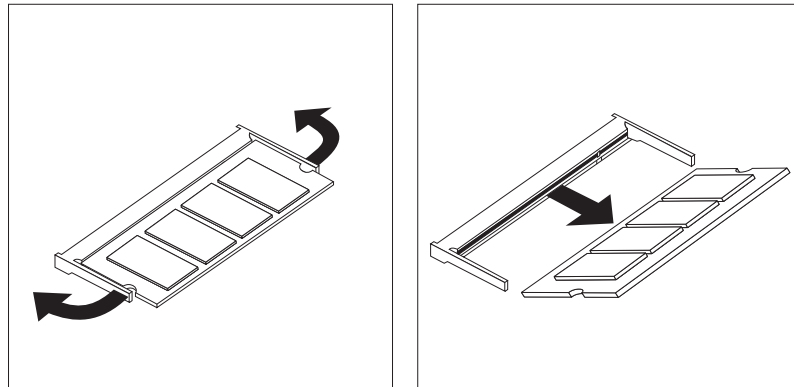


Figure 6. Removing the memory module

4. Insert the notched end **2** of the new memory module into the slot **1**. Press the memory module firmly and pivot the memory module until it snaps into place. Make sure that the memory module is firmly fixed in the slot and does not move easily.

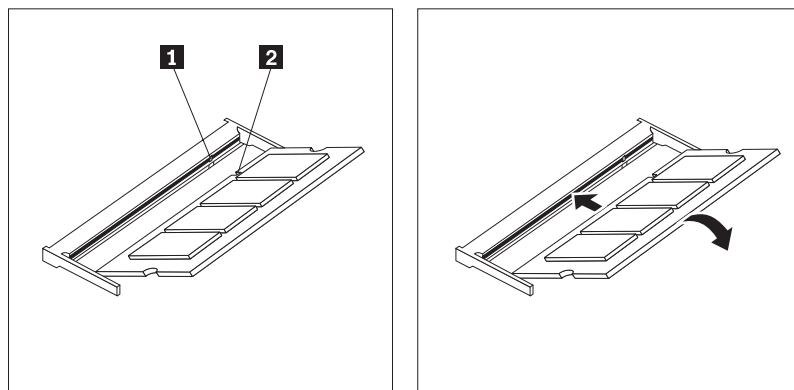


Figure 7. Installing a memory module

What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 30.

Replacing the hard disk drive

Attention

Do not open your computer or attempt any repair before reading and understanding the "Important safety information" in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, go to: <http://www.lenovo.com/support>

This section provides instructions on how to replace the hard disk drive if your computer has one. For computer models that do not have an internal hard disk drive installed and use a remote hard disk drive accessed through the SMC - Storage Array, contact your network or storage administrator.

Important

When you receive a new hard disk drive, you also receive a set of *Product Recovery discs*. The set of *Product Recovery discs* enables you to restore the contents of the hard disk drive to the factory-installed state. For more information on recovering factory-installed software, refer to Chapter 3, "Recovery information," on page 35.

To replace the hard disk drive:

1. Open the computer cover. See "Opening the computer cover" on page 12.
2. Disconnect the power cable from the optical drive.
3. Place your finger on the tab located on the front of the hard disk drive and push upward. Then press inward on the side tabs and pivot the hard disk drive upward to remove.

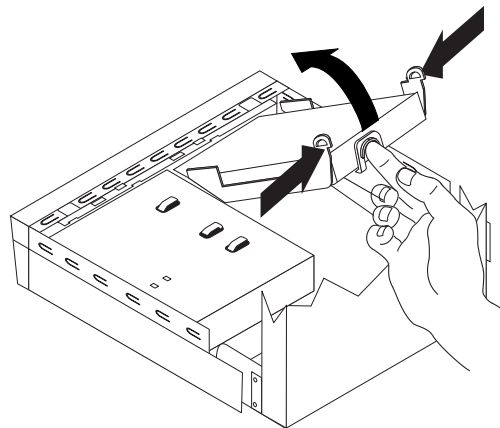


Figure 8. Removing the hard disk drive

4. Remove the failing hard disk drive from the chassis.
5. Disconnect the signal cable and the power cable from the hard disk drive.
6. Remove the hard disk drive from the plastic bracket by flexing the sides of the bracket enough to slide it free of the hard disk drive.

7. To install the new hard disk drive into the plastic bracket, flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the holes in the hard disk drive. Do not touch the circuit board **5** on the bottom of the hard disk drive.

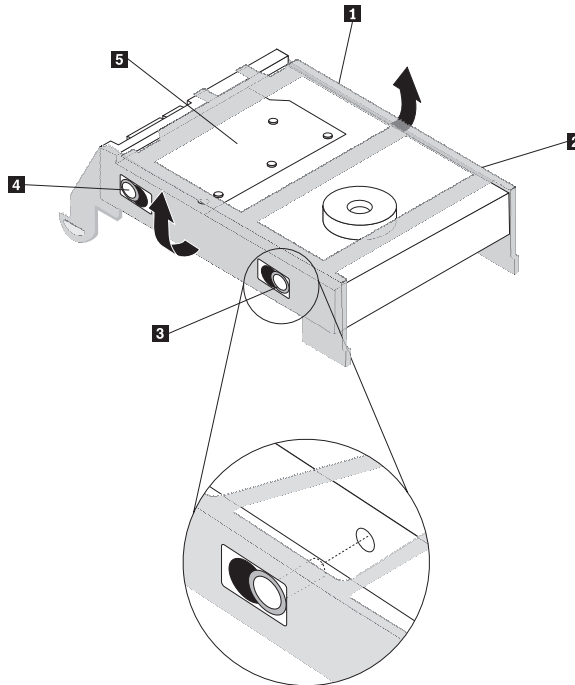


Figure 9. Installing the hard disk drive into the bracket

8. Connect the signal cable and the power cable to the rear of the new hard disk drive.
9. Slide the new hard disk drive into the hard disk drive bay until it snaps into position.
10. Reconnect the power cable to the optical drive.
11. Go to “Completing the parts replacement” on page 30.

Replacing the optical drive

Attention

Do not open your computer or attempt any repair before reading and understanding the “Important safety information” in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, go to: <http://www.lenovo.com/support>

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

To replace the optical drive:

1. Open the computer cover. See “Opening the computer cover” on page 12.

2. Remove the front bezel by releasing the two tabs and pivoting the bezel forward to remove it completely.

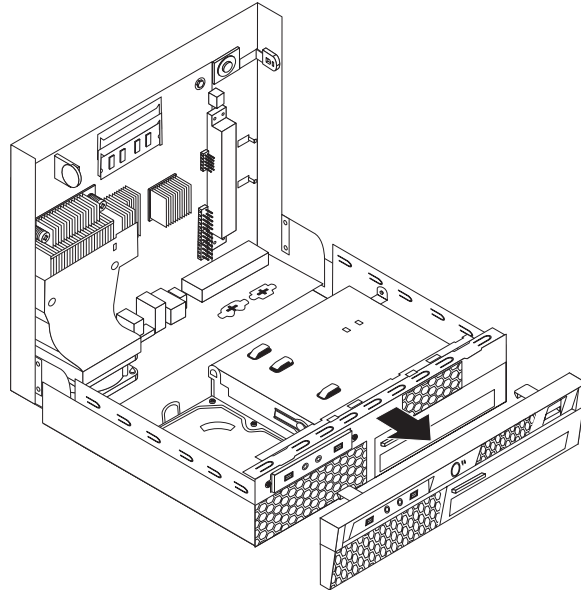


Figure 10. Removing the front bezel

3. Disconnect the signal cable and the power cable from the rear of the optical drive.
4. Press the optical drive lock button to remove the optical drive out of the front of the computer.

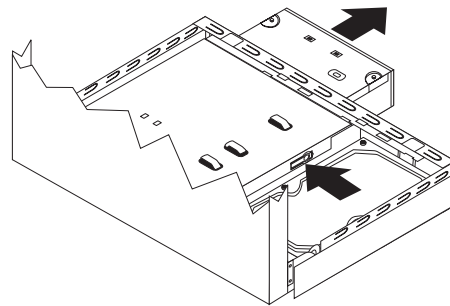


Figure 11. Removing the optical drive

5. Remove the optical drive retainer from the failing optical drive and install it on the side of the new optical drive.

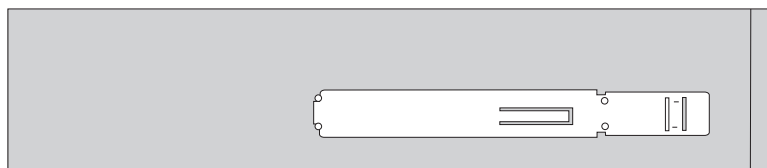


Figure 12. Installing the retainer on the optical drive

- Slide the new optical drive into the drive bay until it snaps into position.

