



# ThinkCentre E73 User Guide

ThinkThink**ThinkCentre**Think

**Machine Types:** 10AS, 10AV, 10DR, and 10DS

**Note:** Before using this information and the product it supports, be sure to read and understand the “Important safety information” on page v and Appendix A “Notices” on page 115.

**Fifth Edition (July 2015)**

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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 information in this section and the safety information in the *Safety, Warranty, and Setup Guide* that you received with this product. Reading and understanding this safety information reduces the risk of personal injury and damage to your product.

If you no longer have a copy of the *Safety, Warranty, and Setup Guide*, you can obtain a Portable Document Format (PDF) version from the Lenovo® Support Web site at <http://www.lenovo.com/UserManuals>. The Lenovo Support Web site also provides the *Safety, Warranty, and Setup Guide* and this *User Guide* in additional languages.

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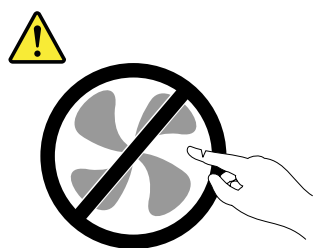
## Service and upgrades

Do not attempt to service a product yourself unless instructed to do so by the Customer Support Center or your documentation. Only use a Service Provider who is approved to repair your particular product.

**Note:** Some computer parts can be upgraded or replaced by the customer. Upgrades typically are referred to as options. Replacement parts approved for customer installation are referred to as Customer Replaceable Units, or CRUs. Lenovo provides documentation with instructions when it is appropriate for customers to install options or replace CRUs. You must closely follow all instructions when installing or replacing parts. The Off state of a power indicator does not necessarily mean that voltage levels inside a product are zero. Before you remove the covers from a product equipped with a power cord, always make sure that the power is turned off and that the product is unplugged from any power source. For more information on CRUs, refer to Chapter 5 “Installing or replacing hardware” on page 33. If you have any questions or concerns, contact the Customer Support Center.

Although there are no moving parts in your computer after the power cord has been disconnected, the following warnings are required for your safety.

### CAUTION:



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

### CAUTION:



**Before you open the computer cover, turn off the computer and wait several minutes until the computer is cool.**

---

## Static electricity prevention

Static electricity, although harmless to you, can seriously damage computer components and options. Improper handling of static-sensitive parts can cause damage to the part. When you unpack an option

or CRU, do not open the static-protective package containing the part until the instructions direct you to install it.

When you handle options or CRUs, or perform any work inside the computer, take the following precautions to avoid static-electricity damage:

- Limit your movement. Movement can cause static electricity to build up around you.
- Always handle components carefully. Handle adapters, memory modules, and other circuit boards by the edges. Never touch exposed circuitry.
- Prevent others from touching components.
- When you install a static-sensitive option or CRU, 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 static-sensitive part from the static-protective packaging and install the part without setting it down. When this is not possible, place the static-protective packaging on a smooth, level surface and place the part on it.
- Do not place the part on the computer cover or other metal surface.

---

## **Power cords and power adapters**

Use only the power cords and power adapters supplied by the product manufacturer. Do not use the ac power cord for other devices.

The power cords shall be safety approved. For Germany, it shall be H05VV-F, 3G, 0.75 mm<sup>2</sup>, or better. For other countries, the suitable types shall be used accordingly.

Never wrap a power cord around a power adapter or other object. Doing so can stress the cord in ways that can cause the cord to fray, crack, or crimp. This can present a safety hazard.

Always route power cords so that they will not be walked on, tripped over, or pinched by objects.

Protect power cord and power adapters from liquids. For instance, do not leave your power cord or power adapter near sinks, tubs, toilets, or on floors that are cleaned with liquid cleansers. Liquids can cause a short circuit, particularly if the power cord or power adapter has been stressed by misuse. Liquids also can cause gradual corrosion of power cord terminals and/or the connector terminals on a power adapter, which can eventually result in overheating.

Ensure that all power cord connectors are securely and completely plugged into receptacles.

Do not use any power adapter that shows corrosion at the ac input pins or shows signs of overheating (such as deformed plastic) at the ac input or anywhere on the power adapter.

Do not use any power cords where the electrical contacts on either end show signs of corrosion or overheating or where the power cord appears to have been damaged in any way.

---

## **Extension cords and related devices**

Ensure that extension cords, surge protectors, uninterruptible power supplies, and power strips that you use are rated to handle the electrical requirements of the product. Never overload these devices. If power strips are used, the load should not exceed the power strip input rating. Consult an electrician for more information if you have questions about power loads, power requirements, and input ratings.



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## Plugs and outlets

If a receptacle (power outlet) that you intend to use with your computer equipment appears to be damaged or corroded, do not use the outlet until it is replaced by a qualified electrician.

Do not bend or modify the plug. If the plug is damaged, contact the manufacturer to obtain a replacement.

Do not share an electrical outlet with other home or commercial appliances that draw large amounts of electricity; otherwise, unstable voltage might damage your computer, data, or attached devices.

Some products are equipped with a three-pronged plug. This plug fits only into a grounded electrical outlet. This is a safety feature. Do not defeat this safety feature by trying to insert it into a non-grounded outlet. If you cannot insert the plug into the outlet, contact an electrician for an approved outlet adapter or to replace the outlet with one that enables this safety feature. Never overload an electrical outlet. The overall system load should not exceed 80 percent of the branch circuit rating. Consult an electrician for more information if you have questions about power loads and branch circuit ratings.

Be sure that the power outlet you are using is properly wired, easily accessible, and located close to the equipment. Do not fully extend power cords in a way that will stress the cords.

Be sure that the power outlet provides the correct voltage and current for the product you are installing.

Carefully connect and disconnect the equipment from the electrical outlet.

---

## External devices

Do not connect or disconnect any external device cables other than Universal Serial Bus (USB) and 1394 cables while the computer power is on; otherwise, you might damage your computer. To avoid possible damage to attached devices, wait at least five seconds after the computer is shut down to disconnect external devices.

---

## Heat and product ventilation

Computers, power adapters, and many accessories can generate heat when turned on and when batteries are charging. Always follow these basic precautions:

- Do not leave your computer, power adapter, or accessories in contact with your lap or any part of your body for an extended period when the products are functioning or when the battery is charging. Your computer, power adapter, and many accessories produce some heat during normal operation. Extended contact with the body could cause discomfort or, potentially, a skin burn.
- Do not charge the battery or operate your computer, power adapter, or accessories near flammable materials or in explosive environments.
- Ventilation slots, fans, and heat sinks are provided with the product for safety, comfort, and reliable operation. These features might inadvertently become blocked by placing the product on a bed, sofa, carpet, or other flexible surface. Never block, cover, or disable these features.

Inspect your desktop computer for dust accumulation at least once every three months. Before inspecting your computer, turn off the power and unplug the computer's power cord from the electrical outlet; then remove any dust from vents and perforations in the bezel. If you notice external dust accumulation, then examine and remove dust from the inside of the computer including heat sink inlet fins, power supply vents, and fans. Always turn off and unplug the computer before opening the cover. If possible, avoid operating your computer within two feet of high-traffic areas. If you must operate your computer in or near a high-traffic area, inspect and, if necessary, clean your computer more frequently.

For your safety and to maintain optimum computer performance, always follow these basic precautions with your desktop computer:

- Keep the cover closed whenever the computer is plugged in.
- Regularly inspect the outside of the computer for dust accumulation.
- Remove dust from vents and any perforations in the bezel. More frequent cleanings might be required for computers in dusty or high-traffic areas.
- Do not restrict or block any ventilation openings.
- Do not store or operate your computer inside furniture, as this might increase the risk of overheating.
- Airflow temperatures into the computer should not exceed 35°C (95°F).
- Do not install air filtration devices. They may interfere with proper cooling.

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## Operating environment

The optimal environment in which to use your computer is 10°C-35°C (50°F-95°F) with humidity ranging between 35% and 80%. If your computer is stored or transported in temperatures less than 10°C (50°F), allow the cold computer to rise slowly to an optimal operating temperature of 10°C-35°C (50°F-95°F) before use. This process could take two hours in extreme conditions. Failure to allow your computer to rise to an optimal operating temperature before use could result in irreparable damage to your computer.

If possible, place your computer in a well-ventilated and dry area without direct exposure to sunshine.

Keep electrical appliances such as an electric fan, radio, high-powered speakers, air conditioner, and microwave oven away from your computer because the strong magnetic fields generated by these appliances can damage the monitor and data on the hard disk drive.

Do not place any beverages on top of or beside the computer or other attached devices. If liquid is spilled on or in the computer or an attached device, a short circuit or other damage might occur.

Do not eat or smoke over your keyboard. Particles that fall into your keyboard can cause damage.

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## Laser compliance statement



### CAUTION:

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

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



**DANGER**

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

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

---

## Power supply statement

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



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

---

## Cleaning and maintenance

Keep your computer and workspace clean. Shut down the computer and then disconnect the power cord before cleaning the computer. Do not spray any liquid detergent directly on the computer or use any detergent containing flammable material to clean the computer. Spray the detergent on a soft cloth and then wipe the computer surfaces.



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## Chapter 1. Product overview

This chapter provides information about the computer features, specifications, software programs provided by Lenovo, and locations of connectors, components, parts on the system board, and internal drives.

---

### Features

This section introduces the computer features. The information covers a variety of models.

To view the information about your specific model, do one of the following:

- On the Microsoft® Windows® 7 operation system, click **Start**, right-click **Computer**, and select **Properties** to view the information.
- On the Microsoft Windows 8 or Windows 8.1 operating system, go to the desktop and move your pointer to the top-right or bottom-right corner of the screen to display the charms. Then click **Settings → PC info** to view the information.
- On the Microsoft Windows 10 operating system, click the Start button to open the Start menu. Then, click **Settings → System → About** to view the information.

### Microprocessor

To view the microprocessor information of your computer, do the following:

- On the Microsoft Windows 7 operation system, click **Start**, right-click **Computer**, and select **Properties** to view the information.
- On the Microsoft Windows 8 or Windows 8.1 operating system, go to the desktop and move your pointer to the top-right or bottom-right corner of the screen to display the charms. Then click **Settings → PC info** to view the information.
- On the Microsoft Windows 10 operating system, click the Start button to open the Start menu. Then, click **Settings → System → About** to view the information.

### Memory

Your computer supports up to two double data rate 3 unbuffered dual inline memory modules (DDR3 UDIMMs).

### Internal drives

- Optical drive: DVD-ROM or DVD-R (available on some models)
- Hybrid drive (available on some models)
- Serial Advanced Technology Attachment (SATA) hard disk drive
- SATA solid-state drive (available on some models)

### Video subsystem

- Integrated graphics for a Video Graphics Array (VGA) connector and a DisplayPort® connector
- Peripheral Component Interconnect (PCI) Express x16 graphics card slot on the system board for a discrete graphics card

### Audio subsystem

- Integrated high-definition (HD) audio

- Audio line-in connector, audio line-out connector, and microphone connector on the rear panel
- Microphone connector and headphone connector on the front panel
- Internal speaker (installed in some models)

### **Connectivity**

- PCI Express Fax modem (some models)

### **System management features**

- Ability to store power-on self-test (POST) hardware test results
- Desktop Management Interface (DMI)

Desktop Management Interface provides a common path for users to access information about all aspects of a computer, including processor type, installation date, attached printers and other peripherals, power sources, and maintenance history.

- ErP LPS compliance mode

The energy-related products directive (ErP) lowest power state (LPS) compliance mode reduces the consumption of electricity when your computer is in sleep or off mode. For more information, see “Enabling ErP LPS compliance mode” on page 80.

- Preboot Execution Environment (PXE)

The Preboot Execution Environment is an environment to start computers using a network interface independent of data storage devices (such as the hard disk drive) or installed operating systems.

- System Management (SM) Basic Input/Output System (BIOS) and SM software

The SM BIOS specification defines data structures and access methods in a BIOS that allows a user or application to store and retrieve information specific about the computer in question.

- Wake on LAN

Wake on LAN is an Ethernet computer networking standard that allows a computer to be turned on or woken up by a network message. The message is usually sent by a program running on another computer on the same local area network.

- Wake on Ring

Wake on Ring, sometimes referred to as Wake on Modem, is a specification that allows supported computers and devices to resume from sleep or hibernation mode.

- Windows Management Instrumentation (WMI)

Windows Management Instrumentation is a set of extensions to the Windows Driver Model. It provides an operating system interface through which instrumented components provide information and notification.

## **Input/Output (I/O) features**

- One DisplayPort connector
- One Ethernet connector
- One 9-pin serial port (optional)
- One VGA monitor connector
- Six Universal Serial Bus (USB) connectors
  - Two USB 2.0 connectors on the front panel
  - Two USB 2.0 connectors on the rear panel
  - Two USB 3.0 connectors on the rear panel
- Three audio connectors on the rear panel (audio line-in connector, audio line-out connector, and microphone connector)
- Two audio connectors on the front panel (microphone connector and headphone connector)

For more information, see “Locating connectors, controls, and indicators on the front of your computer” on page 9 and “Locating connectors on the rear of your computer” on page 10.

## **Expansion**

- One hard disk drive bay
- One optical drive bay
- One secondary solid-state drive bay (optional)
- One slim card reader drive bay
- One PCI Express x16 graphics card slot
- Two PCI Express x1 card slots

## **Power supply**

Your computer comes with one of the following power supplies:

- 180-watt automatic voltage-sensing power supply
- 280-watt automatic voltage-sensing power supply

## **Security features**

- Computrace Agent software embedded in firmware
- Ability to enable or disable a device
- Ability to enable and disable USB connectors individually
- Power-on password (POP), administrator password, and hard disk drive password to deter unauthorized use of your computer
- Startup sequence control
- Startup without keyboard or mouse
- Support for a Kensington-style cable lock
- Support for a padlock

For more information, see Chapter 4 “Security” on page 29.

## **Preinstalled software programs**

Your computer is preinstalled with software programs to help you work more easily and securely. For more information, see “Lenovo programs” on page 5.

### **Preinstalled operating system**

Your computer is preinstalled with one of the following operating systems:

- Microsoft Windows 7 operating system
- Microsoft Windows 8 operating system
- Microsoft Windows 8.1 operating system
- Microsoft Windows 10 operating system

### **Operating system(s), certified or tested for compatibility<sup>1</sup>** (varies by model type)

- Linux®

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1. The operating system(s) 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 manual. This list is 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.



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## Specifications

This section lists the physical specifications for your computer.

### Dimensions

Width: 160 mm (6.3 inches)  
Height: 396.5 mm (15.6 inches)  
Depth: 399.6 mm (15.7 inches)

### Weight

Maximum configuration as shipped: 7.5 kg (16.5 lb) (without package)  
Maximum configuration as shipped: 10.5 kg (23.1 lb) (with package)

### Environment

- Air temperature:
  - Operating: 10°C to 35°C (50°F to 95°F)
  - Storage in original shipping package: -40°C to 60°C (-40°F to 140°F)
  - Storage without package: -10°C to 60°C (14°F to 140°F)
- Humidity:
  - Operating: 20% to 80% (non-condensing)
  - Storage: 20% to 90% (non-condensing)
- Altitude:
  - Operating: -50 to 10 000 ft (-15.2 to 3048 m)
  - Storage: -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: 50/60 Hz
    - Voltage-selection switch setting: 115 V ac
  - High range:
    - Minimum: 200 V ac
    - Maximum: 240 V ac
    - Input frequency range: 50/60 Hz
    - Voltage-selection switch setting: 230 V ac

---

## Lenovo programs

Your computer comes with Lenovo programs to help you work more easily and securely. Depending on the Windows operating system preinstalled, the programs might vary.

## Accessing a program on your computer

**Note:** For Windows 7, some of the Lenovo programs might be ready to be installed, so you need to install them manually. Then, you can access and use these programs. To install a program that is ready to be installed, open the Lenovo ThinkVantage® Tools program, and then view the program icons using Tiles.

Follow the instructions under greyed-out icons to locate the icon for the desired program. Double-click the icon to install the program.

To access a program on your computer, do one of the following:

- For Windows 7 or Windows 10:
  - From Windows Search:
    1. Depending on your Windows version, do one of the following:
      - For Windows 7: Click the Start button to open the Start menu, and then type the program name into the search box.
      - For Windows 10: Type the program name into the search box next to the Start button.
    2. In the search results, click the name of the desired program to launch the program.
  - From the Start menu or Control Panel:
    1. Click the Start button to open the Start menu. Then, click the name of the desired program to launch the program.
    2. If the program name is not displayed, click **All Programs** for Windows 7 or **All apps** for Windows 10 to display the program list. From the list or a folder in the list, click the name of the desired program to launch the program.
    3. If the program name is not displayed on the Start menu, access the program from Control Panel.
      - a. Depending on your Windows version, do one of the following:
        - For Windows 7: Click **Control Panel** on the Start menu.
        - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
      - b. View Control Panel using Large icons or Small icons, and then click the name of the desired program to launch the program.
- For Windows 8 or Windows 8.1:
  1. Press the Windows key  to go to the Start screen. Click the name of the desired program to launch the program.
  2. If you cannot find the program you need, depending on your Windows version, do one of the following:
    - For Windows 8: Move the pointer to the bottom-right corner of the screen to display the charms. Then click the **Search** charm to search for the desired program.
    - For Windows 8.1: Click the arrow icon  in the bottom-left corner of the screen to go to the Apps screen. Find the desired program in the apps list or search for it in the search box in the top-right corner of the screen.

## An introduction to Lenovo programs

This section provides information about the major Lenovo programs available on your operating system.

**Note:** Depending on your computer model, some of the following programs might not be available.

- For Windows 7 only:
  - **Create Recovery Media**

The Create Recovery Media program enables you to restore only the C drive or the entire storage drive to the factory-default settings.
  - **Lenovo PowerENGAGE**

The Lenovo PowerENGAGE program enables you to register your computer with Lenovo.

- **Message Center Plus**

The Message Center Plus program automatically displays messages informing you about important notices from Lenovo, such as alerts on system updates and alerts on conditions that require your attention.

- **Rescue and Recovery®**

The Rescue and Recovery program is a one-button recovery and restore solution. It includes a set of self-recovery tools to help you diagnose computer problems, get help, and recover from system crashes, even if you cannot start the Windows operating system.

- For Windows 10 only:

- **Lenovo ID**

The Lenovo ID program enables you to create your Lenovo ID and access all supported Lenovo programs and web portals with single sign-on.

- For Windows 8 and Windows 8.1:

- **Lenovo Support**

The Lenovo Support program enables you to register your computer with Lenovo, check the computer health condition and battery status, download and view user manuals for your computer, get the warranty information of your computer, and explore help and support information.

- For Windows 7, Windows 8, and Windows 8.1:

- **Fingerprint Manager Pro or ThinkVantage Fingerprint Software**

The Fingerprint Manager Pro or ThinkVantage Fingerprint Software program enables you to use a fingerprint reader. The integrated fingerprint reader provided on some keyboards enables you to enroll your fingerprint and associate it with your power-on password, hard disk password, and Windows password. As a result, fingerprint authentication can replace passwords and enable simple and secure user access.

- **Password Manager**

The Password Manager program automatically captures and fills in authentication information for Windows programs and Web sites.

- For Windows 7, Windows 8.1, and Windows 10:

- **Lenovo Bluetooth Lock**

The Lenovo Bluetooth Lock program enables you to use a Bluetooth device (such as your smartphone) as a proximity-based unit for locking or unlocking your computer automatically. By detecting the distance between your computer and the predefined Bluetooth device that you are carrying, the Lenovo Bluetooth Lock program automatically locks your computer when you walk away and unlocks your computer when you come back. This is a simple way to protect your computer against unauthorized access in case that you forget to lock your computer.

- **PC Cloud Manager**

The PC Cloud Manager (PCM) program is a browser-based solution for client-computer management. The PCM program has two components: PCM Server and PCM Client. PCM Server is installed on the computer, where the administrator performs management work, such as power management and security management. PCM Client is installed on the client computers to be managed. The administrator can log in to PCM Server to manage computers with PCM Client installed, through the Internet Web browser.

- For Windows 8, Windows 8.1, and Windows 10:

- **Lenovo Companion**

Your computer's best features and capabilities should be easy to access and understand. With Lenovo Companion, they are. Use Lenovo Companion to do the following:

- Optimize your computer's performance, monitor your computer's health, and manage updates.
- Access your user guide, check warranty status, and view accessories customized for your computer.
- Read how-to articles, explore Lenovo forums, and stay up-to-date on technology news with articles and blogs from trusted sources.

Lenovo Companion is filled with exclusive Lenovo content to help you learn more about what you can do with your computer.

- For Windows 7, Windows 8, Windows 8.1, and Windows 10:

- **Lenovo Device Experience or Lenovo PC Experience**

The Lenovo Device Experience or Lenovo PC Experience program helps you work more easily and securely. The program provides easy access to Lenovo ThinkVantage Tools or Lenovo Tools, important settings and information about your computer, the Lenovo Support Web site, and so on.

- **Lenovo Solution Center**

The Lenovo Solution Center program enables you to troubleshoot and resolve computer problems. It combines diagnostic tests, system information collection, security status, and support information, along with hints and tips for maximum system performance.

- **Power Manager**

The Power Manager program provides convenient, flexible, and complete power management for your computer. It enables you to adjust your computer power settings to achieve the best balance between performance and power saving.

- **REACHit or Lenovo Reach**

The REACHit or Lenovo Reach program enhances your cloud experience. This program keeps you connected at all times and enables you to access all your favorite items from personal computers, smartphones, or tablets. As a result, you can access, edit, and share your files from anywhere. You also can add your favorite Web services to your cloud desktop and stay logged-in to Web sites with the cloud password manager.

- **SHAREit or Lenovo SHAREit**

The SHAREit or Lenovo SHAREit program provides a quick and easy way to share files and folders among computers, smartphones, tablets, or smart TVs with the Android or the Windows operating system installed. SHAREit or Lenovo SHAREit uses any type of network or even no network at all to share files and folders.

- **System Update**

The System Update program provides regular access to the system updates for your computer, such as device driver updates, software updates, and BIOS updates. The program gathers information from the Lenovo Help Center about new updates for your computer, then sorts and displays the updates for download and installation. You have complete control of which updates to download and install.

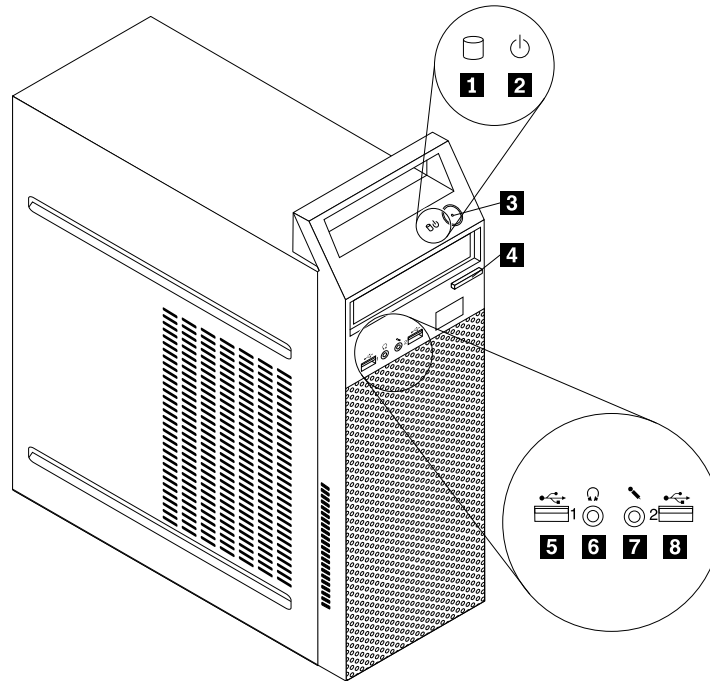
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## Locations

This section provides information to help you locate the connectors on the front and rear of your computer, parts on the system board, and components and internal drives in your computer.

## Locating connectors, controls, and indicators on the front of your computer

Figure 1 “Front connector, control, and indicator locations” on page 9 shows the locations of the connectors, controls, and indicators on the front of your computer.



*Figure 1. Front connector, control, and indicator locations*

- |                                              |                                              |
|----------------------------------------------|----------------------------------------------|
| <b>1</b> Hard disk drive activity indicator  | <b>2</b> Power indicator                     |
| <b>3</b> Power button                        | <b>4</b> Optical drive eject/close button    |
| <b>5</b> USB 2.0 connector (USB connector 1) | <b>6</b> Headphone connector                 |
| <b>7</b> Microphone connector                | <b>8</b> USB 2.0 connector (USB connector 2) |

## Locating connectors on the rear of your computer

Figure 2 “Rear connector locations” on page 10 shows the locations 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.

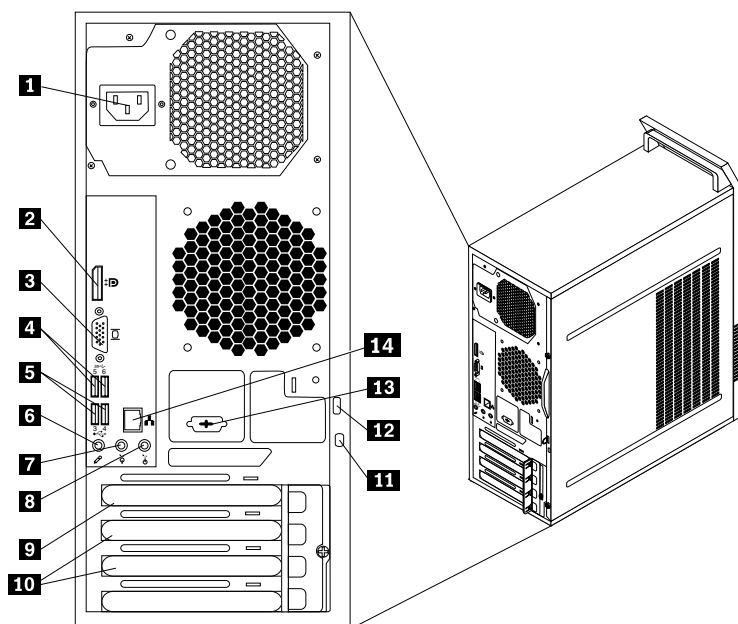


Figure 2. Rear connector locations

- |                                             |                                         |
|---------------------------------------------|-----------------------------------------|
| <b>1</b> Power cord connector               | <b>2</b> DisplayPort connector          |
| <b>3</b> VGA monitor connector              | <b>4</b> USB 3.0 connectors             |
| <b>5</b> USB 2.0 connectors                 | <b>6</b> Microphone connector           |
| <b>7</b> Audio line-out connector           | <b>8</b> Audio line-in connector        |
| <b>9</b> PCI Express x16 graphics card slot | <b>10</b> PCI Express x1 card slots (2) |
| <b>11</b> Security-lock slot                | <b>12</b> Padlock loop                  |
| <b>13</b> Optional serial port              | <b>14</b> Ethernet 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).<br><b>Note:</b> To operate the computer within Federal Communications Commission (FCC) Class B limits, use a Category 5e or better Ethernet cable.                                            |

| Connector             | Description                                                                                                                                                                                                                                                                   |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Microphone connector  | Used to attach a microphone to your computer when you want to record sound or if you use speech-recognition software.                                                                                                                                                         |
| USB 2.0 connector     | Used to attach a device that requires a USB 2.0 connection, such as a keyboard, a mouse, a scanner, a printer, or a personal digital assistant (PDA).                                                                                                                         |
| USB 3.0 connector     | Used to attach a device that requires a USB 2.0 or 3.0 connection, such as a keyboard, a mouse, a scanner, a printer, or a personal digital assistant (PDA). A USB 3.0 connector provides high transmission speeds to reduce the time that is required for data transmission. |
| VGA monitor connector | Used to attach a VGA monitor or other devices that use a VGA monitor connector.                                                                                                                                                                                               |

## Locating components

Figure 3 “Component locations” on page 11 shows the locations of the various components in your computer. To remove the computer cover, see “Removing the computer cover” on page 33.

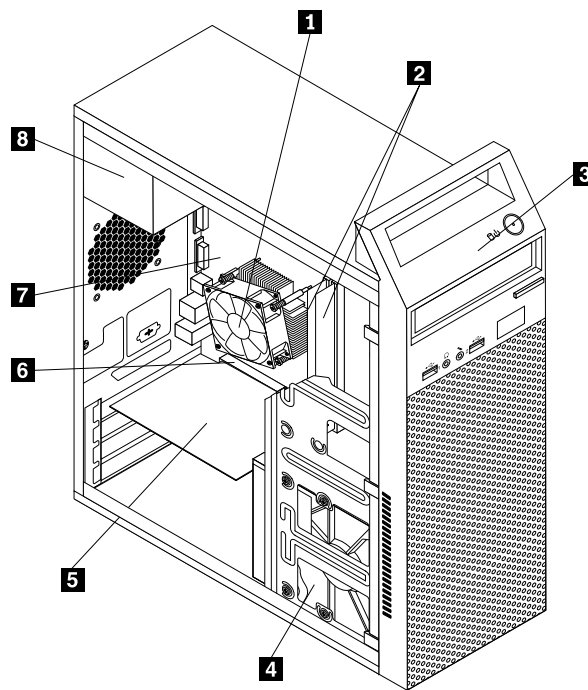


Figure 3. Component locations

- |                                                      |                                             |
|------------------------------------------------------|---------------------------------------------|
| <b>1</b> Heat sink and fan assembly                  | <b>2</b> Memory modules (2)                 |
| <b>3</b> Front bezel                                 | <b>4</b> Hard disk drive                    |
| <b>5</b> PCI Express card (available on some models) | <b>6</b> PCI Express x16 graphics card slot |
| <b>7</b> System board                                | <b>8</b> Power supply assembly              |

## Locating parts on the system board

Figure 4 “System board part locations” on page 12 shows the locations of the parts on the system board.

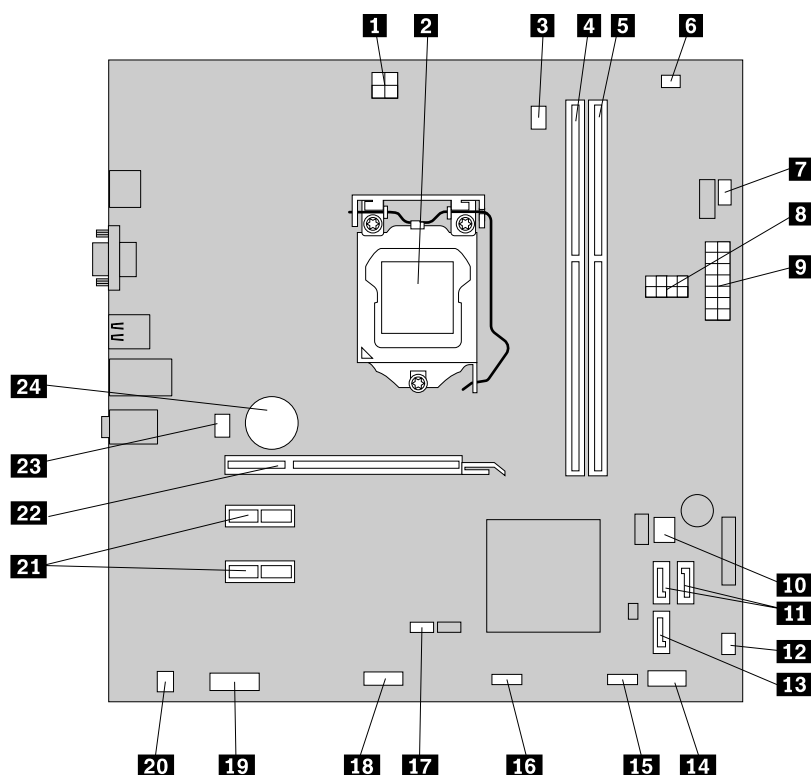


Figure 4. System board part locations

- |                                                                                       |                                                                                              |
|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| <b>1</b> 4-pin power connector                                                        | <b>2</b> Microprocessor                                                                      |
| <b>3</b> Microprocessor fan connector                                                 | <b>4</b> Memory slot 1 (DIMM1)                                                               |
| <b>5</b> Memory slot 2 (DIMM2)                                                        | <b>6</b> Thermal sensor connector                                                            |
| <b>7</b> Power fan connector                                                          | <b>8</b> Hard disk drive/ Optical drive power connectors (number and location vary by model) |
| <b>9</b> 14-pin power connector                                                       | <b>10</b> BIOS ROM                                                                           |
| <b>11</b> SATA 3.0 connectors                                                         | <b>12</b> Power supply fan connector                                                         |
| <b>13</b> SATA 2.0 connector                                                          | <b>14</b> Front panel connector (for connecting LED indicators and the power button)         |
| <b>15</b> Front USB connector 1 (for connecting USB ports 1 and 2 on the front bezel) | <b>16</b> Front USB connector 2 (for connecting an additional USB device)                    |
| <b>17</b> Clear CMOS (Complementary Metal Oxide Semiconductor) /Recovery jumper       | <b>18</b> Serial connector                                                                   |
| <b>19</b> Front audio connector                                                       | <b>20</b> Internal speaker connector                                                         |
| <b>21</b> PCI Express x1 card slots (2)                                               | <b>22</b> PCI Express x16 graphics card slot                                                 |
| <b>23</b> System fan connector                                                        | <b>24</b> Battery                                                                            |



## Locating internal drives

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

When installing or replacing an internal drive, it is important to note the type and size of the drive that you can install or replace in each bay and correctly connect the cables to the drive installed. Refer to the appropriate section in “Installing or replacing hardware” on page 33 for instructions on how to install or replace internal drives for your computer.

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

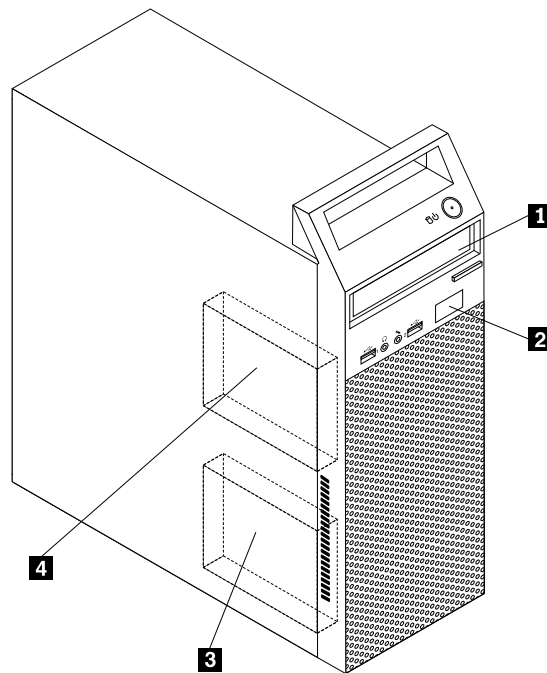


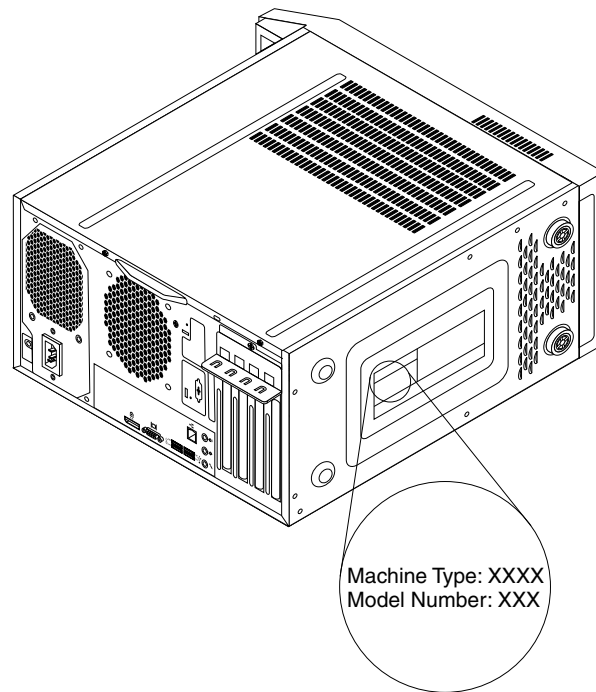
Figure 5. Drive bay locations

- 1** Optical drive bay (with an optical drive installed on some models)
- 2** Slim card reader drive bay
- 3** Primary hard disk drive bay (with a 3.5-inch SATA hard disk drive installed)
- 4** Secondary hard disk drive bay (with a SATA solid-state drive or a hybrid drive installed in some models)

## Machine type and model label

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

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



*Figure 6. Machine type and model label*

---

## Chapter 2. Using your computer

This chapter provides information on using some of the computer components.

---

### Frequently asked questions

The following are a few tips that will help you optimize the use of your computer.

#### Can I get my user guide in another language?

The user guide is available in various languages on the Lenovo Support Web site at:  
<http://www.lenovo.com/UserManuals>

#### Where is my recovery disc set or recovery USB key?

Depending on your Windows version, your computer comes with a recovery disc set or recovery USB key. If your computer does not come with it, contact the Lenovo Customer Support Center to order a recovery disc set or recovery USB key. For a list of Lenovo Support phone numbers, go to <http://www.lenovo.com/support/phone>. If you cannot find the support telephone number for your country or region, contact your Lenovo reseller.

#### Where can I find help about the Windows operating system?

See “Windows help system” on page 111.

#### Can I change the Windows 8.1 startup behavior to open either the desktop or the Start screen?

On the Windows 8.1 operating system, you can set the computer to open either the desktop or the Start screen by default. To set the default startup screen, do the following:

1. On the desktop, move your pointer to the taskbar at the bottom of the screen and right-click on the taskbar.
2. Click **Properties**. The Taskbar and Navigation properties window is displayed.
3. On the **Navigation** tab, locate the **Start screen** section, and then do one of the following:
  - To set the desktop as your default startup screen, select **When I sign in or close all apps on a screen, go to the desktop instead of Start** so a check is visible.
  - To set the Start screen as your default startup screen, remove the check from the **When I sign in or close all apps on the screen, go to desktop instead of Start** checkbox.
4. Click **OK** to save the new setting.

This feature is not available on the Windows 8 operating system.

---

### Navigating among screens on the Windows 8 and Windows 8.1 operating systems

This section provides instructions on how to navigate among the desktop, the Start screen, and applications that were opened from the Start screen on the Windows 8 and Windows 8.1 operating systems. For detailed instructions, see “Navigating on Windows 8” on page 15 or “Navigating on Windows 8.1” on page 17.

#### Navigating on Windows 8

To navigate among the desktop, the Start screen, and applications that were opened from the Start screen on the Windows 8 operating system, do one of the following:

- From the Start screen, do one of the following to navigate to the most recently accessed workspace (application, PC settings, or desktop):
  - Using a pointing device: Move the pointer to the extreme bottom-left corner of the screen until a small representation of the workspace is displayed; then click the representation.
  - Using a touch screen: Swipe in and out on the left edge of the screen. Representations of all available workspaces are displayed along the left edge of the screen. Tap the representation of the workspace at the bottom.

**Note:** The representation of a workspace is displayed only if you have at least one active workspace in the background of the system.

- From the desktop or any other workspace that is opened from the Start screen, do one of the following to navigate to the Start screen:
  - Using a pointing device: Move the pointer to the extreme bottom-left corner of the screen until a small representation of the Start screen is displayed; then click the representation.
  - Using a touch screen: Do one of the following:
    - Swipe in and out on the left edge of the screen. Representations of all available workspaces are displayed along the left edge of the screen. Tap the representation of the Start screen at the bottom.
    - Swipe in from the right edge of the screen to display the charms; then tap **Start**.
- From any workspace (Start screen, desktop, PC settings, or application opened from the Start screen), use any of the following procedures to go to another workspace that you have previously opened:
  - To navigate to a previously accessed workspace (application, PC settings, or desktop), do one of the following:
    - Using a pointing device:
      1. Do one of the following:
        - Move the pointer to the extreme top-left corner of the screen and then move the pointer downward along the left edge of the screen.
        - Move the pointer to the extreme bottom-left corner of the screen and then move the pointer upward along the left edge of the screen.

Representations of all available workspaces are displayed along the left edge of the screen.

**Note:** Only active workspaces that you have accessed during the current Windows session are displayed along the left edge. If you close an active workspace, its representation does not display along the left edge of the screen.

      2. Click the representation.
    - Using a touch screen:
      - Method 1
        1. Swipe in and out on the left edge of the screen. Representations of all available workspaces are displayed along the left edge of the screen.
        2. Tap the desired workspace.
      - Method 2
        1. Swipe in from the left edge of the screen to navigate to the next available workspace.
        2. Repeat step 1 until you navigate to the desired workspace.
  - To navigate to the most recently accessed workspace (application, PC settings, or desktop), do one of the following:
    - Using a pointing device: Move the pointer to the extreme top-left corner of the screen until a small representation of the workspace is displayed; then click the representation.

- Using a touch screen: Swipe in from the left edge of the screen.

For information about using other features of the Windows 8 operating system, refer to the Windows help system. For more information, see “Windows help system” on page 111.

## Navigating on Windows 8.1

To navigate among the desktop, the Start screen, and applications that were opened from the Start screen on the Windows 8.1 operating system, do one of the following:

- From the Start screen, do one of the following to navigate to the most recently accessed workspace (application, setting, or desktop):
  - Using a pointing device: Move the pointer to the extreme bottom-left corner of the screen until the Windows screen-control icon  is displayed; then click the icon.
  - Using a touch screen: Swipe in and out on the left edge of the screen. Representations of all available workspaces are displayed along the left edge of the screen. Tap the Windows screen-control icon  at the bottom.
- Note:** The Windows screen-control icon  is displayed only if you have at least one active workspace in the background of the system.
- From the desktop or any other workspace that is opened from the Start screen, do one of the following to navigate to the Start screen:
  - Using a pointing device:
    - From the desktop, click the Windows screen-control icon  in the bottom-left corner of the screen.
    - From any other workspace, move the pointer to the extreme bottom-left corner of the screen until the Windows screen-control icon  is displayed; then click the icon.
  - Using a touch screen: Do one of the following:
    - From the desktop, tap the Windows screen-control icon  in the bottom-left corner of the screen.
    - From any other workspace, do one of the following:
      - Swipe in and out on the left edge of the screen. Representations of all available workspaces are displayed along the left edge of the screen. Tap the Windows screen-control icon  at the bottom.
      - Swipe in from the right edge of the screen to display the charms; then tap **Start**.
- From any workspace (Start screen, desktop, PC settings, or application opened from the Start screen), use any of the following procedures to go to another workspace that you have previously opened:
  - To navigate to a previously accessed workspace (application, setting, or desktop), do one of the following:
    - Using a pointing device:
      1. Do one of the following:
        - Move the pointer to the extreme top-left corner of the screen and then move the pointer downward along the left edge of the screen.
        - Move the pointer to the extreme bottom-left corner of the screen and then move the pointer upward along the left edge of the screen.

Representations of all available workspaces are displayed along the left edge of the screen.

**Note:** Only active workspaces that you have accessed during the current Windows session are displayed along the left edge. If you close an active workspace, its representation does not display along the left edge of the screen.

2. Click the representation.
- Using a touch screen:
    - Method 1
      1. Swipe in and out on the left edge of the screen. Representations of all available workspaces are displayed along the left edge of the screen.
      2. Tap the desired workspace.
    - Method 2
      1. Swipe in from the left edge of the screen to navigate to the next available workspace.
      2. Repeat step 1 until you navigate to the desired workspace.
  - To navigate to the most recently accessed workspace (application, PC settings, or desktop), do one of the following:
    - Using a pointing device: Move the pointer to the extreme top-left corner of the screen until the Windows screen-control icon  is displayed; then click the icon.
    - Using a touch screen: Swipe in from the left edge of the screen.

For information about using other features of the Windows 8.1 operating system, open the **Help+Tips** application from the Start screen or Apps screen, or refer to the Windows help system. For more information, see “Windows help system” on page 111.

---

## Accessing Control Panel on the Windows 8 or Windows 8.1 operating system

On the Windows operating system, you can view and change computer settings through Control Panel. To access Control Panel on the Windows 8 or Windows 8.1 operating system, do one of the following:

- From the desktop
  1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms.
  2. Click **Settings**.
  3. Click **Control Panel**.
- From the Start screen
  - For Windows 8:
    1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms.
    2. Click **Search**.
    3. On the Apps screen, scroll to the right side, and click **Control Panel** in the **Windows System** section.
  - For Windows 8.1:
    1. Click the arrow icon  in the bottom-left corner of the screen to go to the Apps screen.
    2. Scroll to the right side, and click **Control Panel** in the **Windows System** section.

---

## Using Windows shortcut keys

Both the standard keyboard and the fingerprint reader keyboard provide three keys you can use with your Microsoft Windows operating system.