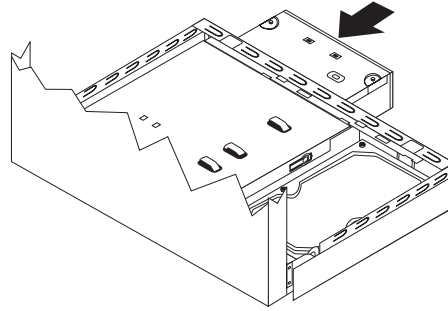


Figure 13. Installing the optical drive

- Connect the signal cable and the power cable to the optical drive.
- To reinstall the front bezel, align the plastic tabs on the bottom of the bezel with the corresponding holes in the chassis, and then pivot the bezel inward until it snaps into position.
- Go to “Completing the parts replacement” on page 30.

Replacing the battery

Attention

Do not open your computer or attempt any repair before reading and understanding the “Important safety information” in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, go to: <http://www.lenovo.com/support>

Your computer has a special type of memory that maintains the date, time, and settings for built-in features, such as parallel-port assignments (configuration). A battery keeps this information active when you turn off the computer.

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

Refer to the “Lithium battery notice” in the *ThinkCentre Safety and Warranty Guide* for information about replacing and disposing of the battery.

To replace the battery:

- Open the computer cover. See “Opening the computer cover” on page 12.
- Locate the battery. See “Locating parts on the system board” on page 10.

3. Remove the old battery.

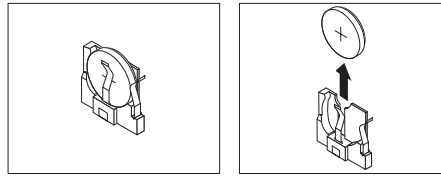


Figure 14. Removing the old battery

4. Install a new battery.

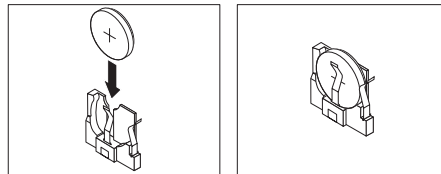


Figure 15. Installing a new battery

5. Reconnect all the cables to the system board and close the computer cover. See “Completing the parts replacement” on page 30.

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

6. Turn on the computer and all attached devices.
7. Use the Setup Utility program to set the date, time, and any passwords. See Chapter 4, “Using the Setup Utility,” on page 43.

Replacing the heat sink

Attention

Do not open your computer or attempt any repair before reading and understanding the “Important safety information” in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, go to: <http://www.lenovo.com/support>

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

CAUTION:



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

To replace the heat sink:

1. Open the computer cover. See “Opening the computer cover” on page 12.
2. Locate the heat sink. See “Locating components” on page 9.

3. Remove the four screws that secure the heat sink to the system board.

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.

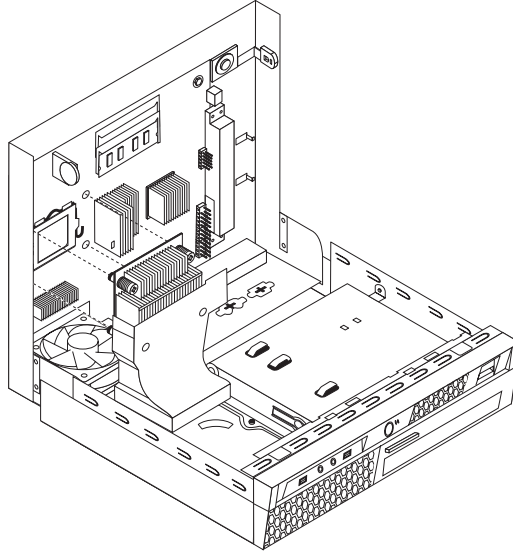


Figure 16. Removing the heat sink

4. Lift the failing heat sink off the system board.

Notes:

- a. You might have to gently twist the heat sink to free it from the microprocessor.
 - b. Do not touch the thermal grease while handling the heat sink.
5. Position the new heat sink on the system board so that the four screws are aligned with the holes on the system board.
 6. Alternate tightening each screw a small and equal amount until the heat sink and fan assembly is secured to the system board. Do not over-tighten the screws.
 7. Go to “Completing the parts replacement” on page 30.

Replacing the microprocessor

Attention

Do not open your computer or attempt any repair before reading and understanding the "Important safety information" in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, 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 opening the computer cover.

To replace the microprocessor:

1. Open the computer cover. See "Opening the computer cover" on page 12.
2. Remove any parts or cables that may prevent your access to the system board.
3. Remove the heat sink. See "Replacing the heat sink" on page 19.
4. Place the heat sink on its side so that the thermal grease does not come in contact with anything.
5. Lift the small handle **3** and open the retainer **1** to access the microprocessor **2**.

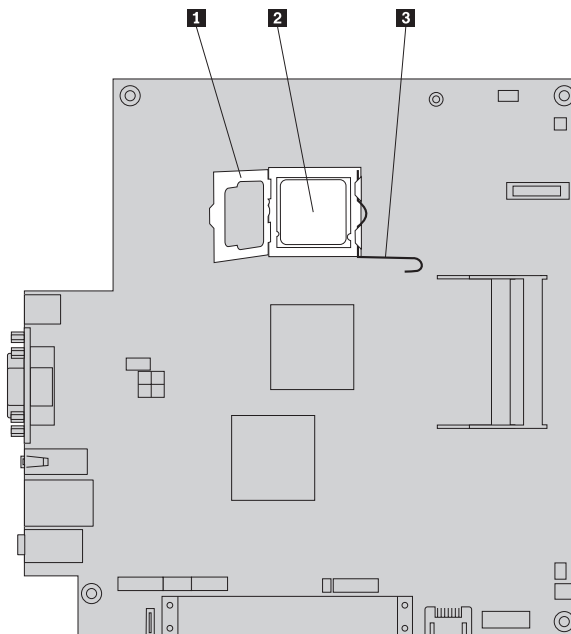
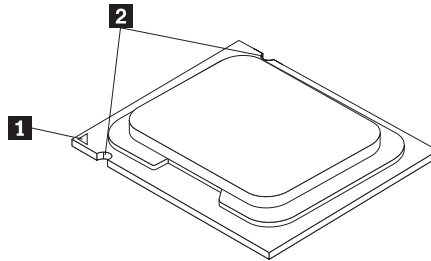


Figure 17. Accessing the microprocessor

6. Lift the microprocessor straight up and out of the socket.

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 sides 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.

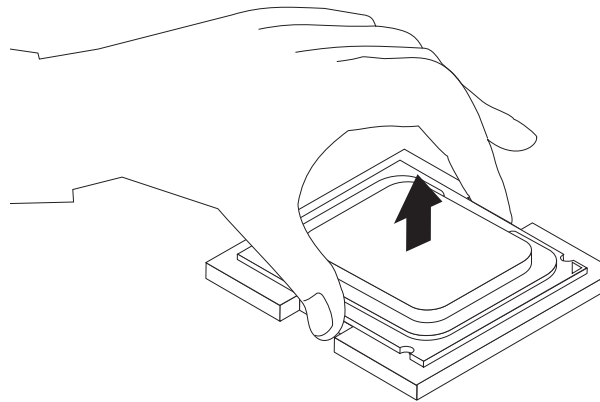
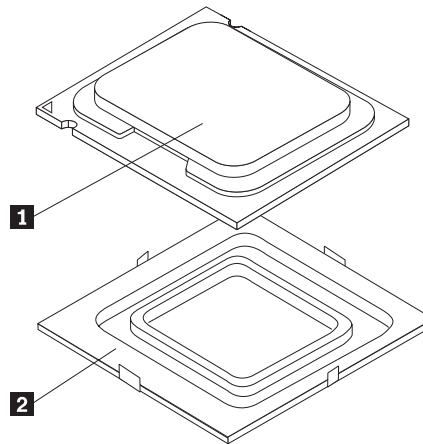


Figure 18. Removing the microprocessor

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

8. Remove the protective cover **2** that protects the gold contacts on the new microprocessor **1**.



9. Hold the new microprocessor and align the notches on it with the tabs in the microprocessor socket, or align the small triangle on one corner with the corresponding beveled corner of the microprocessor socket.
10. Lower the new microprocessor straight down into the microprocessor socket on the system board.
11. Close the microprocessor retainer and lock it into position with the small handle to secure the new microprocessor in the socket.
12. Reinstall the heat sink. See “Replacing the heat sink” on page 19.
13. Reinstall any other parts or reconnect any other cables you removed.
14. Go to “Completing the parts replacement” on page 30.

Replacing the adapter card

Attention

Do not open your computer or attempt any repair before reading and understanding the “Important safety information” in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, go to: <http://www.lenovo.com/support>

This section provides instructions on how to replace the adapter card.

To replace the adapter card:

1. Open the computer cover. See “Opening the computer cover” on page 12.
2. Locate the system board and disconnect all cables connected to the system board. See “Locating parts on the system board” on page 10.

3. Press inward on the two side tabs and then pivot the system board to release it from the chassis.

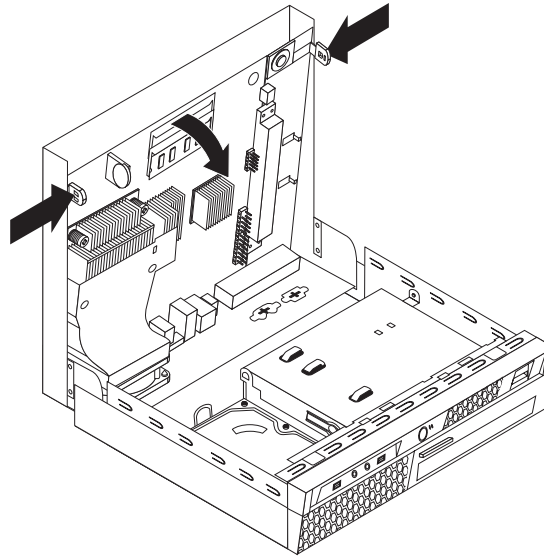


Figure 19. Releasing the system board

4. Place the system board on a clean and flat surface.
5. Locate the adapter card slot. See “Locating parts on the system board” on page 10.
6. Rotate the adapter card retainer to the open position and remove the adapter card being replaced by pulling it out of the adapter card slot.

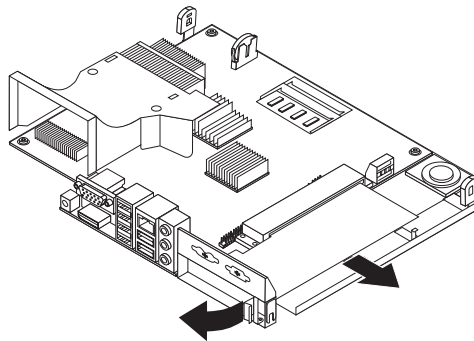


Figure 20. Removing the adapter card

7. Remove the new adapter card from its static-protective package.
8. Install the new adapter card into the adapter card slot. Make sure that the adapter card is firmly fixed in the slot and does not move easily.
9. Close the adapter card retainer.
10. Slide the system board to the rear of the chassis and then pivot the system board until it snaps into position.
11. Reconnect all cables that were disconnected from the system board.
12. Go to “Completing the parts replacement” on page 30.

Replacing the internal speaker

Attention

Do not open your computer or attempt any repair before reading and understanding the “Important safety information” in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, go to: <http://www.lenovo.com/support>

This section provides instructions on how to replace the internal speaker.

To replace the internal speaker:

1. Open the computer cover. See “Opening the computer cover” on page 12.
2. Locate the internal speaker. See “Locating components” on page 9.
3. Disconnect the internal speaker cable from the system board. See “Locating parts on the system board” on page 10.
4. Press the internal speaker lock latch **1**, slide the internal speaker downwards and remove it from the chassis.

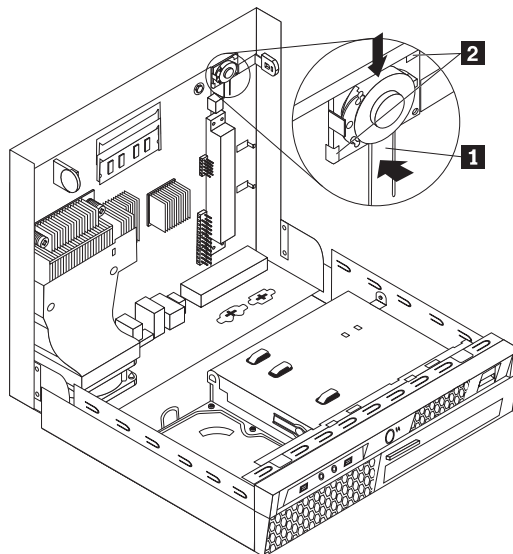


Figure 21. Removing the internal speaker

5. Position the new internal speaker into the metal clips **2** and push the internal speaker upwards until it is secured by the lock latch **1**.
6. Connect the new internal speaker cable to the system board.
7. Go to “Completing the parts replacement” on page 30.

Replacing the front audio and USB assembly

Attention

Do not open your computer or attempt any repair before reading and understanding the “Important safety information” in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, 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:

1. Open the computer cover. See “Opening the computer cover” on page 12.
2. Remove the front bezel by releasing the two tabs and pivoting the bezel forward.

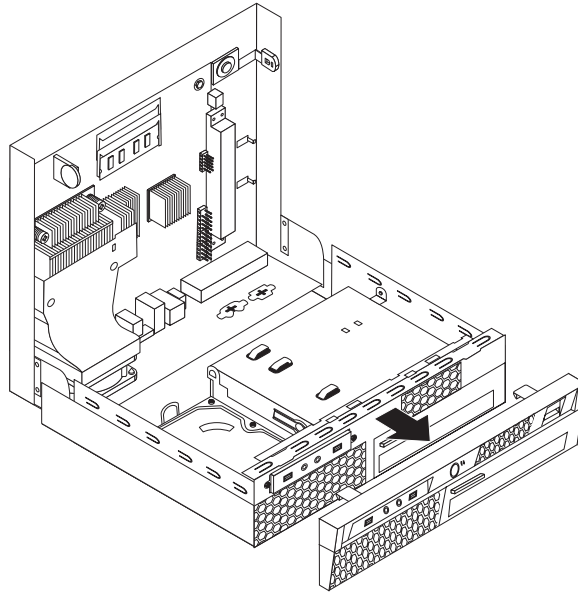


Figure 22. Removing the front bezel

3. Disconnect the front audio and USB assembly cables from the system board and note the cables routing. See “Locating parts on the system board” on page 10.

4. Remove the screw that secures the front audio and USB assembly to the chassis.

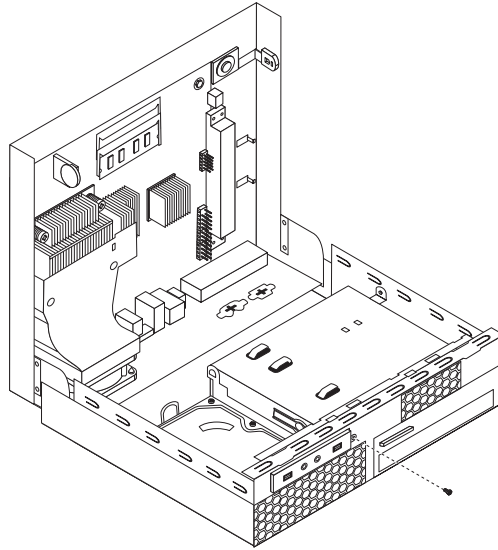


Figure 23. Removing the front audio and USB assembly

5. Remove the failing front audio and USB assembly from the chassis.
6. Install the new front audio and USB assembly into the chassis and secure it with the screw.
7. Connect the front audio and USB assembly cables to the system board.
8. To reinstall the front bezel, align the plastic tabs on the bottom of the bezel with the corresponding holes in the chassis, and then pivot the bezel inward until it snaps into position.
9. Go to “Completing the parts replacement” on page 30.

Replacing the AC power adapter

Attention

Do not open your computer or attempt any repair before reading and understanding the “Important safety information” in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, go to: <http://www.lenovo.com/support>

This section provides instructions on how to replace the AC power adapter.

To replace the AC power adapter:

1. Remove any media from the drives, shut down your operating system, and turn off all attached devices and the computer.
2. Disconnect the AC power adapter cord from the electrical outlet.
3. Locate the power adapter connector. See “Locating connectors on the rear of your computer” on page 7.
4. Disconnect the AC power adapter cable from the power adapter connector.

5. Connect the new AC power adapter cable to the power adapter connector on the chassis and the electrical outlet.

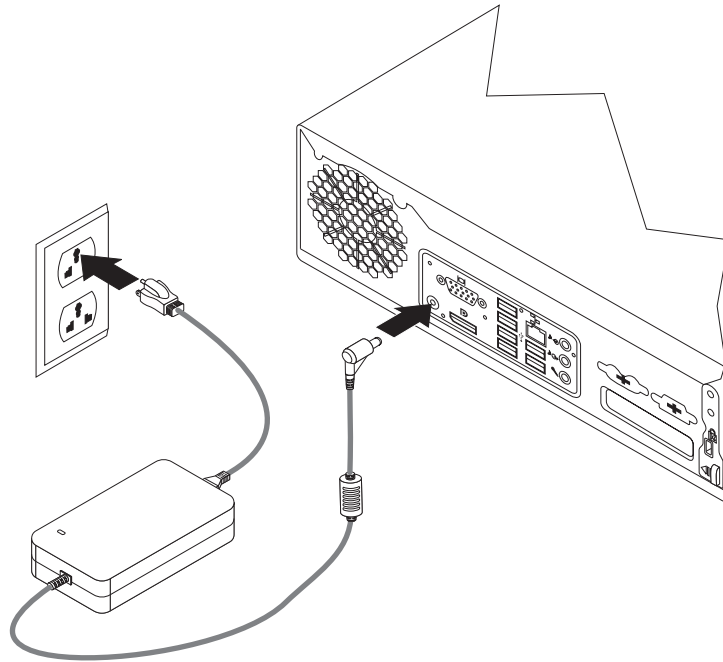


Figure 24. Connecting the AC power adapter

6. Go to “Completing the parts replacement” on page 30.

Replacing the keyboard

Attention

Do not open your computer or attempt any repair before reading and understanding the “Important safety information” in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, go to: <http://www.lenovo.com/support>

This section provides instructions on how to replace the keyboard.