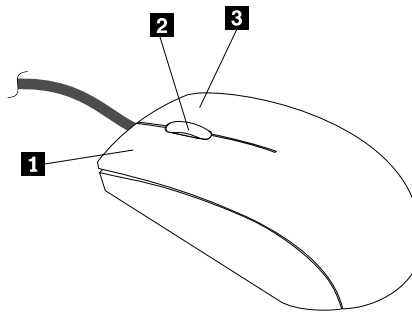
- The two Windows logo keys are located beside the Alt key on either side of the spacebar. They feature the Windows logo. On the Windows 7 or Windows 10 operating system, press the Windows key  to open the Start menu. On the Windows 8 or Windows 8.1 operating system, press the Windows key  to switch between the current workspace and the Start screen. The style of the Windows logo varies depending on the keyboard type.
- The context-menu key is located next to the Ctrl key on the right side of the Spacebar. Pressing the context-menu key opens the context menu for the active program, icon, or object.

**Note:** You can use the mouse or the Up and Down arrow keys to highlight menu selections. On the Windows 7 operating system, you can close the **Start** menu or the context menu by clicking the mouse or pressing Esc.

---

## Using the wheel mouse

The wheel mouse has the following controls:



- |                                 |                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b> Primary mouse button   | Use this button to select or start a program or menu item.                                                                                              |
| <b>2</b> Wheel                  | Use the wheel to control the scrolling action of the mouse. The direction in which you rotate the wheel controls the direction of the scrolling action. |
| <b>3</b> Secondary mouse button | Use this button to display a menu for the active program, icon, or object.                                                                              |

You can switch the function of the primary and secondary mouse buttons and change other default behavior through the mouse properties function in the Windows Control Panel.

---

## Setting the computer volume

To set the computer volume, do the following:

1. Click the volume icon in the Windows notification area on the taskbar.

**Note:** If the volume icon is not displayed in the Windows notification area, add the icon to the notification area. See “Adding an icon to the Windows notification area” on page 19.

2. Follow the instructions on the screen to adjust the volume. Click the speaker icon to mute the audio.

---

## Adding an icon to the Windows notification area

To add an icon to the Windows notification area, do the following:

1. Click the arrow next to the notification area to view hidden icons. Then, click the desired icon and drag it to the notification area.
2. If the icon is not displayed, turn on the icon.
  - a. Depending on your Windows version, do one of the following:

- For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **Notification Area Icons → Turn system icons on or off**.
- For Windows 8 or Windows 8.1: Open Control Panel. View Control Panel using Large icons or Small icons, and then click **Notification Area Icons → Turn system icons on or off**.

**Note:** For detailed information on how to open Control Panel on Windows 8 and Windows 8.1, see “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.

- For Windows 10: Click the Start button to open the Start menu. Then, click **Settings → System → Notifications & actions → Turn system icons on or off**.

b. Turn on the desired icon.

3. If the icon is still not displayed in the Windows notification area, repeat step 1.

---

## Using CDs and DVDs

Your computer might have a DVD ROM drive or recordable DVD drive installed. DVD drives use industry-standard, 12 cm (4.75-inch) CD media or DVD media. If your computer comes with a DVD drive, the drive can read DVD-ROM discs, DVD-R discs, DVD-RAM discs, DVD-RW discs, and all types of CDs, such as CD-ROM discs, CD-RW discs, CD-R discs, and audio CDs. If you have a recordable DVD drive, it can also record on DVD-R discs, DVD-RW discs, type II DVD-RAM discs, CD-RW standard and high speed discs, and CD-R discs.

Follow these guidelines when using the DVD drive:

- Do not place the computer in a location where the drive is exposed to the following:
  - High temperature
  - High humidity
  - Excessive dust
  - Excessive vibration or sudden shock
  - An inclined surface
  - Direct sunlight
- Do not insert any object other than a CD or DVD into the drive.
- Before moving the computer, remove the CD or DVD from the drive.

## Handling and storing CD and DVD media

CD and DVD media are durable and reliable, but they do require some care and special handling. When handling and storing a CD or DVD, follow these guidelines:

- Hold the disc by its edges. Do not touch the surface of the side that is not labeled.
- To remove dust or fingerprints, wipe the disc with a clean, soft cloth from the center to the outside. Wiping the disc in a circular direction might cause loss of data.
- Do not write or stick paper on the disc.
- Do not scratch or mark the disc.
- Do not place or store the disc in direct sunlight.
- Do not use benzene, thinners, or other cleaners to clean the disc.
- Do not drop or bend the disc.
- Do not insert damaged discs into the drive. Warped, scratched, or dirty discs can damage the drive.



## Playing a CD or DVD

If your computer comes with a DVD drive, you can listen to audio CDs or watch DVD movies. To play a CD or DVD, do the following:

1. Press the Eject/Load button on the DVD drive to open the tray.
2. With the tray fully extended, insert the CD or DVD into the tray. Some DVD drives have a snap hub in the center of the tray. If your drive has a snap hub, support the tray with one hand and then push the center of the CD or DVD until it snaps into place.
3. Press the Eject/Load button again or gently push the tray forward to close the tray. The CD or DVD player program starts automatically. For additional information, refer to the CD or DVD player program help system.

To remove a CD or DVD from the DVD drive, do the following:

1. With the computer on, press the Eject/Load button. When the tray slides out automatically, carefully remove the disc.
2. Close the tray by pressing the Eject/Load button or by gently pushing the tray forward.

**Note:** If the tray does not slide out of the drive when you press the Eject/Load button, insert a straightened paper clip into the emergency-eject hole on the front of the DVD drive. Be sure that the drive is powered off when using the emergency eject. Use the Eject/Load button instead of the emergency eject except in an emergency.

## Recording a CD or DVD

If your optical drive supports recording, you can record a CD or DVD.

To record a CD or DVD, do the following:

1. Insert a recordable disc into the optical drive that supports recording.
2. Open the PowerDVD Create, PowerProducer, or Power2Go program. See “Accessing a program on your computer” on page 5.
3. Follow the instructions on the screen.



---

## Chapter 3. You and your computer

This chapter provides information about accessibility, comfort, and relocating your computer to other countries or regions.

---

### Accessibility and comfort

Good ergonomic practice is important to get the most from your personal computer and to avoid discomfort. Arrange your workplace and the equipment you use to suit your individual needs and the kind of work that you perform. In addition, use healthy work habits to maximize your performance and comfort while using your computer.

The following topics provide information about arranging your work area, setting up your computer equipment, and establishing healthy work habits.

### Arranging your workspace

To get the most from your computer, arrange both the equipment you use and your work area to suit your needs and the kind of work you do. Your comfort is of foremost importance, but light sources, air circulation, and the location of electrical outlets can also affect the way you arrange your workspace.

### Comfort

Although no single working position is ideal for everyone, here are a few guidelines to help you find a position that suits you best.

Sitting in the same position for a long time can cause fatigue. The backrest and seat of your chair should adjust independently and provide good support. The seat should have a curved front to relieve pressure on the thighs. Adjust the seat so that your thighs are parallel to the floor and your feet are either flat on the floor or on a footrest.

When using the keyboard, keep your forearms parallel to the floor and your wrists in a comfortable position. Use a light touch on the keyboard and your hands and fingers relaxed. Change the angle of the keyboard for maximum comfort by adjusting the position of the keyboard feet.



Adjust the monitor so the top of the screen is at, or slightly below, eye level. Place the monitor at a comfortable viewing distance, usually 51 to 61 cm (20 to 24 inches), and position it so you can view it without having to twist your body. Also, position other equipment you use regularly, such as the telephone or a mouse, within easy reach.

## Glare and lighting

Position the monitor to minimize glare and reflections from overhead lights, windows, and other light sources. Reflected light from shiny surfaces can cause annoying reflections on your monitor screen. Place the monitor at right angles to windows and other light sources, when possible. Reduce overhead lighting, if necessary, by turning off lights or using lower wattage bulbs. If you install the monitor near a window, use curtains or blinds to block the sunlight. You can adjust the brightness and contrast controls on the monitor as the room lighting changes throughout the day.

Where it is impossible to avoid reflections or to adjust the lighting, an antiglare filter placed over the screen might be helpful. However, these filters might affect the clarity of the image on the screen; try them only after you have exhausted other methods of reducing glare.

Dust buildup compounds problems associated with glare. Remember to clean your monitor screen periodically using a soft cloth as directed in your monitor documentation.

## Air circulation

Your computer and monitor produce heat. The computer has a fan that pulls in fresh air and forces out hot air. The monitor lets hot air escape through vents. Blocking the air vents can cause overheating, which might result in a malfunction or damage. Place the computer and monitor so that nothing blocks the air vents; usually, 51 mm (2 inches) of air space is sufficient. Also, make sure that the vented air is not blowing on people.

## Electrical outlets and cable lengths

The location of electrical outlets, the length of power cords and cables that connect to the monitor, printer, and other devices might determine the final placement of your computer.

When arranging your workspace:

- Avoid the use of extension cords. When possible, plug the computer power cord directly into an electrical outlet.
- Keep power cords and cables neatly routed away from walkways and other areas where they might get kicked accidentally.

For more information about power cords, see “Power cords and power adapters” on page vi.

## Accessibility information

Lenovo is committed to providing users who have hearing, vision, and mobility limitations with greater access to information and technology. This section provides information about the ways these users can get the most out of their computer experience. You also can get the most up-to-date accessibility information from the following Web site:

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

### Keyboard shortcuts

The following table contains keyboard shortcuts that can help make your computer easier to use.

**Note:** Depending on your keyboard, some of the following keyboard shortcuts might not be available.

| Keyboard shortcut             | Function                        |
|-------------------------------|---------------------------------|
| Windows logo key + U          | Open Ease of Access Center      |
| Right Shift for eight seconds | Turn on or turn off Filter Keys |

| Keyboard shortcut                     | Function                          |
|---------------------------------------|-----------------------------------|
| Shift five times                      | Turn on or turn off Sticky Keys   |
| Num Lock for five seconds             | Turn on or turn off Toggle Keys   |
| Left Alt+Left Shift+Num Lock          | Turn on or turn off Mouse Keys    |
| Left Alt+Left Shift+PrtScn (or PrtSc) | Turn on or turn off High Contrast |

For more information, go to <http://windows.microsoft.com/>, and then perform a search using any of the following keywords: keyboard shortcuts, key combinations, shortcut keys.

## Ease of Access Center

Ease of Access Center on the Windows operating system enables users to configure their computers to suit their physical and cognitive needs.

To use Ease of Access Center, do the following:

- Depending on your Windows version, do one of the following:
  - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **Ease of Access Center**.
  - For Windows 8 or Windows 8.1: Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Then, click **Settings → Change PC settings → Ease of Access**.
  - For Windows 10: Click the Start button to open the Start menu. Then, click **Settings → Ease of Access**.
- Choose the appropriate tool by following the instructions on the screen.

Ease of Access Center mainly includes the following tools:

- Magnifier**  
Magnifier is a useful utility that enlarges the entire screen or part of the screen so that you can see the items better.
- Narrator**  
Narrator is a screen reader that reads aloud what is displayed on the screen and describes events such as error messages.
- On-Screen Keyboard**  
If you prefer to type or enter data into your computer using a mouse, joystick, or other pointing device instead of a physical keyboard, you can use On-Screen Keyboard. On-Screen Keyboard displays a visual keyboard with all the standard keys.
- High Contrast**  
High Contrast is a feature that heightens the color contrast of some text and images on your screen. As a result, those items are more distinct and easier to identify.
- Personalized keyboard**  
Adjust keyboard settings to make your keyboard easier to use. For example, you can use your keyboard to control the pointer and type certain key combinations easier.
- Personalized mouse**  
Adjust mouse settings to make your mouse easier to use. For example, you can change the pointer appearance and make it easier to manage windows with the mouse.

## Speech Recognition

Speech Recognition enables you to control your computer by voice.

Using only your voice, you can start programs, open menus, click objects on the screen, dictate text into documents, and write and send e-mails. Everything you do with the keyboard and mouse can be done with only your voice.

To use Speech Recognition, do the following:

1. Depending on your Windows version, do one of the following:
  - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**.
  - For Windows 8 or Windows 8.1: Open Control Panel. See “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.
  - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
2. View Control Panel using Large icons or Small icons, and then click **Speech Recognition**.
3. Follow the instructions on the screen.

### Screen-reader technologies

Screen-reader technologies are primarily focused on software program interfaces, help information systems, and various online documents. For additional information about screen readers, see the following:

- Using PDFs with screen readers:  
<http://www.adobe.com/accessibility.html?promoid=DJGVE>
- Using the JAWS screen reader:  
<http://www.freedomscientific.com/jaws-hq.asp>
- Using the NVDA screen reader:  
<http://www.nvaccess.org/>

### Screen resolution

You can make the text and images on your screen easier to read by adjusting the screen resolution of your computer.

To adjust the screen resolution, do the following:

1. Right-click a blank area on the desktop.
2. Depending on your Windows version, do one of the following:
  - For Windows 7, Windows 8, or Windows 8.1: Click **Screen resolution**.
  - For Windows 10: Click **Display settings**. On the **Display** tab, click **Advanced display settings**.
3. Follow the instructions on the screen.

**Note:** Setting the resolution too low might prevent some items from fitting on the screen.

### Customizable item size

You can make the items on your screen easier to read by changing the item size.

- To change the item size temporarily, use the Magnifier tool in Ease of Access Center. See “Ease of Access Center” on page 25.
- To change the item size permanently, do the following:
  - Change the size of all the items on your screen.
    1. Right-click a blank area on the desktop.
    2. Depending on your Windows version, do one of the following:

- For Windows 7, Windows 8, or Windows 8.1: Click **Screen resolution → Make text and other items larger or smaller**.
  - For Windows 10: Click **Display settings**.
3. Change the item size by following the instructions on the screen.
  4. Click **Apply**. This change will take effect the next time you log in to the operating system.
- Change the size of the items on a Web page.  
Press and hold Ctrl, and then press the plus-sign key (+) to enlarge or the minus-sign key (-) to reduce the text size.
  - Change the size of the items on the desktop or a window.

**Note:** This function might not work on some windows.

If your mouse has a wheel, press and hold Ctrl, and then scroll the wheel to change the item size.

### Industry-standard connectors

Your computer provides industry-standard connectors that enable you to connect assistive devices.

For more information about the location and function of the connectors, see “Locations” on page 8.

### TTY/TDD conversion modem

Your computer supports the use of a text telephone (TTY) or the telecommunications device for the deaf (TDD) conversion modem. The modem must be connected between your computer and a TTY/TDD telephone. Then, you can type a message on your computer and send it to the telephone.

### Documentation in accessible formats

Lenovo provides electronic documentation in accessible formats, such as properly tagged PDF files or HyperText Markup Language (HTML) files. Lenovo electronic documentation is developed to ensure that visually impaired users can read the documentation through a screen reader. Each image in the documentation also includes adequate alternative text so that visually impaired users can understand the image when they use a screen reader.

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## Registering your computer

When you register your computer with Lenovo, you enter required information into a Lenovo database. The information enables Lenovo to contact you when there is a recall or other severe problem and provide quicker service when you call Lenovo for help. In addition, some locations offer extended privileges and services to registered users.

To register your computer with Lenovo, ensure that your computer is connected to the Internet. Then, go to <http://www.lenovo.com/register> and follow the instructions on the screen.

---

## Moving your computer to another country or region

When you move your computer to another country or region, you must take local electrical standards into consideration.

If you relocate your computer to a country or region that uses an electrical outlet style different from the type you are currently using, you will have to purchase either electrical plug adapters or new power cords. You can order power cords directly from Lenovo.

For power cord information and part numbers, go to:  
<http://www.lenovo.com/powercordnotice>





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## Chapter 4. Security

This chapter provides information about how to protect your computer from theft and unauthorized use.

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### Security features

The following security features are available on your computer:

- Computrace Agent software embedded in firmware

The Computrace Agent software is an IT asset management and computer theft recovery solution. The software detects if changes have been made on the computer, such as hardware, software, or the computer call-in location.

**Note:** You might have to purchase a subscription to activate the Computrace Agent software.

- Ability to enable and disable devices and USB connectors

For more information, see “Enabling or disabling a device” on page 79.

- Startup sequence control

For more information, see “Selecting or changing the startup device sequence” on page 80.

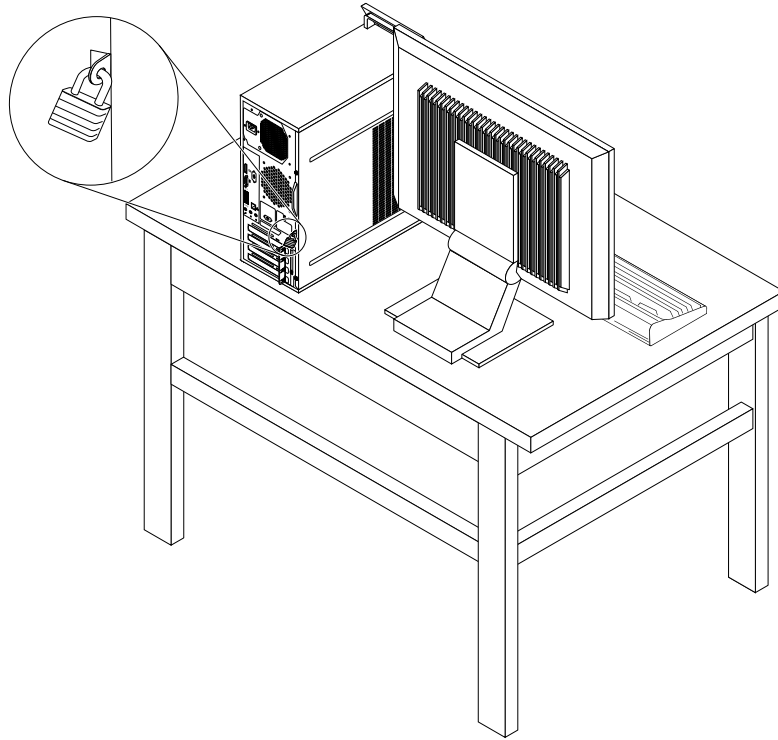
- Startup without keyboard or mouse

Your computer is able to log in to the operating system without keyboard or mouse connected.

---

## Locking the computer cover

Locking the computer cover helps prevent unauthorized people from gaining access to the inside of your computer. Your computer comes with a padlock loop so that the computer cover cannot be removed when a padlock is installed.



*Figure 7. Installing a padlock*

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## Attaching a Kensington-style cable lock

You can use a Kensington-style cable lock to secure your computer to a desk, table, or other non-permanent fixture. The cable lock attaches to the security-lock slot at the rear of your computer and is operated with a key or combination depending on the type selected. 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 such a cable lock directly from Lenovo by searching for *Kensington* at: <http://www.lenovo.com/support>

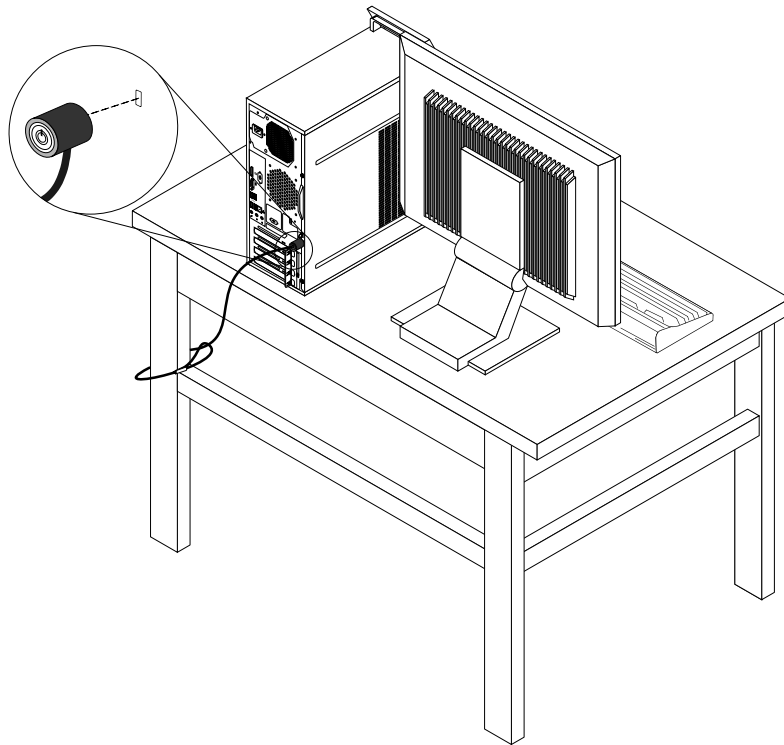


Figure 8. Kensington-style cable lock

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## Preventing unauthorized access to your computer

You can use BIOS passwords and Windows accounts to prevent unauthorized access to your computer and data.

- To use BIOS passwords, see “Using BIOS passwords” on page 77.
- To use Windows accounts, do the following:
  1. Depending on your Windows version, do one of the following:
    - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel → User Accounts**.
    - For Windows 8 or Windows 8.1: Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Then, click **Settings → Change PC settings → Accounts**.
    - For Windows 10: Click the Start button to open the Start menu, and then click **Settings → Accounts**.
  2. Follow the instructions on the screen.

---

## Using fingerprint authentication

If your keyboard has a fingerprint reader, you can use fingerprint authentication to replace passwords for simple and secure user access. To use fingerprint authentication, first enroll your fingerprints and associate them with your passwords (such as the power-on password, hard disk password, and Windows password). Use the fingerprint reader and the fingerprint program to complete this procedure.

To use fingerprint authentication, do one of the following:

- For Windows 7, Windows 8, or Windows 8.1: Use the Fingerprint Manager Pro or ThinkVantage Fingerprint Software program provided by Lenovo. To open the program, see “Accessing a program on your computer” on page 5. For more information about using the program, refer to the help system of the program.
- For Windows 10: Use the fingerprint tool provided by Windows. Click the Start button to open the Start menu, and then click **Settings → Accounts → Sign-in options**. Follow the instructions on the screen.

To use the fingerprint reader, refer to the documentation shipped with the fingerprint keyboard or located on the Lenovo Support Web site at <http://www.lenovo.com/support/keyboards>.

---

## Using and understanding firewalls

A firewall can be hardware, software, or a combination of both depending on the level of security required. Firewalls work on a set of rules to determine which inbound and outbound connections are authorized. If your computer is preinstalled with a firewall program, it helps protect against computer Internet security threats, unauthorized access, intrusions, and Internet attacks. It also protects your privacy. For more information about how to use the firewall program, refer to the help system of your firewall program.

The Windows operating system preinstalled on your computer provides the Windows Firewall. For details on using the Windows Firewall, refer to “Windows help system” on page 111.