To replace the keyboard:

1. Remove any media from the drives, shut down your operating system, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Locate the keyboard connector.

Note: Your keyboard might be connected to a standard keyboard connector **1** or a USB connector **2**. Depending on where your keyboard is connected, see “Locating connectors on the rear of your computer” on page 7 or “Locating connectors on the front of your computer” on page 6.

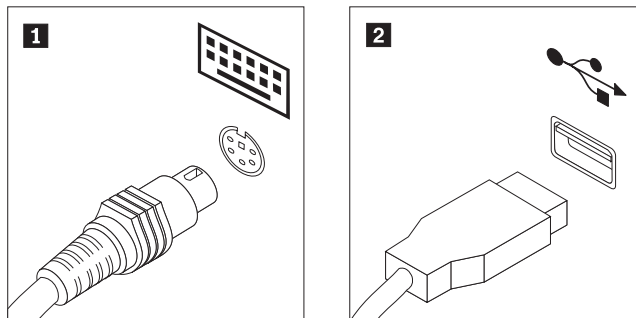


Figure 25. Keyboard connectors

4. Disconnect the failing keyboard cable from the computer.
5. Connect a new keyboard to the appropriate connector on the computer.
6. Go to “Completing the parts replacement” on page 30.

Replacing the mouse

Attention

Do not open your computer or attempt any repair before reading and understanding the “Important safety information” in the *ThinkCentre Safety and Warranty Guide* that came with your computer. To obtain a copy of the *ThinkCentre Safety and Warranty Guide*, go to: <http://www.lenovo.com/support>

This section provides instructions on how to replace the mouse.

To replace the mouse:

1. Remove any media from the drives, shut down your operating system, and turn off all attached devices and the computer.

2. Unplug all power cords from electrical outlets.
3. Locate the connector for the mouse.

Note: Your mouse might be connected to a standard mouse connector **1** or a USB connector **2**. Depending on where your mouse is connected, see “Locating connectors on the rear of your computer” on page 7 or “Locating connectors on the front of your computer” on page 6.

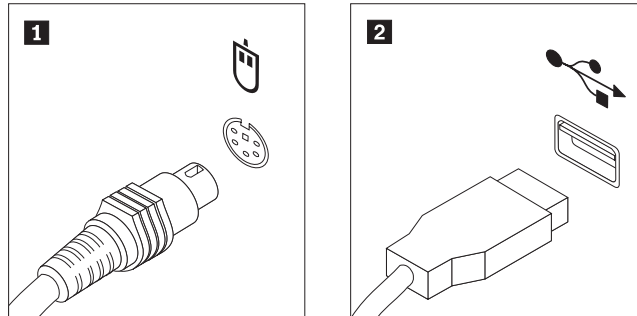


Figure 26. Mouse connectors

4. Disconnect the failing mouse cable from the computer.
5. Connect a new mouse cable to the appropriate connector on the computer.
6. Go to “Completing the parts replacement.”

Completing the parts replacement

After completing all parts replacements, you need to close the computer cover and reconnect cables, such as power cords. Depending on the parts replaced, you might need to confirm the updated information in the Setup Utility program. Refer to Chapter 4, “Using the Setup Utility,” on page 43.

To close the computer cover and reconnect cables to your computer:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer. See “Locating components” on page 9 for the location of various components.

2. Make sure that the cables are routed correctly before closing the computer cover.

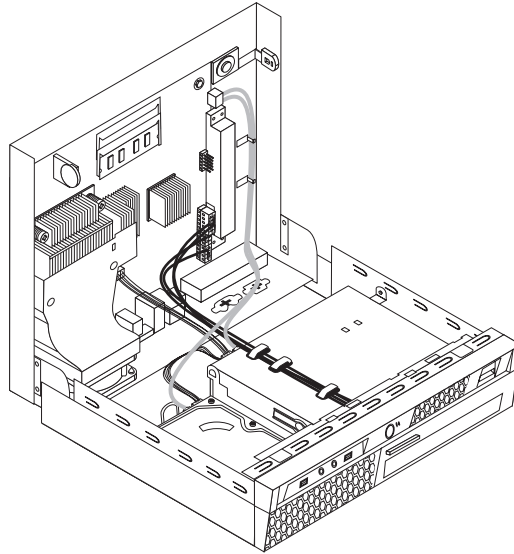


Figure 27. Cable routing

Important

Correctly route all power supply cables to avoid interference when closing the computer cover. Keep cables clear of the hinges and sides of the computer chassis.

3. Close the computer cover as shown.

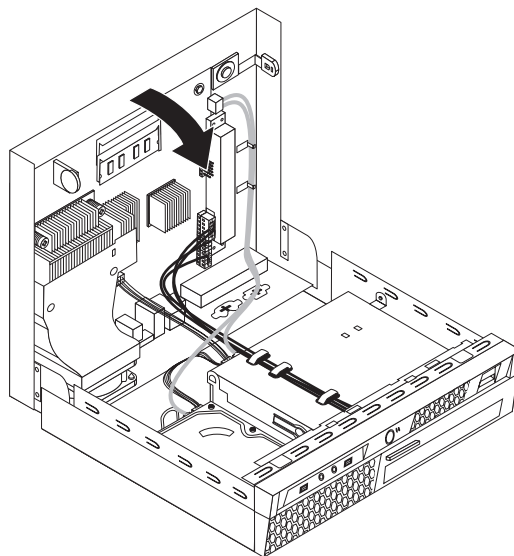


Figure 28. Closing the computer cover

4. If a computer cable lock is installed, lock the computer.
5. Reconnect the external cables and power cords to the computer. See “Locating connectors on the rear of your computer” on page 7.

6. To update your configuration, see Chapter 4, "Using the Setup Utility," on page 43.

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.

Obtaining device drivers

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

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

Make sure that any security cables you installed do not interfere with other computer cables.

Integrated cable lock

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

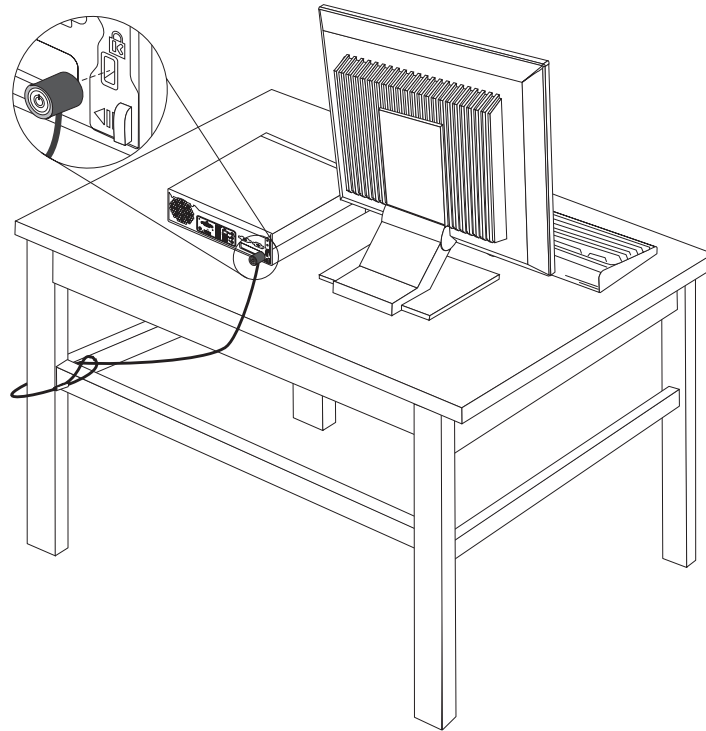


Figure 29. Integrated cable lock

Password protection

To deter unauthorized use of your computer, you can use the Setup Utility program to set a password. When you turn on your computer, you are prompted to type the password to unlock the keyboard for normal use. Refer to Chapter 4, "Using the Setup Utility," on page 43 for more information.

What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to "Completing the parts replacement" on page 30.

Erasing lost or forgotten passwords (clearing CMOS)

This section contains instructions on erasing some lost or forgotten passwords, such as a user password. For more information about lost or forgotten passwords, go to the ThinkVantage Productivity Center program.

To access the ThinkVantage Productivity Center program, click **Start** → **All Programs** → **ThinkVantage** → **Productivity Center**.

To erase lost or forgotten passwords:

1. Open the computer cover. See "Opening the computer cover" on page 12.
2. Locate the Clear CMOS/Recovery jumper on the system board. See "Locating parts on the system board" on page 10.
3. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance or configure position (pin 2 and pin 3).
4. Close the computer cover and connect the power cord. See "Completing the parts replacement" on page 30.
5. Restart the computer and leave it on for approximately 10 seconds. Turn off the computer by holding the power switch for approximately five seconds. The computer will turn off.
6. Repeat step 1 through step 2 on page 34.
7. Move the Clear CMOS/Recovery jumper back to the standard position (pin 1 and pin 2).
8. Close the computer cover and connect the power cord. See "Completing the parts replacement" on page 30.

Chapter 3. Recovery information

This chapter will help you get familiar with recovery solutions provided by Lenovo. This section explains how and when to use the following recovery methods:

- Creating and using Product Recovery discs
- Performing backup and recovery operations
- Using the Rescue and Recovery workspace
- Creating and using rescue media
- Creating and using a Recovery Repair diskette
- Recovering or installing device drivers
- Setting a rescue device in the startup sequence
- Solving recovery problems

Refer to the Access Help online help system for additional information about the Rescue and Recovery program provided by Lenovo. For information on how to access the online help system, see “Access Help” on page 58.

Note: There are a variety of methods to choose from when considering how to recover software in the event of a software or hardware-related problem. Some methods vary depending on the type of your operating system.

Creating and using Product Recovery discs

If your computer is equipped with a recordable CD or DVD drive, you can create a set of Product Recovery discs that enable you to restore the contents of the hard disk drive to the same state as when the computer was originally shipped from the factory. Product Recovery discs are useful if you transfer the computer to another area, sell the computer, recycle the computer, or as a last resort put the computer in an operational state after all other methods of recovery have failed. As a precautionary measure, it is important to create a set of Product Recovery discs as soon as possible.

Note: The recovery operations you can perform using Product Recovery discs vary depending on the operating system from which they were created. Your Microsoft Windows license permits you to create only one set of Product Recovery discs, so it is important that you store the discs in a safe place after you make them.

To create Product Recovery discs, do the following:

1. From the Windows desktop, click **Start** → **All Programs** → **ThinkVantage** → **Create Recovery Media** or **Create Product Recovery Media**.
2. Follow the instructions on the screen.

The following list explains how Product Recovery discs are used on different operating systems:

- Windows XP: use Product Recovery discs to restore your computer to the original factory contents, perform a custom factory recovery, or to perform other rescue and recovery operations such as rescuing individual files.

- Windows Vista: use Product Recovery discs to restore your computer to the original factory contents only.

When using Product Recovery discs on Windows XP, you are given the option to enter the Rescue and Recovery workspace and choose from a variety of recovery operations. When using Product Recovery discs on Windows Vista, you are prompted to insert your Product Recovery discs and are guided through the process of restoring from original factory contents only.

To use Product Recovery discs on Windows XP, do the following:

Attention: When you restore the factory contents from the Product Recovery discs, all files currently on the hard disk drive will be deleted and replaced by the original factory contents. During the restore process, you will be given the opportunity to save one or more files currently on your hard disk drive to other media before any data is removed.

1. Insert the Start Recovery disc into your CD or DVD drive.
2. Restart your computer.
3. After a short delay, the Rescue and Recovery workspace opens.

Note: If the Rescue and Recovery workspace fails to open, you might not have your startup device (CD drive or DVD drive) set correctly in your BIOS startup sequence. For more information, see “Setting a rescue device in the startup sequence” on page 41.

4. In the Rescue and Recovery menu, click **Restore your system**.
5. Follow the instructions on the screen. Insert the appropriate Product Recovery disc when prompted.

To use Product Recovery discs on Windows Vista, do the following:

Attention: When you restore the factory contents from the Product Recovery discs, all files currently on the hard disk drive will be deleted and replaced by the original factory contents.

1. Insert the Start Recovery disc into your CD or DVD drive.
2. Restart your computer. After a short delay, the Rescue and Recovery workspace opens.
3. Follow the instructions on the screen. Insert the appropriate Product Recovery disc when prompted.

Note: After restoring your hard disk drive to the original factory contents, you might have to reinstall some software or drivers. See “Using the Rescue and Recovery workspace” on page 37 for details.

Performing backup and recovery operations

The Rescue and Recovery program enables you to back up all your hard disk drive contents including the operating system, data files, application programs, and personal settings. You can designate where the Rescue and Recovery program stores the backup:

- On a protected area of your hard disk drive
- On a secondary hard disk drive installed in your computer
- On an externally attached USB hard disk drive
- On a network drive

- On recordable CDs or DVDs (a recordable CD or DVD drive is required for this option)

After you have backed up your hard disk drive, you can restore the complete contents of the hard disk drive, restore selected files only, or restore only the Windows operating system and applications.

To perform a backup operation using the Rescue and Recovery program, do the following:

1. From the Windows desktop, click **Start → All Programs → ThinkVantage → Rescue and Recovery**. The Rescue and Recovery program opens.
2. From the Rescue and Recovery main window, click **Launch advanced Rescue and Recovery → Back up your hard drive** and select backup operation options.
3. Follow the instructions on the screen.

To perform a restore operation using the Rescue and Recovery program, do the following:

1. From the Windows desktop, click **Start → All Programs → ThinkVantage → Rescue and Recovery**. The Rescue and Recovery program opens.
2. From the Rescue and Recovery main window, click the **Launch advanced Rescue and Recovery → Restore your system from a backup** icon.
3. Follow the instructions on the screen.

For information about performing a restore operation from the Rescue and Recovery workspace, see “Using the Rescue and Recovery workspace.”

Using the Rescue and Recovery workspace

The Rescue and Recovery workspace resides in a protected, hidden area of your hard disk drive that operates independently from the Windows operating system. This enables you to perform recovery operations even if the Windows operating system cannot be started. You can perform the following recovery operations from the Rescue and Recovery workspace:

- **Rescue files from your hard disk drive or from a backup:** The Rescue and Recovery workspace enables you to locate files on your hard disk drive and transfer them to a network drive or other recordable media, such as a USB hard disk drive or a diskette. This solution is available, even if you did not back up your files or if changes were made to the files since your last backup operation. You can also rescue individual files from a Rescue and Recovery backup located on your local hard disk drive, a USB device, or a network drive.
- **Restore your hard disk drive from a Rescue and Recovery backup:** When you perform a backup operation using the Rescue and Recovery program, you can perform restore operations from the Rescue and Recovery workspace, even if you cannot start the Windows operating system.
- **Restore your hard disk drive to the factory contents:** The Rescue and Recovery workspace enables you to restore the complete contents of your hard disk drive to the same state as it was when originally shipped from the factory. If you have multiple partitions on your hard disk drive, you have the option to restore the factory contents to the C: partition and leave the other partitions intact. Because the Rescue and Recovery workspace operates independently from the Windows operating system, you can restore the factory contents even if you cannot start the Windows operating system.

Attention: If you restore the hard disk drive from a Rescue and Recovery backup or restore the hard disk drive to the factory contents, all files on the primary hard disk drive partition (usually drive C) will be deleted in the recovery process. If possible, make copies of important files. If you are unable to start the Windows operating system, you can use the Rescue files feature in the Rescue and Recovery workspace to copy files from your hard disk drive to other media.

To start the Rescue and Recovery workspace, do the following:

1. Turn off your computer.
2. Restart your computer.
3. Repeatedly press and release the F11 key.
4. When you hear beeps or see a logo screen, release the F11 key.
5. If you set a Rescue and Recovery password, type your password when prompted. The Rescue and Recovery workspace opens after a short delay.

Note: If the Rescue and Recovery workspace fails to open, see “Solving recovery problems” on page 41.

6. Do one of the of the following:
 - To rescue files from your hard disk drive or from a backup, click **Rescue files**; then, follow the instructions on the screen.
 - To restore your hard disk drive from a Rescue and Recovery backup or to restore your hard disk drive to the factory contents, click **Restore your system**; then follow the instructions on the screen.
 - For information about other features of the Rescue and Recovery workspace, click **Help**.

Notes:

1. After restoring a hard disk drive to the original factory contents, you might have to reinstall device drivers for some devices. See “Recovering or installing device drivers” on page 40.
2. Some computers come with Microsoft Office or Microsoft Works preinstalled. If you need to recover or reinstall your Microsoft Office or Microsoft Works applications, you must use the *Microsoft Office CD* or *Microsoft Works CD*. These CDs are provided only with computers that come with Microsoft Office or Microsoft Works preinstalled.

Creating and using rescue media

Rescue media such as a CD, DVD, or USB hard disk drive enables you to recover from failures that prevent you from gaining access to the Rescue and Recovery workspace on your hard disk drive.

Note: The recovery operations you can perform using rescue media vary depending on the operating system. The rescue disc can be started in any type of CD drive or DVD drive. Rescue media also contains a PC-Doctor diagnostics program, which enables you to run diagnostics from the rescue media.

To create rescue media, do the following:

1. Click **Start** → **All Programs** → **ThinkVantage** → **Create Recovery Media**.
2. In the **Rescue Media** area, select the type of rescue media you want to create. You can create rescue media using a CD, DVD, USB hard disk drive, or a secondary internal hard disk drive.

3. Click **OK**.
4. Follow the instructions on the screen.

The following list explains how Product Recovery discs are used on different operating systems:

- Windows XP: use Product Recovery discs to restore the original factory contents, perform a custom factory recovery, or to perform other rescue and recovery operations such as rescuing individual files.
- Windows Vista: use rescue media to perform all recovery operations except custom factory recovery and original factory contents recovery.

To use rescue media, do one of the following:

- If your rescue media is on discs, insert the rescue disc and restart your computer.
- If your rescue media is on a USB hard disk drive, attach your USB hard disk drive to one of the USB connectors on your computer, then restart on your computer.
- If you are using a secondary internal hard disk drive, set the startup sequence to start from that drive.