---

## Protecting data against viruses

Your computer is preinstalled with an antivirus program to help you guard against, detect, and eliminate viruses.

Lenovo provides a full version of antivirus software on your computer with a free 30-day subscription. After 30 days, you must renew the license to continue receiving the antivirus software updates.

**Note:** Virus definition files must be kept up-to-date to guard against new viruses.

For more information about how to use your antivirus software, refer to the help system of your antivirus software.

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## Chapter 5. Installing or replacing hardware

This chapter provides instructions on how to install or replace hardware for your computer.

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### 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 PCI Express 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 from 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 or replacing hardware

This section provides instructions on how to install or replace hardware for your computer. You can expand the capabilities of your computer and maintain your computer by installing or replacing hardware.

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

#### Notes:

1. Use only computer parts provided by Lenovo.
2. When installing or replacing an option, use the appropriate instructions in this section along with the instructions that come with the option.

### Installing external options

You can connect external options to your computer, such as external speakers, a printer, or a scanner. For some external options, you must install additional software in addition to making the physical connection. When installing an external option, see “Locating connectors, controls, and indicators on the front of your computer” on page 9 and “Locating connectors on the rear of your computer” on page 10 to identify the required connector. 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.

### Removing the computer cover

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

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

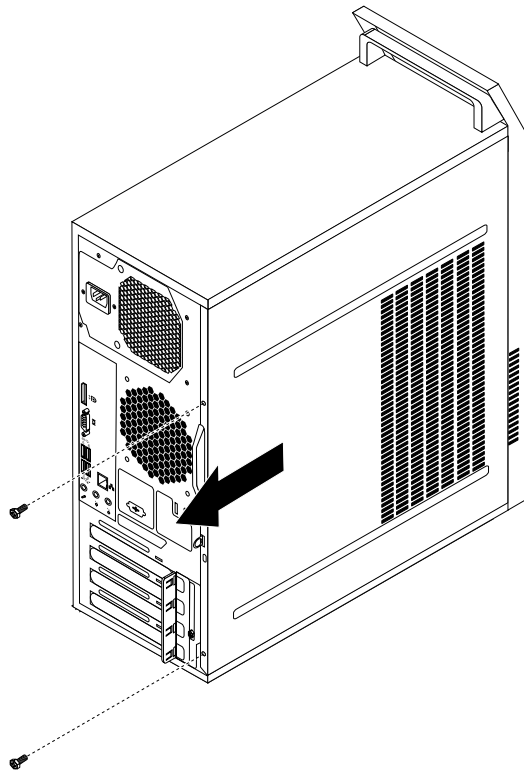
**CAUTION:**



**Before you open the computer cover, turn off the computer and wait several minutes until the computer is cool.**

To remove the computer cover, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer.
2. Disconnect all power cords from electrical outlets.
3. Disconnect the power cords, Input/Output cables, and any other cables that are connected to the computer. See “Locating connectors, controls, and indicators on the front of your computer” on page 9 and “Locating connectors on the rear of your computer” on page 10.
4. Remove any locking device that secures the computer cover, such as a padlock or a Kensington-style cable lock. See “Locking the computer cover” on page 30 and “Attaching a Kensington-style cable lock” on page 31.
5. Remove the two screws that secure the computer cover and slide the computer cover to the rear to remove it.



*Figure 9. Removing the computer cover*

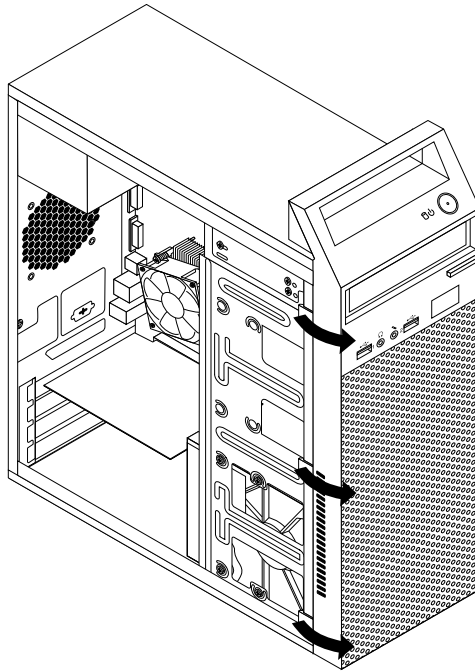
## Removing and reinstalling the front bezel

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

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

To remove and reinstall the front bezel, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Remove the front bezel by releasing the three plastic tabs on the left side and pivoting the front bezel outward.



*Figure 10. Removing the front bezel*

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

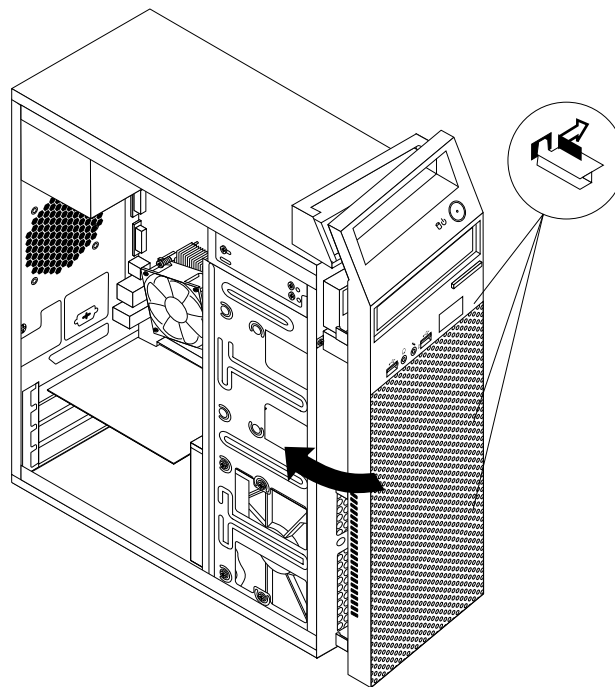


Figure 11. Reinstalling the front bezel

#### **What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

## **Installing or replacing a PCI Express card**

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

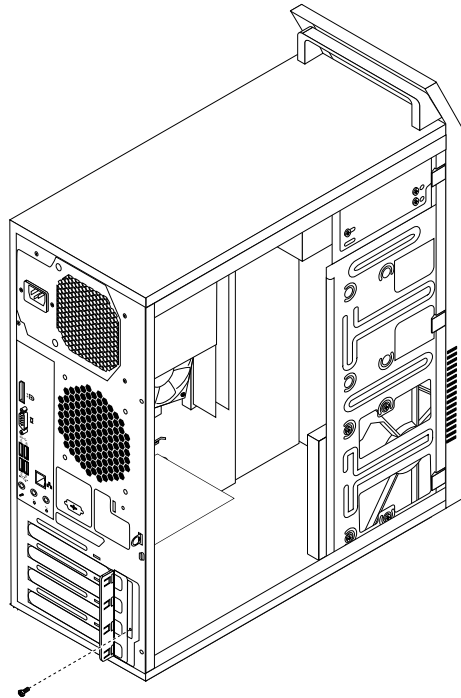
This section provides instructions on how to install or replace a PCI Express card. Your computer has two PCI Express x1 card slots and one PCI Express x16 graphics card slot.

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

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.



3. At the rear of the computer, remove the screw that secures the PCI Express card latch.



*Figure 12. Removing the screw that secures the PCI Express card latch*

4. Depending on whether you are installing or replacing a PCI Express card, do one of the following:
  - If you are installing a PCI Express card, remove the appropriate metal slot cover.

- If you are replacing an old PCI Express card, grasp the old card that is currently installed and gently pull it out of the slot.

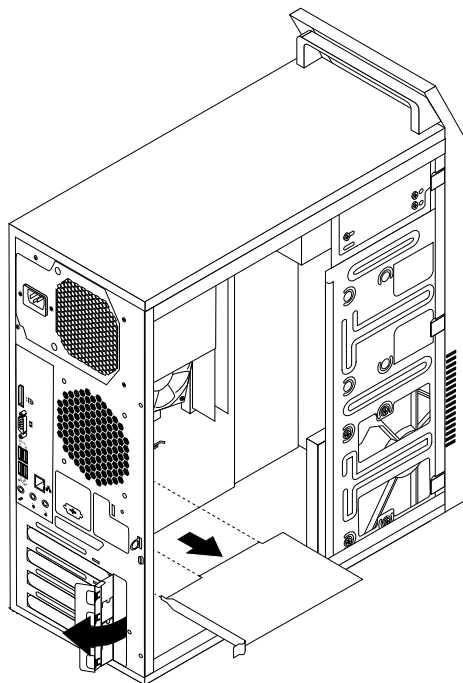
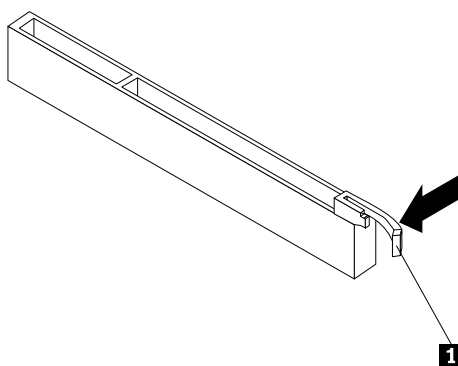


Figure 13. Removing a PCI Express card

**Notes:**

- The card fits tightly into the card slot. If necessary, alternate moving each side of the card a small amount until it is removed from the card slot.
- If the card is held in place by a retaining latch, press the card retaining latch **1** as shown to disengage the latch. Grasp the card and gently pull it out of the slot.



5. Remove the new PCI Express card from its static-protective package.
6. Install the new PCI Express card into the appropriate slot on the system board. See “Locating parts on the system board” on page 12.

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

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

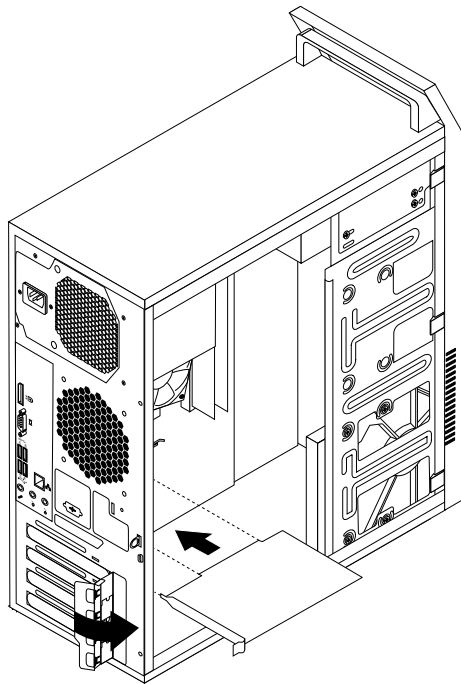


Figure 14. Installing a PCI Express card

8. Reinstall the screw to secure the PCI Express card latch in place.

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

## Installing or replacing a memory module

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

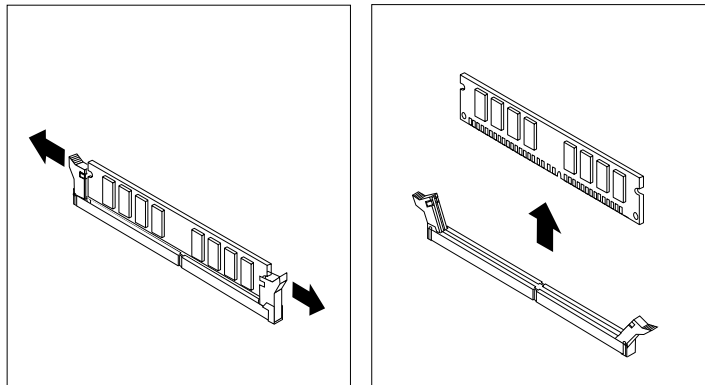
This section provides instructions on how to install or replace a memory module.

Your computer has two slots for installing or replacing DDR3 UDIMMs that provide up to a maximum of 8 GB system memory. When installing or replacing a memory module, use 1 GB, 2 GB, or 4 GB DDR3 UDIMMs in any combination up to a maximum of 8 GB.

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

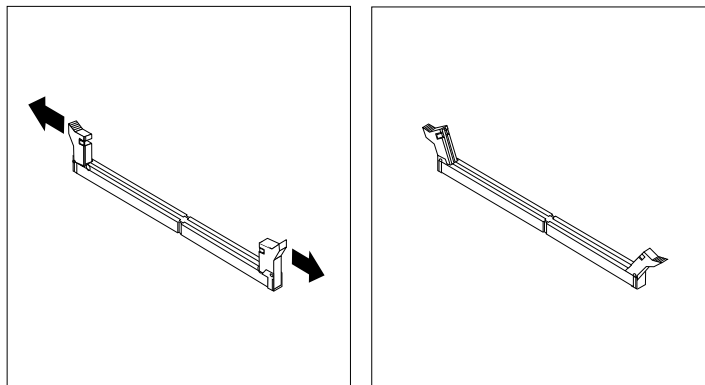
1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Lay the computer on its side for easier access to the system board.
4. Locate the memory slots. See “Locating parts on the system board” on page 12.
5. Remove any parts that might prevent your access to the memory slots. Depending on your computer model, you might need to remove the PCI Express x16 graphics card for easier access to the memory slots. See “Installing or replacing a PCI Express card” on page 36.
6. Depending on whether you are installing or replacing a memory module, do one of the following:

- If you are replacing an old memory module, open the retaining clips and gently pull the memory module out of the memory slot.



*Figure 15. Removing a memory module*

- If you are installing a memory module, open the retaining clips of the memory slot into which you want to install the memory module.



*Figure 16. Opening the retaining clips*

7. Position the new memory module over the memory slot. Make sure that the notch **1** on the memory module aligns correctly with the slot key **2** on the system board. Push the memory module straight down into the slot until the retaining clips close.

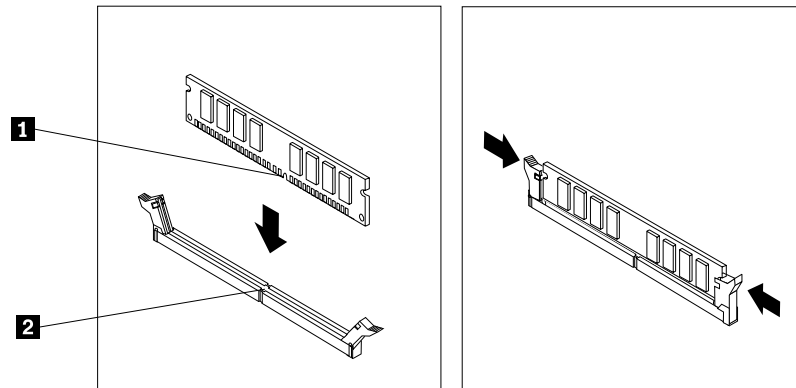


Figure 17. Installing a memory module

8. Reinstall the PCI Express x16 graphics card if you have removed it.

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

## Replacing the battery

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

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 *Safety, Warranty, and Setup Guide* for information about replacing and disposing of the battery.

To replace the battery, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Locate the battery. See “Locating parts on the system board” on page 12.

4. Remove the old battery.

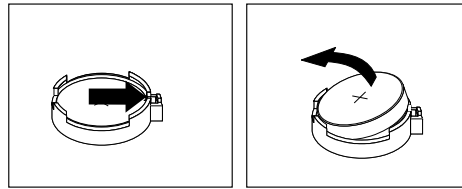


Figure 18. Removing the old battery

5. Install a new battery.

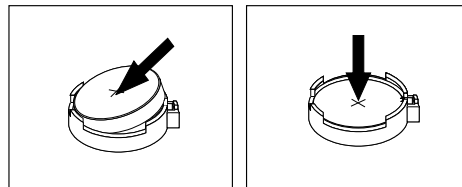


Figure 19. Installing a new battery

6. Reinstall the computer cover and connect the cables. See “Completing the parts replacement” on page 64.

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

7. Turn on the computer and all attached devices.
8. Use the Setup Utility program to set the date, time, and any passwords. See Chapter 7 “Using the Setup Utility program” on page 77.

## Replacing the primary hard disk drive

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

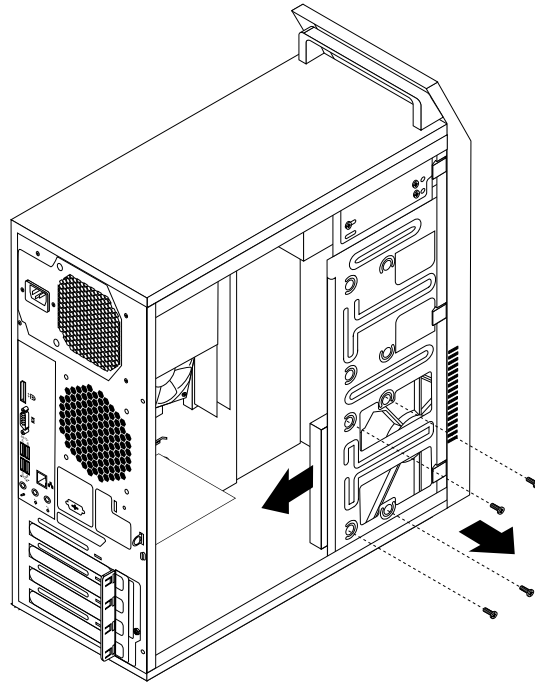
This section provides instructions on how to replace the primary hard disk drive.

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

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Locate the primary hard disk drive. See “Locating internal drives” on page 13.

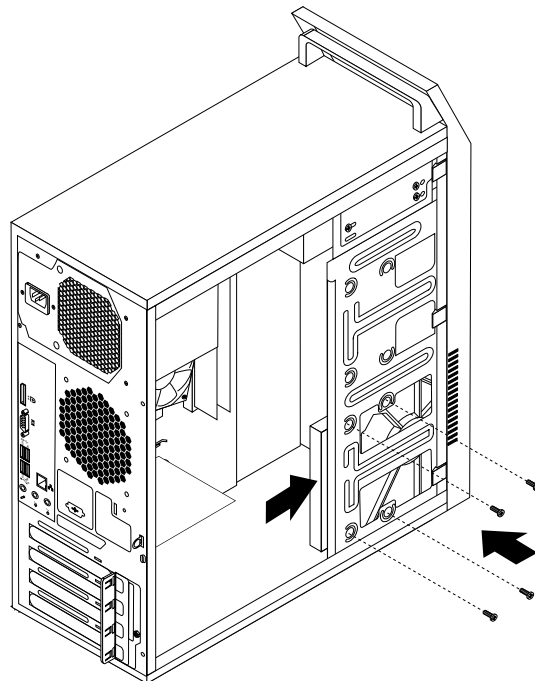
**Note:** There is also a secondary hard disk drive bay for you to purchase and install a secondary hard disk drive by yourself. If you want to install a secondary hard disk drive, use the same way of installing the primary hard disk drive.

4. Disconnect the signal cable and the power cable from the hard disk drive.
5. Remove the four screws that secure the hard disk drive. Then, slide the hard disk drive out of the chassis.



*Figure 20. Removing the primary hard disk drive*

6. Slide the new hard disk drive into the hard disk drive bay and align the screw holes in the new hard disk drive with the corresponding holes in the drive bay. Then, install the four screws to secure the new hard disk drive in place.



*Figure 21. Installing the hard disk drive*

7. Connect one end of the signal cable to the rear of the new hard disk drive and the other end to an available SATA connector on the system board. See “Locating parts on the system board” on page 12. Then, locate an available five-wire power connector and connect it to the rear of the new hard disk drive.

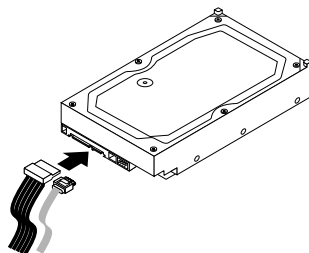


Figure 22. Connecting a SATA hard disk drive

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

## Replacing the optical drive

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

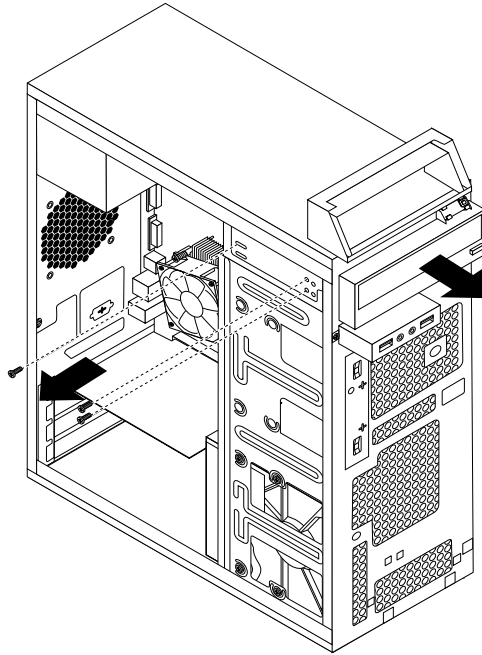
This section provides instructions on how to install or replace the optical drive.

**Note:** The optical drive is only available in some models.

To replace an optical drive, do the following:

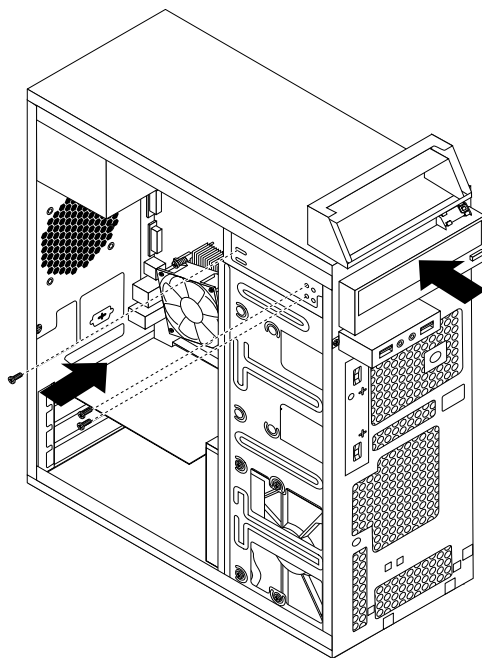
1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 34.
4. Remove the three screws that secure the optical drive. Then, slide the optical drive out of the front of the computer.





*Figure 23. Removing the optical drive*

5. Slide the new optical drive into the drive bay from the front and align the screw holes in the new optical drive with the corresponding holes in the drive bay. Then, install the three screws to secure the new optical drive in place.



*Figure 24. Installing the optical drive*

6. Connect one end of the signal cable to the rear of the new optical drive and the other end to an available SATA connector on the system board. See “Locating parts on the system board” on page 12. Then, locate an available five-wire power connector and connect it to the rear of the new optical drive.

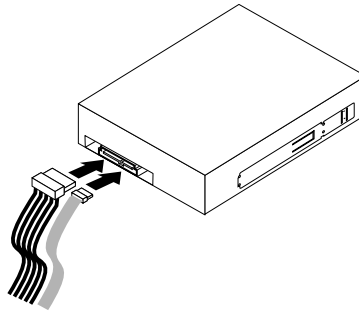


Figure 25. Connecting the optical drive

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

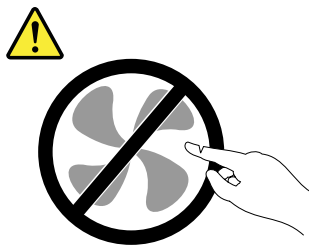
## Replacing the power supply assembly

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

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

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

**CAUTION:**



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

**CAUTION:**

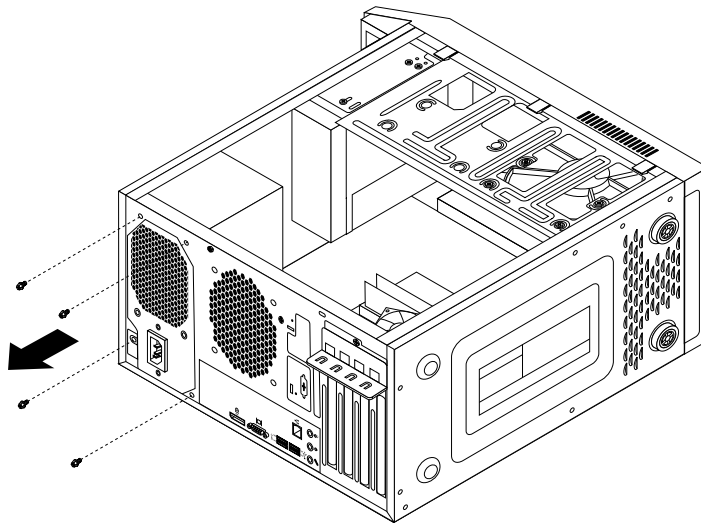
**Never remove the cover on a power supply or any part that has the following label attached.**



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

To replace the power supply assembly, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Disconnect the power supply assembly cables from all drives and from the 24-pin power connector and 4-pin power connector on the system board. See “Locating parts on the system board” on page 12.
4. Lay the computer on its side and remove the four screws at the rear of the chassis that secure the power supply assembly.



*Figure 26. Removing the screws for the power supply assembly*

5. Slide the power supply assembly to the front of the computer and then lift it out of the chassis.
6. Make sure that the new power supply assembly is the correct replacement. Some power supply assemblies automatically sense the voltage, some power supply assemblies are voltage specific, and some power supply assemblies have a voltage-selection switch. If your power supply assembly has a voltage-selection switch, make sure that you set the voltage-selection switch to match the voltage available at your electrical outlet. If necessary, use a ballpoint pen to slide the voltage-selection switch to the correct position.
  - If the voltage supply range in your local country or region is 100–127 V ac, set the voltage-selection switch to 115 V.
  - If the voltage supply range in your local country or region is 200–240 V ac, set the voltage-selection switch to 230 V.
7. Install the new power supply assembly into the chassis so that the screw holes in the power supply assembly align with those in the chassis.
8. Install and tighten the four screws to secure the power supply assembly.

**Note:** Use only screws provided by Lenovo.
9. Reconnect the power supply assembly cables to the system board and each of the drives.
10. Secure the power supply assembly cables with the cable clips and ties in the chassis.

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

## Replacing the heat sink and fan assembly

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

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

**CAUTION:**

**The heat sink and fan assembly might be very hot. Before you open the computer cover, turn off the computer and wait several minutes until the computer is cool.**

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

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Lay the computer on its side for easier access to the system board.
4. Locate the heat sink and fan assembly. See “Locating components” on page 11.
5. Disconnect the heat sink and fan assembly cable from the microprocessor fan connector on the system board. See “Locating parts on the system board” on page 12.

6. Follow this sequence to remove the four screws that secure the heat sink and fan assembly to the system board:
  - a. Partially remove screw **1**, then fully remove screw **2**, and then fully remove screw **1**.
  - b. Partially remove screw **3**, then fully remove screw **4**, and then fully remove screw **3**.

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

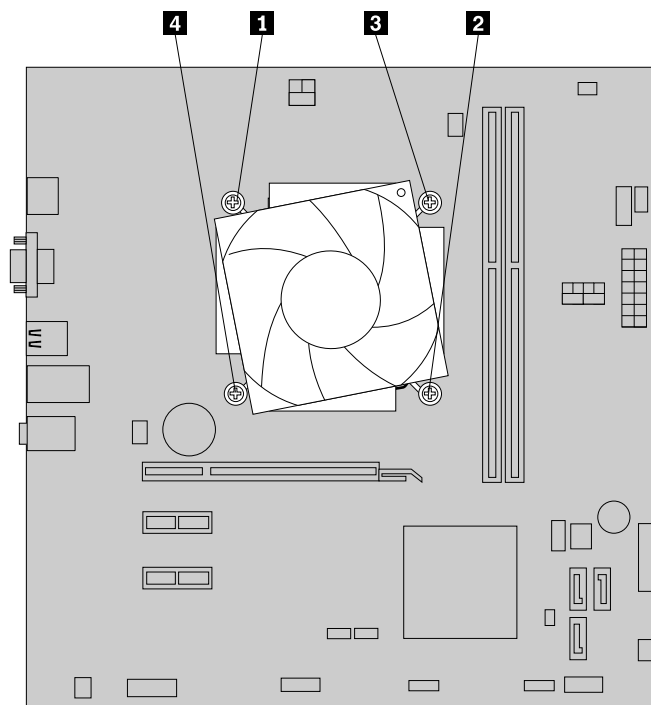


Figure 27. Removing the heat sink and fan assembly

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

**Notes:**

- a. You might have to gently twist the heat sink and fan assembly to free it from the microprocessor.
  - b. When handling the heat sink and fan assembly, do not touch the thermal grease on the bottom of the heat sink and fan assembly.
8. Place the new heat sink and fan assembly on the system board so that the four screws are aligned with the corresponding holes in the system board.

**Note:** Position the new heat sink and fan assembly so that the heat sink and fan assembly cable is toward the microprocessor fan connector on the system board.

- a. Partially tighten screw **1**, then fully tighten screw **2**, and then fully tighten screw **1**.
  - b. Partially tighten screw **3**, then fully tighten screw **4**, and then fully tighten screw **3**.
10. Connect the new heat sink and fan assembly cable to the microprocessor fan connector on the system board. See “Locating parts on the system board” on page 12.

**What to do next:**

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

- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

## Replacing the microprocessor

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

This section provides instructions on how to replace the microprocessor.

**CAUTION:**



**The heat sink and microprocessor might be very hot. Before you open the computer cover, turn off the computer and wait several minutes until the computer is cool.**

To replace the microprocessor, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Lay the computer on its side for easier access to the system board.
4. Remove the heat sink and fan assembly. See “Replacing the heat sink and fan assembly” on page 48.

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

5. Lift the small handle **1** and open the retainer **2** to access the microprocessor **3**.

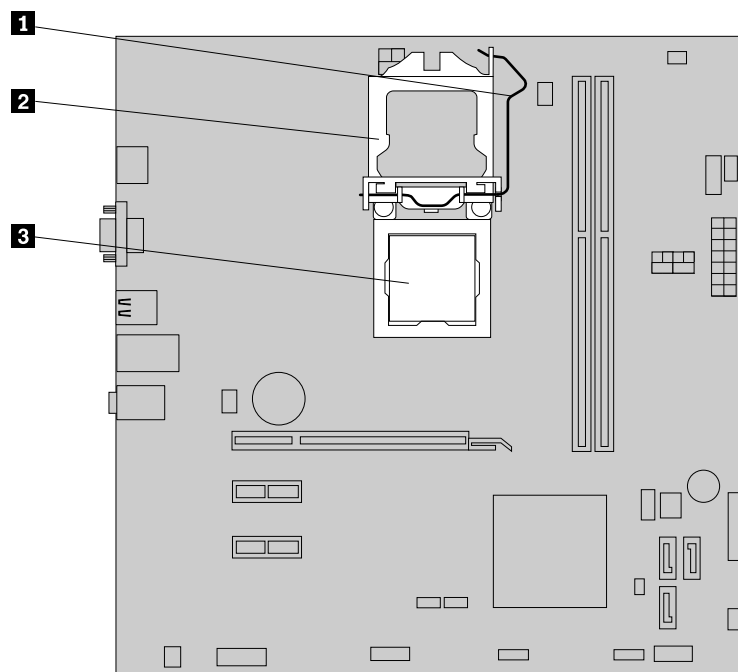


Figure 28. Accessing the microprocessor

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

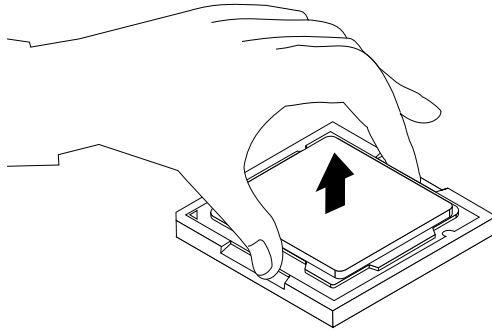
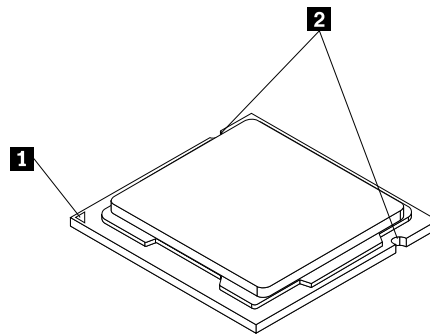


Figure 29. Removing the microprocessor

**Notes:**

- a. Your microprocessor and socket might look different from the one illustrated.
- b. Note the orientation of the microprocessor in the socket. You can either look for the small triangle **1** on one corner of the microprocessor or note the orientation of the notches **2** on the microprocessor. This is important when installing the new microprocessor on the system board.



- c. Touch only the edges of the microprocessor. Do not touch the gold contacts on the bottom.
  - d. Do not drop anything onto the microprocessor socket while it is exposed. The socket pins must be kept as clean as possible.
7. Make sure that the small handle is in the raised position and the microprocessor retainer is fully open.
  8. Remove the protective cover that protects the gold contacts of the new microprocessor.
  9. Hold the new microprocessor by its sides and align the small triangle on one corner of the new microprocessor with the corresponding small triangle on one corner of the microprocessor socket.

10. Lower the new microprocessor straight down into the microprocessor socket on the system board.

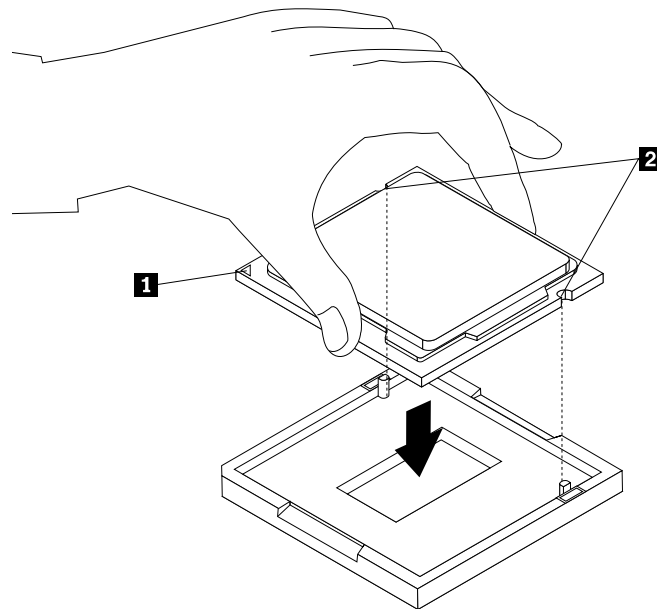


Figure 30. Installing the microprocessor

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 and fan assembly. See “Replacing the heat sink and fan assembly” on page 48.
13. Reconnect all cables that were disconnected from the system board.

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 64.

## 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” on page v.

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

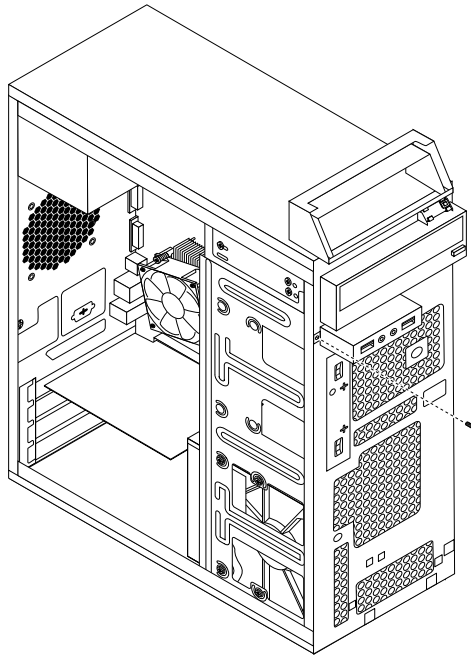
To replace the front audio and USB assembly, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 34.
4. Locate the front audio and USB assembly.
5. Disconnect the front audio and USB assembly cables from the system board. See “Locating parts on the system board” on page 12.

**Note:** Make sure that you note the locations of the cables when you disconnect the cables from the system board.



6. Remove the screw that secures the front audio and USB assembly bracket to the chassis to remove the bracket from the chassis.



*Figure 31. Removing the front audio and USB assembly*

7. Install the new front audio and USB assembly into the chassis and align the screw hole in the bracket with the corresponding hole in the chassis.
8. Install the screw to secure the new front audio and USB assembly to the chassis.
9. Reconnect the front audio and USB assembly cables to the front audio connector and the front USB connector on the system board. See “Locating parts on the system board” on page 12.

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

## Replacing the rear fan assembly

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

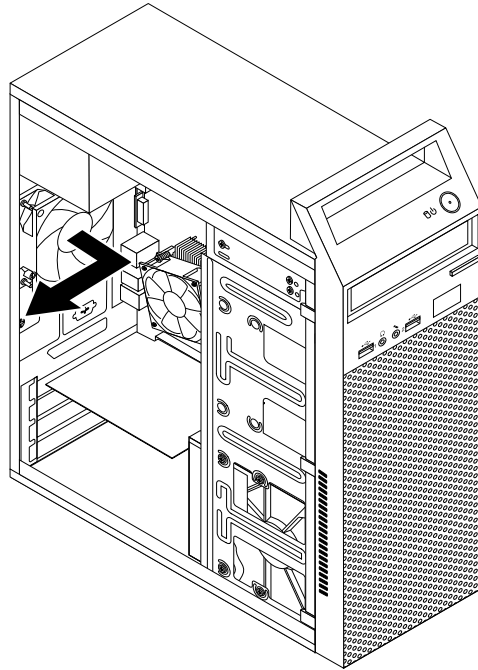
This section provides instructions on how to replace the rear fan assembly.

To replace the rear fan assembly, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Locate the rear fan assembly. See “Locating components” on page 11.
4. Disconnect the rear fan assembly cable from the system fan connector on the system board. See “Locating parts on the system board” on page 12.

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

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



*Figure 32. Removing the rear fan assembly*

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

7. Pull on the tips of the rubber mounts until the rear fan assembly is secured in place.

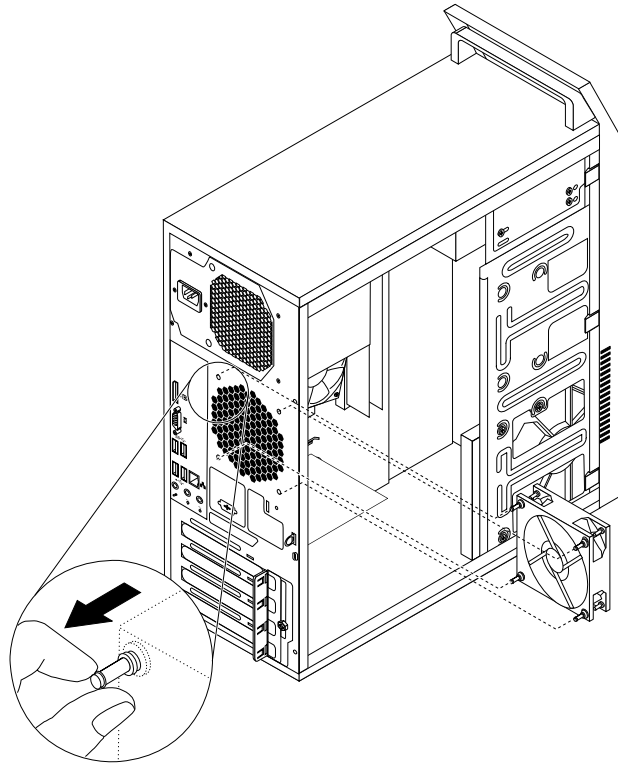


Figure 33. Installing the rear fan assembly

8. Connect the rear fan assembly cable to the system fan connector on the system board.

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 64.

## Replacing the WiFi units

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

This section provides instructions on how to replace the WiFi units. The WiFi units include a WiFi adapter card, a WiFi card module, and a rear WiFi antenna cable.

Replacing the WiFi units involves the following operations:

- “Removing the WiFi adapter card” on page 55
- “Removing the WiFi card module” on page 56
- “Installing the WiFi units” on page 57

### Removing the WiFi adapter card

To remove a WiFi adapter card, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.

3. At the rear of the computer, remove the screw that secures the PCI Express card latch.
4. Grasp the WiFi adapter card that is currently installed and gently pull it out of the slot.

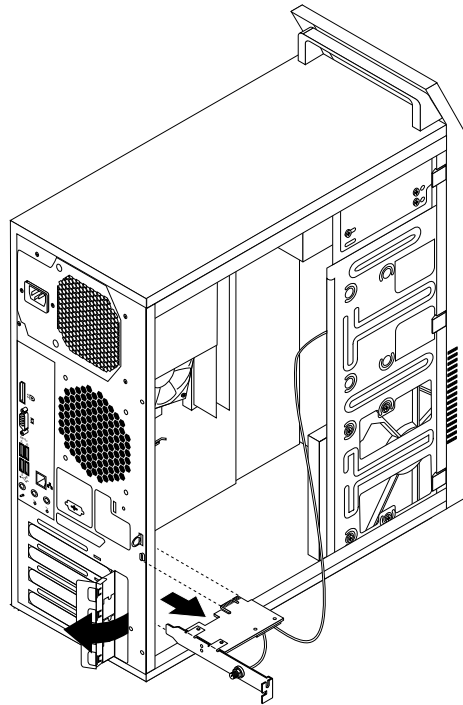


Figure 34. Removing the WiFi adapter card

**Note:** The card fits tightly into the card slot. If necessary, alternate moving each side of the card a small amount until it is removed from the card slot.

## Removing the WiFi card module

To remove the WiFi card module, do the following:

1. Remove the WiFi adapter card from the computer, and then disconnect the front and rear WiFi antenna cables from the WiFi card module.

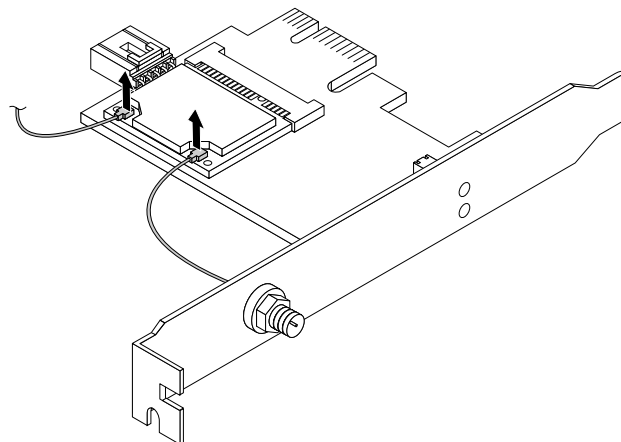
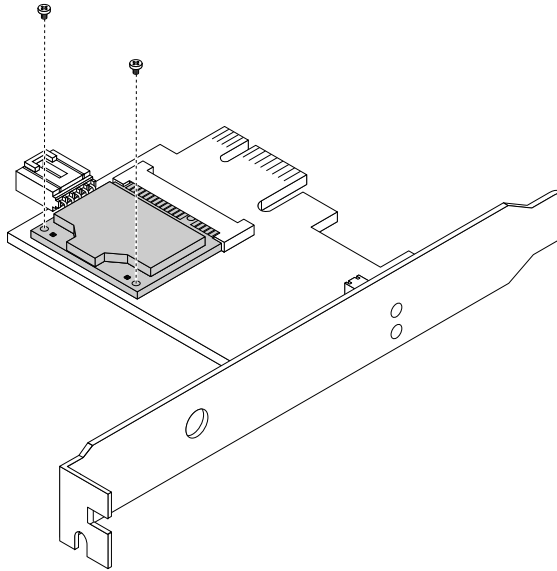


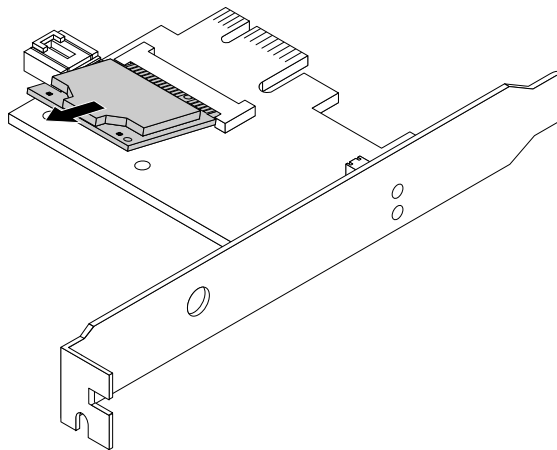
Figure 35. Removing the WiFi antenna cables

2. Remove the two screws that secure the WiFi card module to the WiFi adapter card.



*Figure 36. Removing the screws that secure the WiFi card module*

3. Pull the WiFi card module out of the mini PCI Express slot to remove it from the WiFi adapter card.

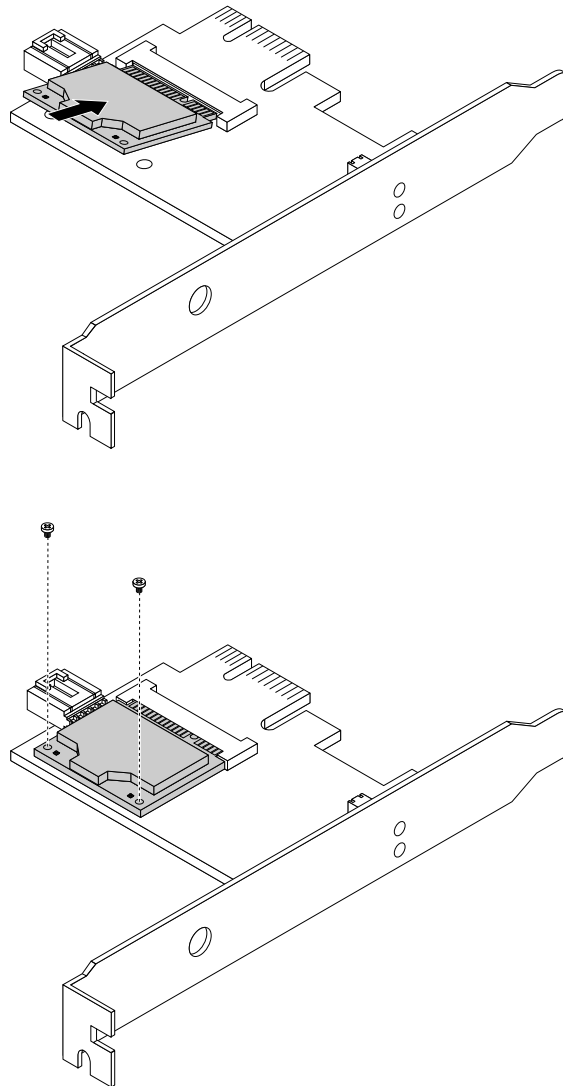


*Figure 37. Removing the WiFi card module*

## **Installing the WiFi units**

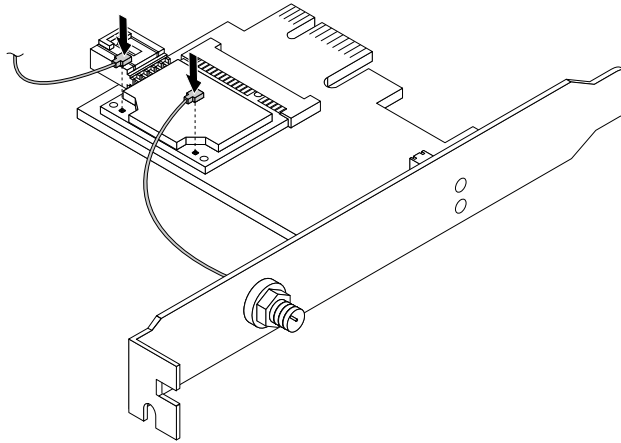
To install the WiFi units, do the following:

1. Insert the WiFi card module into the mini PCI Express slot, and then install the two screws to secure the WiFi card module to the WiFi adapter card.