When the rescue media starts, the Rescue and Recovery workspace opens. Help for each feature is available from the Rescue and Recovery workspace. If your rescue media fails to start, you might not have your rescue device (CD drive, DVD drive, or USB device) set correctly in your BIOS startup sequence. For more information, see "Setting a rescue device in the startup sequence" on page 41.

Creating and using a Recovery Repair diskette

If you are unable to access the Rescue and Recovery workspace or the Windows environment, use a Recovery Repair diskette to repair the Rescue and Recovery workspace or repair a file needed to enter the Windows environment. It is important to create a Recovery Repair diskette as soon as possible and store it in a safe place as a precautionary measure.

To create a Recovery Repair diskette, do the following:

1. Start your computer and the operating system.
2. Go to:

<http://www.lenovo.com/think/support/site.wss/document.do?lnocid=MIGR-54483>

3. Insert a diskette into the diskette drive. Information on the diskette will be erased and the diskette will be formatted appropriately.
4. Double-click the appropriate file name. The diskette is created.
5. Remove the diskette and label it "Recovery Repair."

To use the Recovery Repair diskette, do the following:

1. Shut down the operating system and turn off the computer.
2. Insert the Recovery Repair diskette into the diskette drive.
3. Turn on the computer and follow the instructions on the screen.

Note: If the repair operation finishes without error, you will be able to access the Rescue and Recovery workspace by repeatedly pressing the F11 key while you restart your computer. When you hear beeps or see a logo screen,

release the F11 key. You will also be able to access the Windows environment after the repair operation finishes.

If an error message appears during the repair operation and the repair operation cannot be completed, you might have a problem with the partition that contains the Rescue and Recovery workspace. Use your rescue media to access the Rescue and Recovery workspace. For information about creating and using rescue media, see "Creating and using rescue media" on page 38.

Recovering or installing device drivers

Before you recover or install device drivers, make sure your operating system is installed and you have the documentation and software media for the device.

Device drivers for factory-installed devices are located on the computer hard disk drive (usually drive C) in the SWTOOLS\drivers folder. Other device drivers are on the software media that come with individual devices.

The latest device drivers for factory-installed devices also are available on the World Wide Web at:

<http://www.lenovo.com/think/support>

To reinstall a device driver for a factory-installed device, do the following:

1. Start your computer and operating system.
2. Use Windows Explorer or My Computer to display the directory structure of your hard disk drive.
3. Open the C:\SWTOOLS folder.
4. Open the DRIVERS folder. Within the DRIVERS folder are several subfolders that are named for various devices installed in your computer (for example, AUDIO or VIDEO).
5. Open the appropriate device subfolder.
6. Use one of the following methods to reinstall the device driver:
 - In the device subfolder, look for a README.TXT or other file with the .txt extension. This file might be named after the operating system, such as WIN98.TXT. The TXT file has information on how to reinstall that device driver.
 - If the device subfolder contains a file with the .inf extension, you can use the Add New Hardware program (located in the Windows Control Panel) to reinstall the device driver. Not all device drivers can be reinstalled using this program. In the Add New Hardware program, when prompted for the device driver that you want to install, click **Have Disk** and **Browse**. Then select the appropriate device driver file from the device subfolder.
 - In the device subfolder, look for a SETUP.EXE file. Double-click **SETUP.EXE** and follow the instructions on the screen.

Setting a rescue device in the startup sequence

Before you start the Rescue and Recovery program from a CD, DVD, USB hard disk drive, or any external device, you must first change the startup sequence in the Setup Utility.

To view or change the startup sequence, do the following:

1. With the computer turned off, repeatedly press and release the F1 key while you turn on the computer.
2. When the logo screen appears, or you hear a series of beeps, release the F1 key.
3. If you are prompted for a password, type your current password.
4. From the Setup Utility main menu, use the right-arrow key to select **Startup**.
5. Arrange the startup sequence to meet your needs.
6. Press the Esc key twice to go to the **Setup Utility exit** menu.
7. Use the down-arrow key to select **Save and exit the Setup Utility**, then press Enter.
8. When the Setup Confirmation window appears, press Enter.
9. The computer restarts.

Note: If you are using an external device, you first must turn off your computer before connecting the external device.

For more information on Setup Utility, see Chapter 4, "Using the Setup Utility," on page 43.

Solving recovery problems

If you are unable to access the Rescue and Recovery workspace or the Windows environment, you can:

- Use your rescue media (CD, DVD, or USB hard disk drive) to start the Rescue and Recovery workspace. See "Creating and using rescue media" on page 38 for details.
- Use a Recovery Repair diskette to repair the Rescue and Recovery workspace or repair a file needed to enter the Windows environment. See "Creating and using a Recovery Repair diskette" on page 39 for details.
- Use a set of Product Recovery discs if you want to restore the hard disk drive to its original factory state. See "Creating and using Product Recovery discs" on page 35.

It is important to create a Recovery Repair diskette, rescue media, and a set of Product Recovery discs as soon as possible and store them in a safe place.

If you are unable to access the Rescue and Recovery workspace or the Windows environment from rescue media, a Recovery Repair diskette, or a set of Product Recovery discs, you might not have the rescue device, CD drive, DVD drive, or USB hard disk drive defined as a startup device in the BIOS startup sequence. For more information, see "Setting a rescue device in the startup sequence."

Chapter 4. Using the Setup Utility

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. If your computer is already on when you start this procedure, shut down the operating system and turn off the computer.
2. Press and hold the F1 key, and then turn on the computer. When you hear multiple beeps, release the F1 key.

Notes:

- a. If you are using a USB keyboard and the Setup Utility program does not display using this method, repeatedly press and release the F1 key rather than leaving it pressed when turning on the computer.
- b. If a Power-On Password or a Privileged Access Password has been set, the Setup Utility program menu is not displayed until you type your password. For more information, see “Using passwords.”

The Setup Utility program might start automatically when POST detects that hardware has been removed or new hardware has been installed in your computer.

Viewing and changing settings

The Setup Utility program menu lists items that identify system configuration topics. To view or change settings, see “Starting the Setup Utility program.”

When working with the Setup Utility program menu, you must use the keyboard. 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 persons from gaining access to your computer and data. See “Starting the Setup Utility program.” The following types of passwords are available:

- Power-On Password
- Privileged Access Password
- Hard Disk User Password

You do not have to set any passwords to use your computer. However, if you decide to set any passwords, read the following sections.

Password considerations

A password can be any combination of up to 12 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 password

Power-On Password

When a Power-On Password is set, the computer cannot be used until a valid password is typed from the keyboard.

Privileged Access Password

When a Privileged Access Password is set, it deters unauthorized persons from changing configuration settings. If you are responsible for maintaining the settings of several computers, you might want to set a Privileged Access Password.

After you set a Privileged Access Password, a password prompt is displayed each time you try to access the Setup Utility program.

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

Hard Disk User Password

When a Hard Disk User Password is set, it prevents unauthorized users from accessing the data on the hard disk drive.

Setting, changing, and deleting a password

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

Note: A password can be any combination of up to 12 alphabetic and numeric characters. For more information, see "Password considerations."

1. Start the Setup Utility program. See Chapter 4, "Using the Setup Utility," on page 43.
2. From the Setup Utility program, select **Security** → **Set Passwords**.
3. Read the information displayed on the right side of the screen.

Enabling or disabling a device

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

Serial ATA	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 will not be displayed in the system configuration.
External SATA Port	When this feature is set to Disabled , the device connected to the External SATA connector cannot be accessed.
Legacy Diskette A (some models)	When this feature is set to Disabled , the diskette drive 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 43.
2. From the Setup Utility program, select **Devices** or select **Devices → IDE Drives Setup**.
3. Select the desired devices and settings and press Enter.
4. Return to the Setup Utility program menu and select **Exit** and then **Save Settings** or **Save and exit the Setup Utility**.

Note: If you do not want to save the settings, select **Exit the Setup Utility without saving**.

Selecting a startup device

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

Selecting a temporary startup device

Use this procedure to startup from any start device.

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

1. Turn off your computer.
2. Press and hold the F12 key, and then turn on the computer. When the **Startup Device** Menu appears, release the F12 key.

Note: If you are using a USB keyboard and the **Startup Device** Menu does not display using this method, repeatedly press and release the F12 key rather than leaving it pressed when turning on the computer.

3. Select the desired startup device from the **Startup Device** Menu and press Enter to begin.

Note: Selecting a startup device from the **Startup Device** menu 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 43.
2. Select **Startup** → **Startup Sequence**. See the information displayed on the right side of the screen.
3. Select the devices for the Primary Startup Sequence, the Automatic Startup Sequence, and the Error Startup Sequence.
4. Select **Exit** from the Setup Utility menu and then **Save Settings** or **Save and exit the Setup Utility**.

If you have changed these settings and want to return to the default settings, select **Load Default Settings** on the **Exit** menu.

Advanced settings

On some computer models, the **Advanced** menu includes a setting to enable or disable HyperThreading. This feature works only with HyperThreading-aware operating systems, such as Windows Vista and Windows XP. The default setting for HyperThreading is **Enabled**. However, if you select **Set Defaults** and are using an operating system other than Windows Vista and Windows XP, your computer performance might be degraded. Therefore, you should always set HyperThreading to **Disabled** unless you are sure your operating system supports HyperThreading.