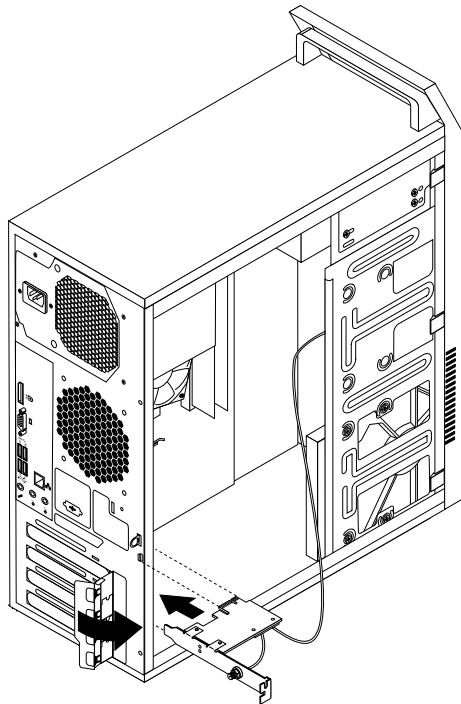
*Figure 38. Installing the WiFi card module*

2. Connect the front antenna cable and rear antenna cable to the WiFi card module.



*Figure 39. Installing the WiFi antenna cables*

3. Install the WiFi adapter card into the PCI Express x1 slot on the system board. See “Locating parts on the system board” on page 12.
4. Pivot the card latch to the closed position to secure the WiFi adapter card.



*Figure 40. Installing the WiFi adapter card*

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

## Installing or removing the rear WiFi antenna

**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

This section provides instructions on how to install or remove the rear WiFi antenna.

### Installing the rear WiFi antenna

To install the rear WiFi antenna, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Install the rear WiFi antenna to the rear WiFi antenna cable connector attached on the rear of the computer.
3. Adjust the angle of the rear antenna to lower the risk of breaking the antenna by accident.

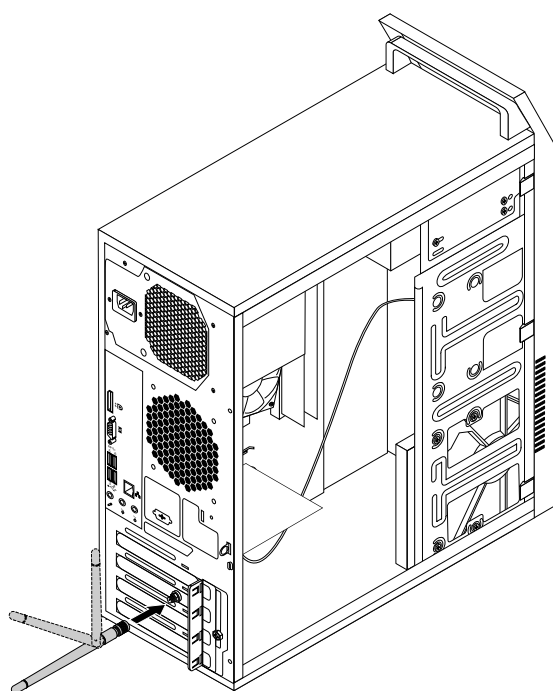


Figure 41. Installing the rear WiFi antenna

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

### Removing the rear WiFi antenna

To remove the rear WiFi antenna, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Straighten the rear WiFi antenna so that it can be more easily twisted.



3. Hold the thicker end of the rear WiFi antenna and unscrew the WiFi antenna from the rear of the computer.

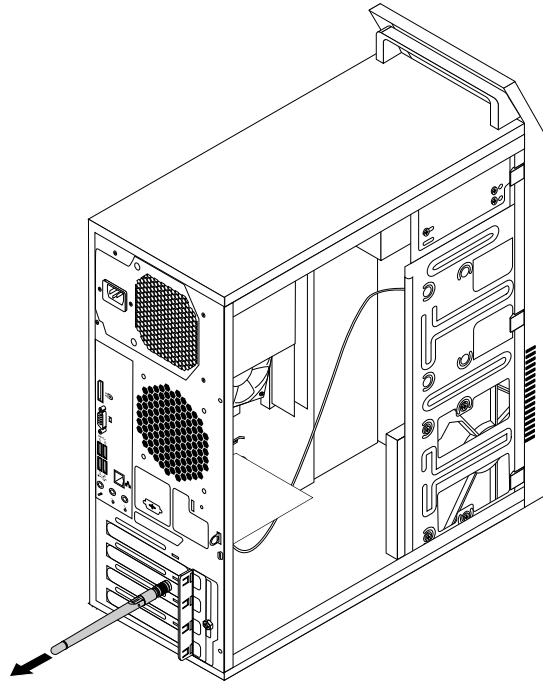


Figure 42. Removing the rear WiFi antenna

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

## Installing or removing the front WiFi antenna

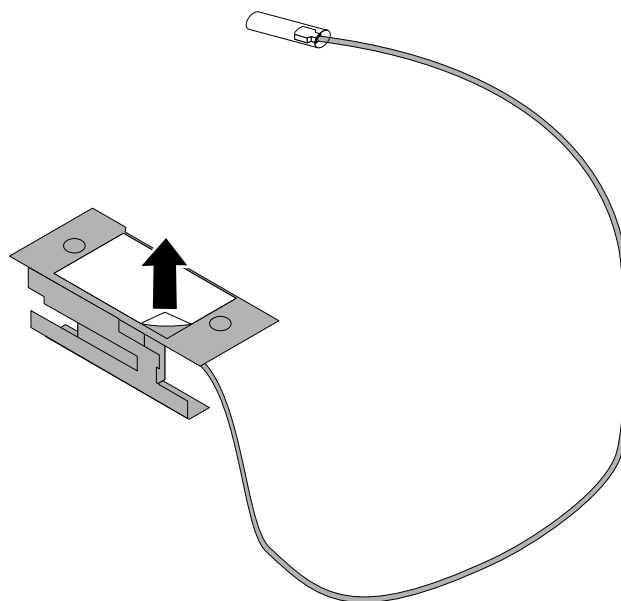
**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

This section provides instructions on how to install or remove the front WiFi antenna.

### Installing the front WiFi antenna

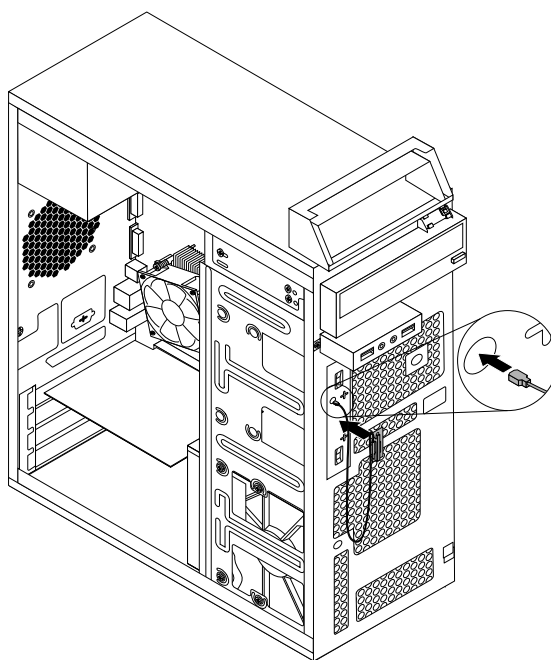
To install the front WiFi antenna, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 34.
4. Peel off the paper that protects the stickers on the front antenna.



*Figure 43. Peeling off the paper that protects the stickers*

5. Stick the front antenna to the front panel as shown. Then insert the front antenna cable through the hole in the front panel.



*Figure 44. Installing the front WiFi antenna*

6. Connect the front antenna cable to the WiFi card module.

**What to do next:**

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

- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

## Removing the front WiFi antenna

To remove the front WiFi antenna, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 34.
4. Disconnect the front antenna cable from the WiFi card module.
5. Remove the front antenna and cable from the front of the computer.

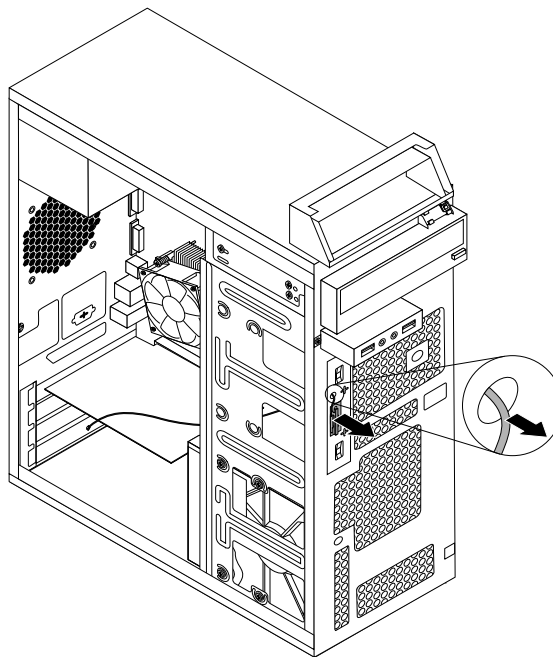


Figure 45. Removing the front WiFi antenna

### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

## Replacing the keyboard or mouse

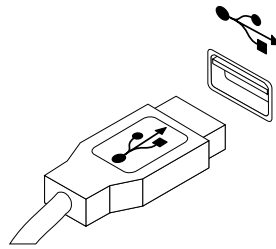
**Attention:** Do not open your computer or attempt any repair before reading and understanding the “Important safety information” on page v.

This section provides instructions on how to replace the keyboard or mouse.

To replace the keyboard or mouse, do the following:

1. Disconnect the old keyboard cable or mouse cable from the computer.

2. Connect a new keyboard or mouse to one of the USB connectors on the computer. Depending on where you want to connect the new keyboard or mouse, see “Locating connectors, controls, and indicators on the front of your computer” on page 9 or “Locating connectors on the rear of your computer” on page 10.



*Figure 46. Connecting the USB keyboard or mouse*

**What to do next:**

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 64.

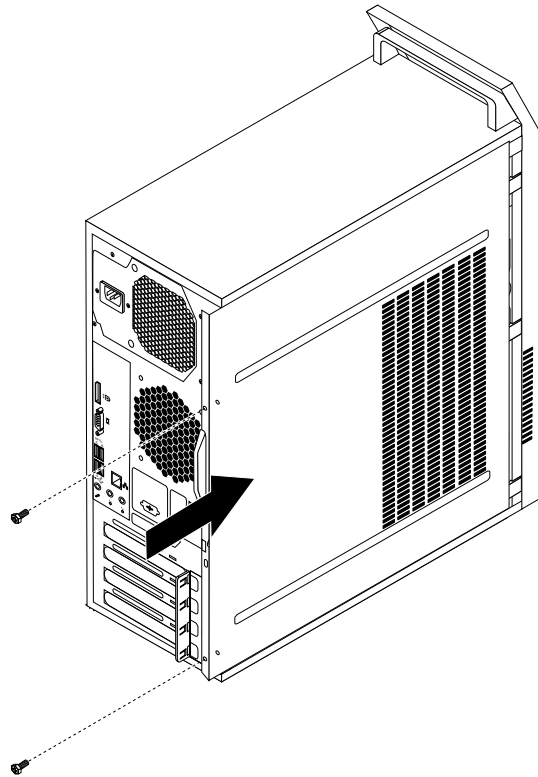
## **Completing the parts replacement**

After completing the installation or replacement for all parts, you need to reinstall the computer cover and reconnect cables. Depending on the parts you installed or replaced, you might need to confirm the updated information in the Setup Utility program. Refer to Chapter 7 “Using the Setup Utility program” on page 77.

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

1. Make sure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer. See “Locating components” on page 11 for the locations of various components in your computer.
2. Make sure that the cables are routed correctly. Keep cables clear of the hinges and sides of the computer chassis to avoid interference with closing the computer cover.
3. If you have removed the front bezel, reinstall it.

4. Position the computer cover on the chassis so that the rail guides on the bottom of the computer cover engage the rails on the chassis. Then, push the cover to the front of the computer until it snaps into position.



*Figure 47. Reinstalling the computer cover*

5. If there is a padlock available, lock the computer cover. See “Locking the computer cover” on page 30.
6. If there is a Kensington-style cable lock available, lock the computer. See “Attaching a Kensington-style cable lock” on page 31.
7. Reconnect the external cables and power cords to the computer. See “Locating connectors on the rear of your computer” on page 10.
8. To update your configuration, refer to Chapter 7 “Using the Setup Utility program” on page 77.

**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 that are not preinstalled in your operating system at <http://www.lenovo.com/support>. Installation instructions are provided in readme files with the device-driver files.



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## Chapter 6. Recovery information

This chapter provides information about the recovery solutions provided by Lenovo.

- “Recovery information for the Windows 7 operating system” on page 67
- “Recovery information for the Windows 8 or Windows 8.1 operating system” on page 73
- “Recovery information for the Windows 10 operating system” on page 74

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### Recovery information for the Windows 7 operating system

This section contains the following topics:

- Creating and using recovery media
- Performing backup and recovery operations
- Using the Rescue and Recovery workspace
- Creating and using a rescue medium
- Installing or reinstalling device drivers
- Solving recovery problems

#### Notes:

1. The recovery information in this chapter only applies to the computers that have the Rescue and Recovery program or the Product Recovery program installed. If the **Enhanced Backup and Restore** icon in the Lenovo ThinkVantage Tools program is dimmed, it indicates that you need to install the Rescue and Recovery program manually before enabling its features. To install the Rescue and Recovery program, do the following:
  - a. Click **Start → All Programs → Lenovo ThinkVantage Tools**, and double-click **Enhanced Backup and Restore**.
  - b. Follow the instructions on the screen.
  - c. When the installation process completes, the **Enhanced Backup and Restore** icon is activated.
2. There are a variety of methods to choose from when considering how to recover in the event of a software- or hardware-related problem. Some methods vary depending on the type of operating system that is installed.
3. The product on the recovery media may be used only for the following purposes:
  - Restore the product preinstalled on your computer
  - Reinstall the product
  - Modify the product using the Additional Files

### Creating and using recovery media

You can use recovery media to restore the hard disk drive to the factory default state. Recovery media are useful if you transfer the computer to another area, sell the computer, recycle the computer, or put the computer in an operational state after all other methods of recovery have failed. As a precautionary measure, it is important to create recovery media as early as possible.

**Note:** The recovery operations you can perform using recovery media vary depending on the operating system from which the recovery media were created. The recovery media might contain a boot medium and a data medium. Your Microsoft Windows license permits you to create only one data medium, so it is important that you store the recovery media in a safe place after you have made them.

## Creating recovery media

This section provides instructions on how to create recovery media on different operating systems.

**Note:** On the Windows 7 operating system, you can create recovery media using discs or external USB storage devices. On the Windows Vista operating system, you can create recovery media using only discs, so this operation is also called “creating Product Recovery discs.”

To create recovery media on the Windows 7 operating system, click **Start → All Programs → Lenovo ThinkVantage Tools → Factory Recovery Disks**. Then, follow the instructions on the screen.

## Using recovery media

This section provides instructions on how to use recovery media on different operating systems.

On the Windows 7 operating system, you can use recovery media to restore the contents of the hard disk drive to the factory default state. Also, you can use recovery media to put the computer in an operational state after all other methods of hard disk drive recovery have failed.

**Attention:** When you use recovery media to restore the contents of the hard disk to the factory default state, all the files currently on the hard disk drive will be deleted and replaced by the factory default files.

To use recovery media on the Windows 7 operating system, do the following:

1. Depending on the type of your recovery media, connect the boot medium (memory key or other USB storage device) to the computer, or insert the boot disc into the optical drive.
2. Repeatedly press and release the F12 key when turning on the computer. When the Please select boot device window opens, release the F12 key.
3. Select the desired startup device and press Enter. The restore process begins.
4. Follow the instructions on the screen to complete the operation.

**Note:** After restoring your computer hard disk drive to the factory default state, you might have to reinstall device drivers for some devices. See “Reinstalling device drivers” on page 72.

## 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, software programs, and personal settings. You can designate where the Rescue and Recovery program stores the backup:

- In a protected area of your hard disk drive
- On the secondary hard disk drive if a secondary hard disk drive is installed in your computer
- On an attached external USB hard disk drive
- On a network drive
- On recordable discs (a recordable optical drive is required for this option)

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

## Performing a backup operation

This section provides instructions on how to perform a backup operation using the Rescue and Recovery program on different operating systems.

- To perform a backup operation using the Rescue and Recovery program on the Windows 7 operating system, do the following:



1. From the Windows desktop, click **Start → All Programs → Lenovo ThinkVantage Tools → Enhanced Backup and Restore**. The Rescue and Recovery program opens.
2. In the Rescue and Recovery main window, click the **Launch advanced Rescue and Recovery** arrow.
3. Click **Back up your hard drive** and select backup operation options. Then, follow the instructions on the screen to complete the backup operation.

## Performing a recovery operation

This section provides instructions on how to perform a recovery operation using the Rescue and Recovery program on different operating systems.

To perform a recovery operation using the Rescue and Recovery program on the Windows 7 operating system, do the following:

1. From the Windows desktop, click **Start → All Programs → Lenovo ThinkVantage Tools → Enhanced Backup and Restore**. The Rescue and Recovery program opens.
2. In the Rescue and Recovery main window, click the **Launch advanced Rescue and Recovery** arrow.
3. Click the **Restore your system from a backup** icon.
4. Follow the instructions on the screen to complete the recovery operation.

For more information about performing a recovery operation from the Rescue and Recovery workspace, see “Using the Rescue and Recovery workspace” on page 69.

## 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 you cannot start the Windows operating system. 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 device or a disc. 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 on your local hard disk drive, a USB device, or a network drive.
- **Restore your hard disk drive from a Rescue and Recovery backup:** If you have backed up your hard disk drive using the Rescue and Recovery program, you can restore the hard disk drive from a Rescue and Recovery backup, even if you cannot start the Windows operating system.
- **Restore your hard disk drive to the factory default state:** The Rescue and Recovery workspace enables you to restore the complete contents of your hard disk drive to the factory default state. If you have multiple partitions on your hard disk drive, you have the option to restore 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 hard disk drive to the factory default state 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 default settings, 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 of 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. Make sure that the computer is turned off.

2. Turn on your computer. When you see the logo screen, press Enter, and then press F11 to enter the Rescue and Recovery workspace.
3. If you have 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 72.

4. Do one of the following:
  - To rescue files from your hard disk drive, click **Rescue files** and 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 default settings, click **Full Restore** and follow the instructions on the screen.

For more information about the features of the Rescue and Recovery workspace, click **Help**.

**Note:** After restoring your hard disk drive to the factory default state, you might have to reinstall device drivers for some devices. See “Reinstalling device drivers” on page 72.

## Creating and using a rescue medium

With a rescue medium, such as a disc or a USB hard disk drive, you can recover the computer from failures that prevent you from gaining access to the Rescue and Recovery workspace on your hard disk drive.

### Notes:

1. The recovery operations you can perform using a rescue medium vary depending on the operating system.
2. The rescue disc can be started in all types of optical drives.

## Creating a rescue medium

This section provides instructions on how to create a rescue medium on different operating systems.

To create a rescue medium on the Windows 7 operating system, do the following:

1. From the Windows desktop, click **Start → All Programs → Lenovo ThinkVantage Tools → Enhanced Backup and Restore**. The Rescue and Recovery program opens.
2. In the Rescue and Recovery main window, click the **Launch advanced Rescue and Recovery** arrow.
3. Click the **Create Rescue Media** icon. The Create Rescue and Recovery Media window opens.
4. In the **Rescue Media** area, select the type of the rescue medium you want to create. You can create a rescue medium using a disc, a USB hard disk drive, or a secondary internal hard disk drive.
5. Click **OK** and follow the instructions on the screen to create a rescue medium.

## Using a rescue medium

This section provides instructions on how to use the rescue medium you have created.

- If you have created a rescue medium using a disc, use the following instructions to use the rescue medium:
  1. Turn off your computer.
  2. Repeatedly press and release the F12 key when turning on the computer. When the Please select boot device window opens, release the F12 key.
  3. In the Please select boot device window, select the desired optical drive as the first boot device. Then, insert the rescue disc into the optical drive and press Enter. The rescue medium starts.
- If you have created a rescue medium using a USB hard disk drive, use the following instructions to use the rescue medium:
  1. Attach the USB hard disk drive to one of the USB connectors on your computer.

2. Repeatedly press and release the F12 key when turning on the computer. When the Please select boot device window opens, release the F12 key.
3. In the Please select boot device window, select the USB hard disk drive as the first boot device and press Enter. The rescue medium starts.

When the rescue medium starts, the Rescue and Recovery workspace opens. The help information for each feature is available from the Rescue and Recovery workspace. Follow the instructions to complete the recovery process.

## Reinstalling preinstalled applications and device drivers

Your computer has provisions that enable you to reinstall selected factory-installed applications and device drivers.

### Reinstalling preinstalled applications

This section provides instructions on how to reinstall preinstalled applications.

To reinstall the selected applications preinstalled on your Lenovo computer, do the following:

1. Turn on the computer.
2. Go to the C:\SWT00LS directory.
3. Open the apps folder. Within the apps folder, there are several subfolders named for various applications installed in your computer.
4. Open the appropriate application subfolder.
5. In the application subfolder, look for a SETUP.EXE file or other appropriate EXE files for setup. Double-click the file and follow the instructions on the screen to complete the installation.

### Reinstalling preinstalled device drivers

This section provides instructions on how to reinstall preinstalled device drivers.

**Attention:** When you reinstall device drivers, you are changing the current configuration of your computer. Reinstall device drivers only when it is necessary to correct a problem with your computer.

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

1. Turn on the computer.
2. Go to the C:\SWT00LS directory.
3. Open the DRIVERS folder. Within the DRIVERS folder, there are several subfolders named for various devices installed in your computer, such as AUDIO or VIDEO.
4. Open the appropriate device subfolder.
5. Do one of the following:
  - In the device subfolder, look for a SETUP.exe file. Double-click the file and follow the instructions on the screen to complete the installation.
  - In the device subfolder, look for a README.txt file or a file with the .txt extension. This file might be named after the operating system, such as WIN98.txt. The TXT file contains information about how to install the device driver. Follow the instructions to complete the installation.
  - If the device subfolder contains a file with the .inf extension and you want to install the device driver using the INF file, refer to the Windows help system for detailed information about how to install the device driver.

**Note:** If you need updated device drivers, see “Getting the latest device drivers for your computer” on page 85 for more information.

## Reinstalling software programs

If a software program you installed on your computer is not working correctly, you might need to remove and reinstall it. Reinstalling overwrites the existing programs files and usually fixes any problems that you might have had with that program.

To remove a program in your system, see Microsoft Windows help system for detailed information.

To reinstall the program, do one of the following:

**Note:** The method of reinstalling a program varies from program to program. Refer to the documentation provided with the program to see if your program has special installation instructions.

- To reinstall most commercially available programs in your system, see Microsoft Windows help system for more information.
- To reinstall selected application programs that came preinstalled from Lenovo, do the following:
  1. Turn on the computer.
  2. Go to the C:\SWTOOLS directory.
  3. Open the APPS folder. Within the APPS folder, there are several subfolders named for various applications installed in your computer.
  4. Open the appropriate application subfolder.
  5. In the application subfolder, look for a SETUP.EXE file or other appropriate EXE files for setup. Double-click the file and follow the instructions on the screen to complete the installation.

## Reinstalling device drivers

To reinstall a device driver for an option you installed, refer to the documentation that comes with the option.

When you reinstall device drivers, you are changing the current configuration of your computer. Reinstall device drivers only when it is necessary to correct a problem with your computer.

For more information about reinstalling device drivers that came with your computer, see “Reinstalling preinstalled applications and device drivers” on page 71.

## Solving recovery problems

If you are unable to access the Rescue and Recovery workspace or the Windows environment, do one of the following:

- Use a rescue medium to start the Rescue and Recovery workspace. See “Creating and using a rescue medium” on page 70.
- Use recovery media if all other methods of recovery have failed and you need to restore the hard disk drive to the factory default settings. See “Creating and using recovery media” on page 67.

**Note:** If you are unable to access the Rescue and Recovery workspace or the Windows environment from a rescue medium or recovery media, you might not have the rescue device (an internal hard disk drive, a disc, a USB hard disk drive, or other external devices) set as the first boot device in the startup device sequence. You must first make sure that your rescue device is set as the first boot device in the startup device sequence in the Setup Utility program. See “Selecting a startup device” on page 79 for detailed information about temporarily or permanently changing the startup device sequence. For more information about the Setup Utility program, see Chapter 7 “Using the Setup Utility program” on page 77.

It is important to create a rescue medium and a set of recovery media as early as possible and store them in a safe place for future use.

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## Recovery information for the Windows 8 or Windows 8.1 operating system

This section provides information about the recovery solutions provided on computers preinstalled with the Windows 8 or Windows 8.1 operating system.

### Refreshing your computer

If your computer does not perform well and the problem might be caused by a recently installed program, you can refresh your computer without losing your personal files or changing your settings.

**Attention:** If you refresh your computer, the programs that came with your computer and the programs that you installed from Windows Store will be reinstalled, but all other programs will be removed.

To refresh your computer, do one of the following:

- For Windows 8:
  1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → General**.
  2. In the **Refresh your PC without affecting your files** section, click **Get started**.
- For Windows 8.1:
  1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → Update and recovery → Recovery**.
  2. In the **Refresh your PC without affecting your files** section, click **Get started**.

### Resetting your computer to the factory default settings

You can reset your computer to the factory default settings. Resetting the computer will reinstall the operating system, and reinstall all the programs and settings that came with your computer.

**Attention:** If you reset your computer, all your personal files and settings will be deleted. To avoid data loss, make a backup copy of all the data that you want to keep.

To reset your computer, do one of the following:

- For Windows 8:
  1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → General**.
  2. In the **Remove everything and reinstall Windows** section, click **Get started**.
- For Windows 8.1:
  1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → Update and recovery → Recovery**.
  2. In the **Remove everything and reinstall Windows** section, click **Get started**.

### Using the advanced startup options

Advanced startup options enable you to change the startup settings of your Windows operating system, start the computer from an external device, or restore the Windows operating system from a system image.

To use the advanced startup options, do the following:

- For Windows 8:

1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → General**.
  2. In the **Advanced startup** section, click **Restart now → Troubleshoot → Advanced options**.
  3. Restart your computer following the instructions on the screen.
- For Windows 8.1:
    1. Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Click **Settings → Change PC settings → Update and recovery → Recovery**.
    2. In the **Advanced startup** section, click **Restart now → Troubleshoot → Advanced options**.
    3. Restart your computer following the instructions on the screen.

## Recovering your operating system if Windows 8 or Windows 8.1 fails to start

The Windows recovery environment on your computer is capable of operating independently from the Windows 8 or Windows 8.1 operating system. This enables you to recover or repair the operating system even if the Windows 8 or Windows 8.1 operating system fails to start.

After two consecutive failed boot attempts, the Windows recovery environment starts automatically. Then you can choose repair and recovery options by following the instructions on the screen.

**Note:** Ensure that your computer is connected to ac power during the recovery process.

For more details about the recovery solutions provided on computers preinstalled with the Windows 8 or Windows 8.1 operating system, refer to the help information system of the Windows 8 or Windows 8.1 operating system.

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## Recovery information for the Windows 10 operating system

To recover your Windows 10 operating system, use the following solutions:

- Use Windows recovery solutions.
  - Use recovery solutions in Windows Settings.
    1. Click the Start button to open the Start menu.
    2. Click **Settings → Update & security → Recovery**.
    3. Choose the appropriate recovery solution by following the instructions on the screen.
  - Use System Restore to restore system files and settings to an earlier point.
    1. Right-click the Start button to open the Start context menu.
    2. Click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **Recovery → Open System Restore**.
    3. Follow the instructions on the screen.
  - Use the File History tool to restore your files from a backup.

**Note:** If you use the File History tool to restore your files from a backup, ensure that you backed up your data earlier with the tool.

1. Right-click the Start button to open the Start context menu.
  2. Click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **File History → Restore personal files**.
  3. Follow the instructions on the screen.
- Use the Windows recovery environment by doing one of the following:

- After several consecutive failed boot attempts, the Windows recovery environment might start automatically. Follow the instructions on the screen to choose the appropriate recovery solution.
- Select the recovery medium you created earlier with the Windows tool as the startup device. See “Selecting a temporary startup device” on page 80. Then, follow the instructions on the screen to choose the appropriate recovery solution.

**Note:** To create a recovery medium, see “Good maintenance practices” on page 87.

- Use the recovery USB key provided by Lenovo to restore the entire storage drive to the factory-default settings.
  - If your computer comes with the recovery USB key, follow the instructions shipped with the USB key.
  - If your computer does not come with the recovery USB key, contact the Lenovo Customer Support Center to order a recovery USB key. For a list of Lenovo Support phone numbers, go to <http://www.lenovo.com/support/phone>. If you cannot find the support telephone number for your country or region, contact your Lenovo reseller.





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## Chapter 7. Using the Setup Utility program

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

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### Starting the Setup Utility program

To start the Setup Utility program, do the following:

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

**Note:** If a Power-On Password or an Administrator Password has been set, the Setup Utility program menu will not be displayed until you type the correct password. For more information, see “Using BIOS passwords” on page 77.

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

- Press F1 to enter the Setup Utility program.

**Note:** After you enter the Setup Utility program, press F10 to save changes and exit the Setup Utility program. Press Enter when prompted to confirm the exit. The error message will not be displayed again.

- Press F2 to bypass the error message and log in to the operating system.

**Note:** You have to enable the configuration change detection feature for the POST to detect the removal of the hard disk drive. To enable the configuration change detection feature, do the following:

1. Start the Setup Utility program.
2. From the Setup Utility program main menu, select **Security → Configuration Change Detection**, and press Enter.
3. Select **Enabled** and press Enter.
4. Press F10 to save changes and exit the Setup Utility program. Press Enter when prompted to confirm the exit.

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### Viewing and changing settings

The Setup Utility program menu lists various items about the system configuration. To view or change settings, start the Setup Utility program. See “Starting the Setup Utility program” on page 77. Then, follow the instructions on the screen.

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

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### Using BIOS passwords

By using the Setup Utility program, you can set passwords to prevent unauthorized access to your computer and data.

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

## Password considerations

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

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

## Power-On Password

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

## Administrator Password

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

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

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

## Hard Disk Password

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

### Notes:

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

## Setting, changing, and deleting a password

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

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 77.
2. From the Setup Utility program main menu, select **Security**.
3. Depending on the password type, select **Set Power-On Password**, **Set Administrator Password**, or **Hard Disk Password**.

4. Follow the instructions on the right side of the screen to set, change, or delete a password.

**Note:** A password can be any combination of up to 64 alphabetic and numeric characters. For more information, see “Password considerations” on page 78.

## Erasing lost or forgotten passwords (clearing CMOS)

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

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

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Locate the Clear CMOS /Recovery jumper on the system board. See “Locating parts on the system board” on page 12.
4. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
5. Reinstall the computer cover and connect the power cord. See “Completing the parts replacement” on page 64.
6. Turn on the computer and leave it on for approximately 10 seconds. Then, turn off the computer by holding the power button for approximately five seconds.
7. Repeat step 1 through step 3.
8. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
9. Reinstall the computer cover and connect the power cord. See “Completing the parts replacement” on page 64.

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## Enabling or disabling a device

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

### USB Setup

Use this option to enable or disable a USB connector. When a USB connector is disabled, the device connected to the USB connector cannot be used.

### SATA Controller

When this feature is set to **Disable**, all devices connected to the SATA connectors (such as hard disk drives or the optical drive) are disabled and 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 77.
2. From the Setup Utility program main menu, select **Devices**.
3. Depending on the device you want to enable or disable, do one of the following:
  - Select **USB Setup** to enable or disable a USB device.
  - Select **ATA Drives Setup → SATA Controller** to enable or disable a SATA device.
4. Select the desired settings and press Enter.
5. Press F10 to save and exit the Setup Utility program. See “Exiting the Setup Utility program” on page 81.

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## Selecting a startup device

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

## Selecting a temporary startup device

Use this procedure to select a temporary startup device.

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

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

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

## Selecting or changing the startup device sequence

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

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 77.
2. From the Setup Utility program main menu, select **Startup**.
3. Select the devices for the Primary Startup Sequence, the Automatic Startup Sequence, and the Error Startup Sequence. Read the information displayed on the right side of the screen.
4. Press F10 to save and exit the Setup Utility program. See “Exiting the Setup Utility program” on page 81.

---

## Enabling ErP LPS compliance mode

Lenovo computers meet the eco-design requirements of the ErP Lot 3 regulation. For more information, go to:

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

You can enable ErP LPS compliance mode in the Setup Utility program to reduce the consumption of electricity when your computer is off or in sleep mode.

To enable ErP LPS compliance mode in the Setup Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 77.
2. From the Setup Utility program main menu, select **Power → Enhanced Power Saving Mode**, and press Enter.
3. Select **Enabled** and press Enter.
4. From the **Power** menu, select **Automatic Power On** and press Enter.
5. Select **Wake on Lan** and press Enter.
6. Select **Disabled** and press Enter.
7. Press F10 to save changes and exit the Setup Utility program. Press Enter when prompted to confirm the exit.

**Note:** When ErP LPS compliance mode is enabled, you can wake up your computer by doing one of the following:

- Pressing the power button
- Enabling the wake up on alarm feature

The wake up on alarm feature enables your computer to wake up at a set time. To enable the wake up on alarm feature, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 77.

2. From the Setup Utility program main menu, select **Power → Automatic Power On**, and press Enter.
3. Select **Wake Up on Alarm** and press Enter. Then follow the instructions on the screen.
4. Press F10 to save changes and exit the Setup Utility program. Press Enter when prompted to confirm the exit.

- Enabling the after power loss feature

The after power loss feature enables your computer to wake up when the power supply resumes after a sudden loss of electricity. To enable the after power loss feature, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 77.
2. From the Setup Utility program main menu, select **Power → After Power Loss**, and press Enter.
3. Select **Power On** and press Enter.
4. Press F10 to save changes and exit the Setup Utility program. Press Enter when prompted to confirm the exit.

---

## Exiting the Setup Utility program

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

- If you want to save the new settings, press F10 to save and exit the Setup Utility program.
- If you do not want to save the settings, select **Exit → Discard Changes and Exit**, and then press Enter. When the Reset Without Saving window opens, select **Yes**, and then press Enter to exit the Setup Utility program.
- If you want to return to the default settings, press F9 to load the default settings, and then press F10 to save and exit the Setup Utility program.



---

## Chapter 8. Updating system programs

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

---

### Using system programs

System programs are the basic layer of software built into your computer. System programs include the POST, the BIOS, and the Setup Utility program. The POST is a set of tests and procedures that are performed each time you turn on your computer. The BIOS is a layer of software that translates instructions from other layers of software into electrical signals that the computer hardware can execute. You can use the Setup Utility program to view or change the configuration settings of your computer. See Chapter 7 “Using the Setup Utility program” on page 77 for detailed information.

Your computer system board has a module called electrically erasable programmable read-only memory (EEPROM, also referred to as flash memory). You can easily update the POST, the BIOS, and the Setup Utility program by starting your computer with a system-program-update disc or running a special update program from your operating system.

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

---

### Updating the BIOS

When you install a new program, hardware device, or device driver, you might be informed to update the BIOS. You can update the BIOS from your operating system or a flash update disc (supported only on some models).

To update the BIOS, do the following:

1. Go to <http://www.lenovo.com/drivers>.
2. Download the flash BIOS update driver for the operating system version or the ISO image version (used to create a flash update disc). Then, download the installation instructions for the flash BIOS update driver you download.
3. Print the installation instructions you download and follow the instructions to update the BIOS.

**Note:** If you want to update the BIOS from a flash update disc, the installation instructions might not provide the information about how to record the update disc. See “Recording a CD or DVD” on page 21.

---

### Recovering from a POST/BIOS update failure

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

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 33.
3. Locate the Clear CMOS /Recovery jumper on the system board. See “Locating parts on the system board” on page 12.

4. Remove any cables that impede access to the Clear CMOS /Recovery jumper.
5. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
6. Reconnect any cables that were disconnected and reinstall the PCI Express card if removed.
7. Reinstall the computer cover and reconnect the power cords for the computer and monitor to electrical outlets. See "Completing the parts replacement" on page 64.
8. Turn on the computer and then insert the POST and BIOS update (flash update) disc into the optical drive. Wait a few minutes. Then, the recovery session begins. The recovery session will take two to three minutes. During this time, a warning message will be displayed and no action is needed from you.
9. After the recovery session is completed, there will be no video, and your computer will automatically turn off.
10. Repeat step 1 through step 4.
11. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
12. Reconnect any cables that were disconnected and reinstall the PCI Express card if removed.
13. Reinstall the computer cover and reconnect any cables that were disconnected.
14. Turn on the computer to restart the operating system.



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## Chapter 9. Preventing problems

This chapter provides information that can help you avoid common problems and keep your computer running smoothly.

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### Keeping your computer current

In some situations you may find it necessary to have the most current software programs, device drivers, or operating system. This section explains how to get the latest updates for your computer.

Select any of the following topics:

- “Getting the latest device drivers for your computer” on page 85
- “Getting the latest system updates” on page 85

### Getting the latest device drivers for your computer

**Attention:** Reinstalling device drivers will change the current configuration of your computer.

To get the latest device drivers for your computer, do one of the following:

- Download the device drivers that are preinstalled on your computer. Go to <http://www.lenovo.com/drivers>.
- Use the Lenovo program or Windows Update. See “Getting the latest system updates” on page 85.

**Note:** The device drivers provided by Windows Update might not be tested by Lenovo. It is recommended that you get device drivers from Lenovo.

### Getting the latest system updates

To get the latest system updates for your computer, ensure that your computer is connected to the Internet and do one of the following:

- Use the System Update or Lenovo Companion program provided by Lenovo to get the system updates, such as device driver updates, software updates, and BIOS updates.

**Note:** The Lenovo Companion program is not available on Windows 7 computer models.

To open the System Update or Lenovo Companion program. See “Accessing a program on your computer” on page 5. For more information about using the program, refer to the help system of the program.

- Use Windows Update to get the system updates, such as security fixes, new versions of Windows components, and device driver updates.
  1. Depending on your Windows version, do one of the following:
    - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **Windows Update**.
    - For Windows 8 or Windows 8.1: Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Then, click **Settings → Change PC settings → Update and recovery → Windows Update**.
    - For Windows 10: Click the Start button to open the Start menu. Then, click **Settings → Update & security → Windows Update**.
  2. Follow the instructions on the screen.

---

## Cleaning and maintenance

With appropriate care and maintenance your computer will serve you reliably. The following topics offer information to help you keep your computer in top working order.

- “Basics” on page 86
- “Cleaning your computer” on page 86
  - “Computer” on page 86
  - “Keyboard” on page 86
  - “Optical mouse” on page 87
  - “Display screen” on page 87
- “Good maintenance practices” on page 87

### Basics

Here are some basic points about keeping your computer functioning properly:

- Keep your computer in a clean, dry environment. Make sure that it rests on a flat, steady surface.
- Do not place items on top of the monitor or cover any of the vents in the monitor or computer. These vents provide airflow to keep your computer from overheating.
- Keep food and drinks away from all parts of your computer. Food particles and spills might make the keyboard and mouse stick and unusable.
- Do not get the power buttons or other controls wet. Moisture can damage these parts and cause an electrical hazard.
- Always disconnect a power cord by grasping the plug, but not the cord.

### Cleaning your computer

It is a good practice to clean your computer periodically to protect the surfaces and ensure trouble-free operation.

#### **CAUTION:**

**Be sure to turn off the computer and monitor power buttons before cleaning the computer and monitor screen.**

### Computer

Use only mild cleaning solutions and a damp cloth to clean the painted surfaces of the computer.

### Keyboard

To clean your computer keyboard, do the following:

1. Apply some isopropyl rubbing alcohol to a soft, dust-free cloth.
2. Wipe each keytop surface with the cloth. Wipe the keys one by one; if you wipe several keys at a time, the cloth may hook onto an adjacent key, and possibly damage it. Make sure that no liquid drips onto or between the keys.
3. To remove any crumbs or dust from beneath the keys, you can use a camera blower with a brush or cool air from a hair dryer.

**Note:** Avoid spraying cleaner directly onto the display or the keyboard.

## Optical mouse

This section provides instructions on how to clean an 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 an optical mouse, do the following:

1. Turn off your computer.
2. Disconnect the mouse cable from the computer.
3. Turn the mouse upside down to check 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.

## Display screen

Dust buildup compounds problems associated with glare. Remember to clean your monitor screen periodically. See “Cleaning a flat-panel monitor surface” on page 87 or “Cleaning a glass-screen surface” on page 87.

### Cleaning a flat-panel monitor surface

If you have a flat-panel computer display that has a flexible film surface, do the following to clean the special surface. Wipe it gently with a soft, dry cloth, or blow on the screen to remove grit and other loose particles. Then moisten a cloth with LCD cleaner and wipe the screen surface.

Many computer supply stores carry the special cleaning fluids for displays. Use cleaning fluids developed for LCD displays only. First apply the fluid to a lint-free, soft cloth, then clean the LCD display. Some computer supply stores carry pre-moistened towelettes for LCD maintenance.

### Cleaning a glass-screen surface

To clean a glass-screen surface, wipe it gently with a soft, dry cloth, or blow on the screen to remove grit and other loose particles. Then use a soft cloth moistened with a nonabrasive liquid glass cleaner.

## Good maintenance practices

By performing a few good maintenance practices, you can maintain good computer performance, protect your data, and be prepared in case of a computer failure.

- Keep your computer software, device drivers, and operating system up-to-date. See “Keeping your computer current ” on page 85.
- Empty your recycle bin on a regular basis.
- Clean out your Inbox, Sent Items, and Deleted Items folders in your e-mail application on a regular basis.
- Clean up files and free up storage drive space and memory space occasionally to prevent performance problems. See “Performance and lockup problems” on page 104.
- Keep a log book. Entries might include major software or hardware changes, device-driver updates, intermittent problems and what you did to resolve them, and other issues you might have experienced.