Exiting from the Setup Utility program

After you finish viewing or changing settings, press Esc to return to the Setup Utility program menu (you might have to press Esc several times). If you want to save the new settings, select **Save Settings** or **Save and exit the Setup Utility**. Otherwise, your changes will not be saved.

Chapter 5. Updating system programs

This chapter contains information about updating POST/BIOS and how to recover from a POST/BIOS update failure.

Using system programs

System programs are the basic layer of software built into your computer. They include the power-on self-test (POST), the basic input/output system (BIOS) code, and the Setup Utility program. POST is a set of tests and procedures that are performed each time you turn on your computer. 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 and change the configuration and setup of your computer.

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 POST, BIOS, and the Setup Utility program by starting your computer using a flash update disc or by running a special update program from your operating system.

Lenovo might make changes and enhancements to the POST/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/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 (flash) disc or an update program that can be run from the operating system.

Note: You can download a self starting bootable CD/DVD image (known as an ISO image) of the diagnostics program to support systems without a diskette drive from:
<http://www.lenovo.com>

Updating (flashing) BIOS from a disc

This section provides instructions on how to update (flash) the BIOS from a disc. System BIOS program updates are available at:
<http://www.lenovo.com/support>

To update (flash) the BIOS from a disc:

1. Make sure the optical drive you want to use is set as the first boot device in the startup device sequence. See "Selecting or changing the startup device sequence" on page 46.
2. Make sure the computer is turned on. Insert the disc into the optical drive.
3. Turn off the computer and back on again. The update begins.
4. When you are prompted to select a language, press the number on your keyboard that corresponds to the language and then press Enter.
5. When prompted to change the serial number, press Y.
6. Type in the seven character serial number of your computer and then press Enter.
7. When prompted to change the machine type/model, press Y.

8. Type in the seven character machine type/model of your computer and then press Enter.
9. Follow the instructions on the screen to complete the update.

Updating (flashing) BIOS from your operating system

Note: Due to the constant improvements made to the Web site, Web page content (including the links referenced in the following procedure) is subject to change.

1. Go to:
<http://www.lenovo.com/support>
2. Locate the downloadable files for your machine type as follows:
 - a. In the **Enter a product number** field, type your machine type and click **Go → Continue → Downloads and drivers**.
 - b. Under the BIOS category, click **Flash BIOS update**.
 - c. Click the TXT file that contains the installation instructions for the flash BIOS update (flash from the operating system version).
3. Print these instructions. This is very important because they are not on the screen after the download begins.
4. Click **Back** to return to the list of files. Carefully 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 POST/BIOS is being updated (flash update), your computer might not restart correctly. If this happens, perform the following procedure commonly called Boot-block Recovery.

1. Turn off the computer and any attached devices, such as printers, monitors, and external drives.
2. Unplug all power cords from electrical outlets and open the computer cover. Refer to "Opening the computer cover" on page 12.
3. Locate the Clear CMOS/Recovery jumper on the system board. Refer to "Locating parts on the system board" on page 10.
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 pin 2 and pin 3.
6. Reconnect any cables that were disconnected.
7. Close the computer cover and reconnect the power cords for the computer and monitor to electrical outlets. Refer to "Completing the parts replacement" on page 30.
8. Turn on the computer and the monitor. Insert the POST/BIOS update (flash) disc into the optical drive.
9. Turn the computer off and back on again.
10. The recovery session will take two to three minutes. During this time you will hear a series of beeps. After the update session is completed, there will be no video, the series of beeps will end, and the system will automatically turn off. Remove the disc from the disc drive.
11. Repeat steps 2 through 4.
12. Move the Clear CMOS/Recovery jumper back to the standard position (pin 1 and pin 2).

13. Reconnect any cables that were disconnected.
14. Close the computer cover and reconnect the power cords for the computer and monitor to electrical outlets. Refer to "Completing the parts replacement" on page 30.
15. Turn on the computer to restart the operating system.

Chapter 6. Troubleshooting and diagnostics

This chapter describes some basic troubleshooting and diagnostic programs. If your computer problem is not described here, see Chapter 7, "Getting information, help, and service," on page 57 for additional troubleshooting resources.

Basic troubleshooting

The following table provides information to help you troubleshoot your computer problem.

Symptom	Action
The computer does not start when you press the power button.	<p>Verify that:</p> <ul style="list-style-type: none">• The power cord is plugged into the rear of the computer and into a working electrical outlet.• If your computer has a secondary power switch on the back of the computer, make sure that it is switched on.• The power indicator on the front of the computer is on.• The voltage is set to the correct setting for your country. <p>If you cannot correct the problem, have the computer serviced. Refer to the safety and warranty information that is provided with your computer for a list of service and support telephone numbers.</p>
The monitor screen is blank.	<p>Verify that:</p> <ul style="list-style-type: none">• The monitor cable is securely attached to the rear of the monitor and to the rear of the computer.• The monitor power cord is plugged into the monitor and into a working electrical outlet.• The monitor is turned on and the brightness and contrast controls are set correctly.• The voltage is set to the correct setting for your country.• The monitor signal cable is securely connected to the monitor and to the monitor connector on the computer. <p>Note: If your computer has two monitor connectors, verify that your monitor is connected to the option connector rather than the one in the rear of the system board. For more information, see "Connecting your computer" in the <i>ThinkCentre Safety and Warranty Guide</i>.</p> <p>If you cannot correct the problem, have the computer serviced. Refer to the safety and warranty information that is provided with your computer for a list of service and support telephone numbers.</p>

Symptom	Action
The keyboard does not work. The computer does not respond to the keyboard.	<p>Verify that:</p> <ul style="list-style-type: none"> • The computer is turned on. • The monitor is turned on and the brightness and contrast controls are set correctly. • The keyboard is securely connected to the keyboard connector on the computer. • No keys are stuck. <p>If you cannot correct the problem, have the computer serviced. Refer to the safety and warranty information that is provided with your computer for a list of service and support telephone numbers.</p>
The USB Keyboard does not work.	<p>Verify that:</p> <ul style="list-style-type: none"> • The computer is turned on. • The keyboard is securely connected to a USB connector on the front or rear of the computer. • No keys are stuck. <p>If you cannot correct the problem, have the computer serviced. Refer to the safety and warranty information that is provided with your computer for a list of service and support telephone numbers.</p>
The mouse does not work. The computer does not respond to the mouse.	<p>Verify that:</p> <ul style="list-style-type: none"> • The computer is turned on. • The mouse is securely connected to the mouse connector on the computer. • The mouse is clean. Refer to "Cleaning the mouse" on page 54 for further information. <p>If you cannot correct the problem, have the computer serviced. Refer to the safety and warranty information that is provided with your computer for a list of service and support telephone numbers.</p>
The operating system will not start.	<p>Verify that:</p> <ul style="list-style-type: none"> • There is no diskette in the diskette drive. • 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 45. <p>Note: For SMC computers, you might receive the error message "No operating system found. Press F1 to repeat boot sequence." In this case, press Ctrl+Alt+Delete instead of F1 to establish a connection to the storage area network where your operating system is stored. Verify that the user name is not logged on in another location.</p> <p>If you cannot correct the problem, have the computer serviced. Refer to the safety and warranty information that is provided with your computer for a list of service and support telephone numbers.</p>
The SMC login prompt disappears before you log on and then a black screen displays (for SMC computers only).	Contact your administrator.
The computer beeps multiple times before the operating system starts.	<p>Verify that no keys are stuck down.</p> <p>If you cannot correct the problem, have the computer serviced. Refer to the safety and warranty information that is provided with your computer for a list of service and support telephone numbers.</p>

Diagnostic programs

Diagnostic programs are used to test hardware components of your computer and report operating-system-controlled settings that can cause hardware failures. There are two diagnostic programs preinstalled on your computer:

- Lenovo System Toolbox (used when the Windows operating system is running)
- PC-Doctor for Windows PE (used when the Windows operating system does not start)

Notes:

1. You can also download the latest version of the Lenovo System Toolbox and PC-Doctor for DOS diagnostic programs from:
<http://www.lenovo.com/support>
See “Lenovo System Toolbox” and “PC-Doctor for DOS” on page 54 for detailed information.
2. If you are unable to isolate and repair the problem yourself after you run the Lenovo System Toolbox and the PC-Doctor for Windows PE, save and print the log files created by both diagnostic programs. You will need the log files when you speak to a Lenovo technical support representative.

Lenovo System Toolbox

The Lenovo System Toolbox is a diagnostic program that works through the Windows operating system and enables you to view symptoms and solutions for computer problems, access the Lenovo troubleshooting center, update system drivers, and review system information.

To run the Lenovo System Toolbox, click **Start** → **All Programs** → **Lenovo Services** → **Lenovo System Toolbox**. Follow the instructions on the screen. For additional information about running the diagnostic program, refer to the Lenovo System Toolbox help system.

If you still suspect a problem after the Lenovo System Toolbox runs successfully, run the PC-Doctor for Windows PE to help you diagnose the computer problem.

The Lenovo System Toolbox also has problem determination aids that determine software and usage problems.

PC-Doctor for Windows PE

The PC-Doctor for Windows PE diagnostic program is part of the Rescue and Recovery workspace on each Lenovo computer. Use the PC-Doctor for Windows PE if you are unable to start the Windows operating system or if the Lenovo System Toolbox has not been successful in isolating a possible problem.

Running diagnostics from the Rescue and Recovery workspace

You can run the PC-Doctor for Windows PE diagnostic program from the Rescue and Recovery workspace. To run diagnostics from the Rescue and Recovery workspace, do the following:

1. Shut down the operating system and turn off the computer.
2. Repeatedly press and release the F11 key when you turn on the computer.
3. When you hear beeps or see a logo screen, stop pressing the F11 key. The Rescue and Recovery workspace opens.
4. From the Rescue and Recovery workspace, select **Launch Advanced Rescue and Recovery** → **Diagnose hardware**.

5. The diagnostic program opens automatically. Select the diagnostic test you want to run. Press the F1 key for additional help.
6. Follow the instructions on the screen.

Note: Rescue media includes PC-Doctor for Windows PE. For more information about rescue media, see “Creating and using rescue media” on page 38.

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 PC-Doctor for DOS, if you are unable to start the Windows operating system or if Lenovo System Toolbox and PC-Doctor for Windows PE have not been successful in isolating a possible problem. You can run PC-Doctor for DOS from a diagnostic CD/DVD image that you create.

Creating a diagnostic CD/DVD image

To create a diagnostic CD/DVD image, download a self-starting bootable CD/DVD image (known as an ISO image) of the diagnostic program from <http://www.lenovo.com/support>

After you download the image, you can create the CD/DVD using any CD/DVD burning software.

Running diagnostics from the disc

To run diagnostics from the diagnostic CD/DVD image that you created, do the following:

1. Insert the disc into the optical drive.
2. Restart the computer.

Note: If the diagnostic program does not start, you might not have your optical drive set as a startable device. See “Selecting a startup device” on page 45 for instructions on how to change the startup device.

3. When the diagnostics program opens, follow the instructions on the screen.
4. When the program finishes, be sure to remove the disc from the drive.
5. Select the diagnostic test you want to run. Press the F1 key for additional help.

Cleaning the mouse

This section provides instructions on how to clean an optical or non-optical mouse.

Optical mouse

An optical mouse uses a light-emitting diode (LED) and an optical sensor to navigate the pointer. If the pointer on the screen does not move smoothly with the optical mouse, you might need to clean the mouse.

To clean the optical mouse:

1. Turn off your computer.
2. Disconnect the mouse cable from the computer.
3. Turn the mouse upside down to look at the lens.
 - a. If there is a smudge on the lens, gently clean the area with a plain cotton-tipped swab.

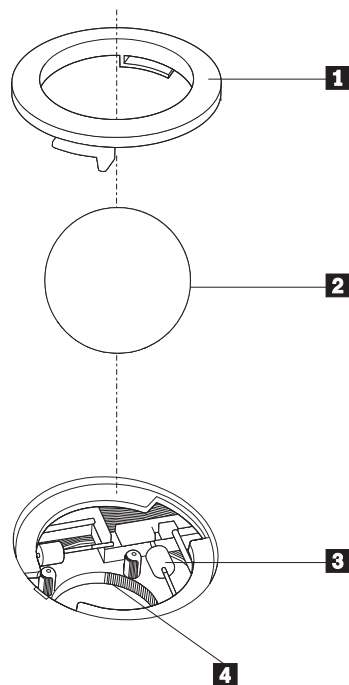
- b. If there is debris in the lens, gently blow the debris away from the area.
4. Check the surface on which you are using the mouse. If you have a very intricate picture or pattern beneath the mouse it may be difficult for the digital signal processor (DSP) to determine changes in the mouse position.
5. Reconnect the mouse cable to the computer.
6. Turn your computer back on.

Non-optical mouse

The non-optical mouse uses a ball to navigate the pointer. If the pointer on the screen does not move smoothly with the mouse, you might need to clean the mouse.

To clean a non-optical mouse:

Note: The following illustration might be slightly different from your mouse.



- 1** Retainer ring
- 2** Ball
- 3** Plastic rollers
- 4** Ball cage

1. Turn off your computer.
2. Disconnect the mouse cable from the computer.
3. Turn the mouse upside down. Twist the retainer ring **1** to the unlocked position to remove the ball.
4. Place your hand over the retainer ring and ball **2**, and then turn the mouse right-side up, so that the retainer ring and ball fall out into your hand.
5. Wash the ball in warm, soapy water then dry it with a clean cloth.
6. Blow air carefully into the ball cage **4** to dislodge dust and lint.
7. Look for a buildup of dirt on the plastic rollers **3** inside the ball cage. This buildup usually appears as a stripe running across the middle of the rollers.

8. If the rollers are dirty, clean them by using a cotton swab soaked in isopropyl (rubbing) alcohol. Turn the rollers with your finger and continue swabbing them until all the dirt is removed. Be sure the rollers are still centered in their channels after you clean them.
9. Remove any fibers from the swab that might be remaining on the rollers.
10. Replace the ball and the retainer ring. Twist the retainer ring to the locked position.
11. Reconnect the mouse cable to the computer.
12. Turn your computer back on.

Chapter 7. Getting information, help, and service

This chapter contains information about help, service, and technical assistance for products manufactured by Lenovo.

Information resources

This section describes how to access useful resources relating to your computing needs.

Note: The Online Books folder, ThinkVantage Productivity Center, Lenovo Welcome, and Access Help are only available on computers that have an internal hard disk drive and preinstalled software from Lenovo.

Online Books folder

The Online Books folder provides online *ThinkCentre User Guide* to help you set up and use your computer. The Online Books folder is preinstalled on your computer and requires no Internet access to view the publications.

To view a publication, click **Start** → **All Programs** → **Online Books** → **Online Books**. Double-click the appropriate publication for your computer. The publications also are available on the Lenovo Web site at:
<http://www.lenovo.com>

Notes:

1. These publications are in Portable Document Format (PDF), which requires the Adobe Reader to be installed to view. If the Adobe Reader has not yet been installed on your computer, a message will appear when you attempt to view the PDF file and you will be guided through the Adobe Reader installation.
2. The publications that are preinstalled on your computer are available in other languages on the Lenovo Support Web site at:
<http://www.lenovo.com/support>
3. If you want to install a different language version of the Adobe Reader rather than the version provided on your computer, download the version you want to use from the Adobe Web site at:
<http://www.adobe.com>

ThinkVantage Productivity Center

The ThinkVantage Productivity Center program contains information sources and tools designed to make computing easier and secure. It provides easy access to various technologies, such as:

- Client Security Solution
- Power Manager
- Product Recovery
- Productivity Center
- Rescue and Recovery
- Service and support
- System Update

Note: The ThinkVantage Technologies are only available on select Lenovo computers.

To access the ThinkVantage Productivity Center program, click **Start → All Programs → ThinkVantage → Productivity Center**.

Lenovo Welcome

The Lenovo Welcome program introduces you to some innovative built-in features of Lenovo and guides you through a few important setup tasks to help you make the most of your computer.

Access Help

The Access Help online help system provides information about getting started, doing basic tasks, customizing settings for your personal preference, protecting data, expanding and upgrading, and troubleshooting.

To open Access Help, click **Start → All Programs → ThinkVantage → Access Help**. After you have opened Access Help, use the left panel to make a selection from the **Contents** tab or the **Index** tab, or use the **Search** tab to find a particular word or phrase.

Safety and Warranty

The *ThinkCentre Safety and Warranty Guide* that is provided with your computer contains 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 and notebook computers
 - Monitors
 - Projectors
 - Upgrades and accessories
 - 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.
- Access the Lenovo Statement of Limited Warranty.
- Access troubleshooting and support information for your computer model and other supported products.
- Find the service and support phone number for your country or region.
- Find a service provider located near you.

Help and service

This section contains information about obtaining help and service.

Using the documentation and diagnostic programs

If you experience a problem with your computer, see Chapter 6, “Troubleshooting and diagnostics,” on page 51. For information on additional resources to help you troubleshoot your computer problem, see “Information resources” on page 57.

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

Most computers come with a set of diagnostic programs that help you identify hardware problems. For instructions on using the diagnostic programs, see “Diagnostic programs” on page 53.

You can also get the latest technical information and download device drivers and updates from 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.

These services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining a hardware problem and deciding what action is necessary to fix the problem.
- **Hardware repair** - If the problem is caused by hardware under warranty, trained service personnel are available to provide the applicable level of service.
- **Engineering Change management** - There might be changes that are required after a product has been sold. Lenovo or your reseller will make selected Engineering Changes (ECs) 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 safety and warranty information that is provided with your computer for a complete explanation of warranty terms. You must retain your proof of purchase to obtain warranty service.

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

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

If possible, be at your computer when you call. Have the following information available:

- Machine type and model
- Serial numbers of 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. Notices

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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.

Television output notice

The following notice applies to models that have the factory-installed television-output feature.

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