The cause of a problem might be change in hardware, change in software, or any other actions that might have taken place. A log book can help you or a Lenovo technician determine the cause of a problem.

- Back up your data on the storage drive regularly. You can restore the storage drive from a backup.

To back up your data, do one of the following:

- For Windows 7: Open the Rescue and Recovery program. See “Accessing a program on your computer” on page 5. For more information about backing up your data, refer to the help system of the program.
- For Windows 8 or Windows 8.1: Open Control Panel. View Control Panel using Large icons or Small icons, and then click **File History**. Follow the instructions on the screen.

**Note:** For detailed information on how to open Control Panel on Windows 8 and Windows 8.1, see “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.

- For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **File History**. Follow the instructions on the screen.
- Create a recovery medium as early as possible. You can use the recovery medium to recover your operating system even if Windows fails to start up.

To create a recovery medium, do one of the following:

- For Windows 7: Open the Create Recovery Media program. See “Accessing a program on your computer” on page 5. For more information about creating a recovery medium, refer to the help system of the program.
- For Windows 8 or Windows 8.1: Open Control Panel. View Control Panel using Large icons or Small icons, and then click **Recovery**. Follow the instructions on the screen.

**Note:** For detailed information on how to open Control Panel on Windows 8 and Windows 8.1, see “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.

- For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**. View Control Panel using Large icons or Small icons, and then click **Recovery**. Follow the instructions on the screen.
- For Windows 7, create a rescue medium as early as possible. You can use the rescue medium to recover from failures that prevent you from gaining access to the Rescue and Recovery workspace on your storage drive.

To create a rescue medium, open the Rescue and Recovery program. See “Accessing a program on your computer” on page 5. For more information about creating a rescue medium, refer to the help system of the program.

---

## Moving your computer

Take the following precautions before moving your computer.

1. Back up all files and data from the hard disk drive. There are a variety of backup programs available commercially. Your operating system also might have a backup program that you can use. Lenovo provides the Rescue and Recovery program to help you back up and restore data. See “Performing backup and recovery operations” on page 68 for more information.
2. Remove all media (diskettes, compact discs, tapes, and so on) from the drives.
3. Turn off the computer and all attached devices. Your hard disk drive automatically parks the read/write head in a nondata area. This prevents damage to the hard disk drive.
4. Unplug the power cords from electrical outlets.
5. Disconnect communication cables, such as modem or network cables, from the outlets first, and then disconnect the other ends from the computer.

6. Note where any remaining cables are attached to the computer; then, remove them.
7. If you saved the original shipping cartons and packing materials, use them to pack the units. If you are using different cartons, cushion the units to avoid damage.



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## Chapter 10. Troubleshooting and diagnostics

This chapter describes some basic troubleshooting and diagnostic programs. If your computer problem is not described here, see Chapter 11 “Getting information, help, and service” on page 111 for additional troubleshooting resources.

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### Basic troubleshooting

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

**Note:** If you cannot correct the problem, have the computer serviced. For a list of service and support telephone numbers, refer to the *Safety, Warranty, and Setup Guide* that comes with your computer or go to the Lenovo Support Web site at <http://www.lenovo.com/support/phone>.

| Symptom                                                      | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The computer does not start when you press the power button. | Verify that: <ul style="list-style-type: none"><li>• The power cord is correctly connected to the rear of the computer and to a working electrical outlet.</li><li>• If your computer has a secondary power button on the rear of the computer, make sure that it is switched on.</li><li>• The power indicator on the front of the computer is on.</li><li>• The computer voltage matches the voltage available at the electrical outlet for your country or region.</li></ul>                                                                                                                                               |
| The monitor screen is blank.                                 | Verify that: <ul style="list-style-type: none"><li>• The monitor signal cable is correctly connected to the monitor and to the appropriate monitor connector on the computer.</li><li>• The monitor power cord is correctly connected to the monitor and to a working electrical outlet.</li><li>• The monitor is turned on and the brightness and contrast controls are set correctly.</li><li>• The computer voltage matches the voltage available at the electrical outlet for your country or region.</li><li>• If your computer has two monitor connectors, be sure to use the connector on the graphics card.</li></ul> |
| The keyboard does not work.                                  | Verify that: <ul style="list-style-type: none"><li>• The computer is turned on.</li><li>• The keyboard is securely connected to a USB connector on the computer.</li><li>• No keys are stuck.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                       |
| The mouse does not work.                                     | Verify that: <ul style="list-style-type: none"><li>• The computer is turned on.</li><li>• The mouse is securely connected to a USB connector on the computer.</li><li>• The mouse is clean. Refer to “Optical mouse” on page 87 for further information.</li></ul>                                                                                                                                                                                                                                                                                                                                                            |

| Symptom                                                               | Action                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The operating system does not start.                                  | Verify that: <ul style="list-style-type: none"> <li>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 79.</li> </ul> |
| The computer beeps multiple times before the operating system starts. | Verify that no keys are stuck.                                                                                                                                                                                                                                          |

## Troubleshooting procedure

Use the following procedure as a starting point for diagnosing problems you are experiencing with your computer:

1. Verify that the cables for all attached devices are connected correctly and securely.
2. Verify that all attached devices that require ac power are connected to properly grounded, functioning electrical outlets.
3. Verify that all attached devices are enabled in the BIOS settings of your computer. For more information about accessing and changing the BIOS settings, refer to your Chapter 7 “Using the Setup Utility program” on page 77.
4. Go to the “Troubleshooting” on page 93 and follow the instructions for the type of problem you are experiencing. If the Troubleshooting information does not help you resolve a problem, continue with the next step.
5. Try using a previously captured configuration to see if a recent change to hardware or software settings has caused a problem. Before restoring a previous configuration, capture your current configuration in case the older configuration settings do not solve the problem or have adverse effects. To restore a captured configuration, do the following:
  - a. Open Control Panel by doing one of the following:
    - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**.
    - For Windows 8 or Windows 8.1: See “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.
    - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
  - b. View Control Panel using Large icons or Small icons, and then click **Recovery → Open System Restore**.
  - c. Follow the instructions on the screen.

If this does not correct the problem, continue with the next step.
6. Run the diagnostic program. See “Lenovo Solution Center” on page 108 for more information.
  - If the diagnostic program detects a hardware failure, contact the Lenovo Customer Support Center. See Chapter 11 “Getting information, help, and service” on page 111 for more information.
  - If you are unable to run the diagnostic program, contact the Lenovo Customer Support Center. See Chapter 11 “Getting information, help, and service” on page 111 for more information.
  - If the diagnostic program does not detect a hardware failure, continue with the next step.
7. Use an antivirus program to see if your computer has been infected by a virus. If the program detects a virus, remove the virus.
8. If none of these actions solve the problem, seek technical assistance. See Chapter 11 “Getting information, help, and service” on page 111 for more information.



---

## Troubleshooting

Use the troubleshooting information to find solutions to problems that have definite symptoms.

If the symptom your computer is experiencing occurred immediately after you installed a new hardware option or new software, do the following before referring to the troubleshooting information:

1. Remove the new hardware option or software. If you must remove the computer cover to remove a hardware option, make sure that you review and follow the electrical safety information provided with your computer. For your safety, do not operate the computer with the cover removed.
2. Run the diagnostic programs to ensure that your computer is operating correctly.
3. Reinstall the new hardware option or software following the manufacturer's instructions.

Select the problem your computer is experiencing from the following list:

- “Audio problems” on page 93
- “CD problems” on page 94
- “DVD problems” on page 95
- “Intermittent problems” on page 97
- “Keyboard, mouse, or pointing device problems” on page 97
- “Monitor problems” on page 99
- “Networking problems” on page 101
- “Option problems” on page 103
- “Performance and lockup problems” on page 104
- “Printer problems” on page 106
- “Serial port problems” on page 106
- “Software problems” on page 106
- “USB problems” on page 108

### Audio problems

Select your symptom from the following list:

- “No audio in Windows” on page 93
- “An audio disc or AutoPlay-enabled disc does not automatically play when it is inserted into a drive” on page 94
- “Sound comes from one external speaker only” on page 94
- “No audio in DOS applications or games” on page 94

#### No audio in Windows

Symptom: No audio in Windows

Actions:

- If you are using powered external speakers that have an On/Off control, verify that the On/Off control is set to the **On** position and the speaker power cable is connected to a properly grounded, functional ac electrical outlet.
- If your external speakers have a volume control, verify that the volume control is not set too low.
- Double-click the speaker icon in the Windows notification area. A master volume-control window opens. Verify that the **Mute** settings are not checked and none of the volume settings is set too low.

- Some models have a front audio panel you can use to adjust volume. If you have a front audio panel, verify that the volume is not set too low.
- Verify that your external speakers (and headphones, if used) are connected to the correct audio connector on the computer. Most speaker cables are color-coded to match the connector.

**Note:** When external-speaker or headphone cables are attached to the audio connector, the internal speaker, if present, is disabled. In most cases, if an audio adapter is installed in one of the expansion slots, the audio function built into the system board is disabled; use the audio jacks on the adapter.

- Make sure that the program you are running is designed for use in the Microsoft Windows operating system. If the program is designed to run in DOS, the program does not use the Windows sound feature and must be configured to use SoundBlaster Pro or SoundBlaster emulation.
- Verify that the audio device drivers are correctly installed. See Microsoft Windows help system for more information.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

### **An audio disc or AutoPlay-enabled disc does not automatically play when it is inserted into a drive**

Symptom: An audio disc or AutoPlay-enabled disc does not automatically play when it is inserted into a drive

Action: See “CD problems” on page 94.

### **Sound comes from one external speaker only**

Symptom: Sound comes from one external speaker only.

Actions:

- Ensure that the speaker cable is inserted completely into the connector on the computer.
- Make sure the cable that attaches the left speaker to the right speaker is securely connected.
- Double-click the speaker icon in the Windows notification area. A master volume-control window opens. Verify that the Balance settings are set correctly.

If these actions do not correct the problem, you might have a failing speaker. Have the speaker serviced. If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

### **No audio in DOS applications or games**

Symptom: No audio in DOS applications or games

Actions:

- Make sure that the DOS application or game is configured to use SoundBlaster Pro or SoundBlaster emulation. Refer to the documentation that comes with the application or game for instructions on setting sound-card settings.
- If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

## **CD problems**

Select your symptom from the following list:

- “An audio disc or AutoPlay-enabled disc does not automatically play when it is inserted into a CD drive” on page 95
- “A CD or DVD does not work” on page 95
- “Unable to use a startable (bootable) recovery medium, such as the Product Recovery CD, to start your computer” on page 95

### **An audio disc or AutoPlay-enabled disc does not automatically play when it is inserted into a CD drive**

Symptom: An audio disc or AutoPlay-enabled disc does not automatically play when it is inserted into a CD drive.

Actions:

- If you have multiple CD or DVD drives installed (or a combination of CD and DVD drives), try inserting the disc into the other drive. In some cases, only one of the drives is connected to the audio subsystem.
- If you are using the Windows 7 operating system, follow the action for “A CD or DVD does not work” on page 95.

If this does not correct the problem, follow the action for “A CD or DVD does not work” on page 95.

### **A CD or DVD does not work**

Symptom: A CD or DVD does not work.

Actions:

- Verify that the disc is inserted correctly, with its label up.
- Make sure that the disc you are using is clean. To remove dust or fingerprints, wipe the disc clean with a soft cloth from the center to the outside. Wiping a disc in a circular motion might cause loss of data.
- Verify that the disc you are using is not scratched or damaged. Try inserting another disc that you know is good. If you cannot read from a known-good disc, you might have a problem with your CD or DVD drive or the cabling to your CD or DVD drive. Make sure that the power cable and signal cable are securely connected to the drive.

### **Unable to use a startable (bootable) recovery medium, such as the Product Recovery CD, to start your computer**

Symptom: Unable to use a startable (bootable) recovery medium, such as the Product Recovery CD, to start your computer.

Action: Make sure that the CD or DVD drive is in the startup sequence before the hard disk drive. Refer to your “Selecting or changing the startup device sequence” on page 80 for information on viewing and changing the startup sequence. Note that on some models the startup sequence is permanently set and cannot be changed.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

## **DVD problems**

Select your symptom from the following list:

- “Black screen instead of DVD video” on page 96
- “DVD movie will not play” on page 96

- “No audio or intermittent audio while playing DVD movie” on page 96
- “Playback is very slow or choppy” on page 96
- “Invalid disc or no disc found message” on page 97

### **Black screen instead of DVD video**

Symptom: Black screen instead of DVD video

Actions:

- Restart the DVD player program.
- Close any open files, turn off the computer, and then restart the computer.
- Try a lower screen resolution or color depth.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

### **DVD movie will not play**

Symptom: DVD movie will not play.

Actions:

- Make sure that the disc surface is clean and not scratched.
- Check the disc or package for regional coding. You might need to purchase a disc with coding for the region where you are using your computer.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

### **No audio or intermittent audio while playing DVD movie**

Symptom: No audio or intermittent audio while playing DVD movie.

Actions:

- Check the volume control settings on your computer and on your speakers.
- Make sure that the disc surface is clean and not scratched.
- Check all cable connections to and from the speakers.
- Use the DVD menu for the video to select a different audio track.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

### **Playback is very slow or choppy**

Symptom: Playback is very slow or choppy.

Actions:

- Disable any background programs, such as AntiVirus or Desktop Themes.
- Ensure that video resolution is set to less than 1152 x 864.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

### **Invalid disc or no disc found message**

Symptom: Invalid disc or no disc found message

Actions:

- Ensure that a DVD disc is in the drive with the shiny side of the disc facing down.
- Ensure that video resolution is set to less than 1152 x 864.
- On computers that have a CD-ROM or CD-RW drive in addition to a DVD-ROM drive, make sure that the DVD disc is in the drive labeled “DVD”.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

### **Intermittent problems**

Symptom: A problem occurs only occasionally and is difficult to repeat.

Actions:

- Verify that all cables and cords are securely connected to the computer and attached devices.
- Verify that when the computer is on, the fan grill is not blocked (there is air flow around the grill), and the fans are working. If airflow is blocked or the fans are not working, the computer might overheat.
- If SCSI devices are installed, verify that the last external device in each SCSI chain is terminated correctly. (See your SCSI documentation.)

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

### **Keyboard, mouse, or pointing device problems**

Select your symptom from the following list:

- “All or some keys on the keyboard do not work” on page 97
- “The mouse or pointing device does not work” on page 98
- “The pointer on the screen does not move smoothly with the mouse” on page 98
- “The fingerprint reader does not work” on page 98
- “The wireless keyboard does not work” on page 99

#### **All or some keys on the keyboard do not work**

Symptom: All or some keys on the keyboard do not work.

Actions:

- Verify that the keyboard cable is securely connected to the correct connector on the computer.
- If you are using an Enhanced Performance USB keyboard and one or more of the Rapid Access buttons are the only keys that are not working, these buttons might have been disabled or have not been assigned

to a function. Use the help system in the Enhanced Performance Customization Keyboard program to help diagnose problems with the Rapid Access buttons.

To open the Enhanced Performance Customization Keyboard program, do one of the following:

- On the Windows 7 operating system, do the following:
  1. Click **Start → Control Panel**.
  2. Click **Hardware and Sound**.
  3. Click **Devices and Printers**.
  4. Double-click **USB Enhanced Performance Keyboard**. The USB Enhanced Performance Keyboard Customization program starts.

- On the Windows 8 or Windows 8.1 operating system, do the following:

1. Open Control Panel.

**Note:** For detailed information on how to open Control Panel on Windows 8 and Windows 8.1, see “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.

2. Click **Hardware and Sound**.
3. Click **Devices and Printers**.
4. Double-click **USB Enhanced Performance Keyboard**. The USB Enhanced Performance Keyboard Customization program starts.

If these actions do not correct the problem, have the computer and keyboard serviced. See Chapter 11 “Getting information, help, and service” on page 111 for details.

## The mouse or pointing device does not work

Symptom: The mouse or pointing device does not work.

Actions:

- Verify that the mouse or pointing-device cable is securely attached to the correct connector on the computer. Depending on the type of mouse you have, the mouse cable will connect to either the mouse, serial, or USB connector. Some keyboards have integrated USB connectors that can be used for a USB mouse or pointing device.
- Verify that the device drivers for the mouse or pointing device are installed correctly.
- If you are using a USB keyboard or mouse, verify that the USB connectors are enabled in the BIOS settings. See “Enabling or disabling a device” on page 79.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

## The pointer on the screen does not move smoothly with the mouse

Symptom: The pointer on the screen does not move smoothly with the mouse.

Action: Erratic movement of the mouse pointer is generally caused by a buildup of dirt, oils, and other contaminants on the ball inside the mouse. Clean the mouse. See “Optical mouse” on page 87 for instructions.

## The fingerprint reader does not work

Symptom: The fingerprint reader does not work.

Action: The following could cause the fingerprint reader not to operate properly:

- Not enrolling your fingerprint correctly.
- Scratching the surface of the reader with a hard, pointed object.
- Scraping the surface of the reader with your nail or anything hard.
- Using or touching the reader with a dirty finger.
- The surface of your finger is very different from when you enrolled your fingerprint.

### **The wireless keyboard does not work**

Symptom: The wireless keyboard does not work.

Action: If the Transceiver Communications LED is on and the wireless Keyboard does not work, restart your computer. If restarting your computer does not solve the problem, verify that the following conditions are met:

- The batteries are properly installed.
- The batteries still retain their current.
- The wireless Keyboard is located less than 10 meters away from the transceiver.
- The transceiver is fully installed.

Action: If the Transceiver Communications LED is not on, reconnect the transceiver and the keyboard.

## **Monitor problems**

**Note:** Many monitors have status-indicator lights and built-in controls for adjusting brightness, contrast, width, height, and other picture adjustments. However, the controls vary from monitor type to monitor type. For information about the status lights and using the controls, refer to the documentation that comes with your monitor.

Select your symptom from the following list:

- “Wrong characters appear on the screen” on page 99
- “The monitor works when you turn on the computer, but goes blank after some period of computer inactivity” on page 99
- “The monitor works when you turn on the computer, but goes blank when you start some application programs” on page 100
- “The image appears to be flickering” on page 100
- “The image is discolored” on page 100

### **Wrong characters appear on the screen**

Symptom: Wrong characters appear on the screen.

Action: Have the computer serviced. For details, see Chapter 11 “Getting information, help, and service” on page 111.

### **The monitor works when you turn on the computer, but goes blank after some period of computer inactivity**

Symptom: The monitor works when you turn on the computer, but goes blank after some period of computer inactivity.

Action: The computer is probably set for energy savings with the power-management feature. If the power-management feature is enabled, disabling it or changing the settings might solve the problem.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

## **The monitor works when you turn on the computer, but goes blank when you start some application programs**

Symptom: The monitor works when you turn on the computer, but goes blank when you start some application programs.

Actions:

- Make sure that the monitor signal cable is securely connected to the monitor and the monitor connector on the computer. A loose cable can cause intermittent problems.
- Verify that the necessary device drivers for the application programs are installed. Refer to the documentation for the affected application program to see if device drivers are required.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

## **The image appears to be flickering**

Solutions:

- The screen might be affected by interference from nearby equipment. Magnetic fields around other devices, such as transformers, appliances, fluorescent lights, and other monitors might be causing the problem. Move fluorescent desk lighting or any equipment that produces magnetic fields farther away from the screen. If this does not correct the problem, turn off the computer. Then, adjust the placement of the computer and other devices so that they are at least 305 mm (12 inches) apart. Turn on the computer.
- Reset the refresh rate supported by your computer.
  1. Right-click a blank area on the desktop.
  2. Depending on your Windows version, do one of the following:
    - For Windows 7, Windows 8, or Windows 8.1: Click **Screen resolution** → **Advanced settings**.
    - For Windows 10: Click **Display settings**. On the **Display** tab, click **Advanced display settings** → **Display adapter properties**.
  3. Click the **Monitor** tab, and then reset the refresh rate to be the highest and noninterlaced.

## **The image is discolored**

Symptom: The image is discolored.

Action: The monitor might be affected by interference from nearby equipment. Magnetic fields around other devices, such as transformers, appliances, fluorescent lights, and other monitors might be causing the problem. Move fluorescent desk lighting or any equipment that produces magnetic fields further away from the monitor. If this does not correct the problem, do the following:

1. Turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.)
2. Adjust the placement of the monitor and other devices so that they are at least 305 mm (12 inches) apart.
3. Turn on the monitor.

If these actions do not correct the problem, your monitor might need service. See Chapter 11 “Getting information, help, and service” on page 111 for details.



## Networking problems

The following are the most common networking problems. Select your networking problem from the following list:

- “Ethernet problems” on page 101
- “A wireless LAN problem” on page 102
- “A wireless WAN problem” on page 103
- “Bluetooth problem” on page 103

For more information, see “Windows help system” on page 111.

### Ethernet problems

For Ethernet problems, select your symptom from the following list:

- “Your computer cannot connect to the network” on page 101
- “The adapter stops working for no apparent reason” on page 102
- “If your computer is a Gigabit Ethernet model and you use a speed of 1000 Mbps, the connection fails or errors occur” on page 102
- “If your computer is a Gigabit Ethernet model, it cannot connect to the network at 1000 Mbps. Instead, it connects at 100 Mbps” on page 102

#### Your computer cannot connect to the network

Symptom: Your computer cannot connect to the network.

Actions: Ensure that:

- The cable is installed properly.

The network cable must be securely connected to both the Ethernet connector of your computer and the RJ45 connector of the hub. The maximum allowable distance from the computer to hub is 100 meters. If the cable is connected and the distance is within acceptable limits but the problem persists, try a different cable.

- The cable is installed properly.
- You are using the correct device driver.

On the Windows 7 operating system, do the following:

1. Click **Start → Control Panel**.
2. Click **Hardware and Sound**.
3. Click **Device Manager**. If you are prompted for an administrator password or confirmation, type the password or provide confirmation.
4. If an exclamation mark is displayed next to an adapter name under **Network adapters**, you might not be using the correct driver or the driver is not enabled. To update the driver, right-click the highlighted adapter.
5. Click **Update Driver Software**, and then follow the instructions on the screen.

On the Windows 8 or Windows 8.1 operating system, do the following:

1. Open Control Panel.

**Note:** For detailed information on how to open Control Panel on Windows 8 and Windows 8.1, see “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.

2. Click **Hardware and Sound**.

3. Click **Device Manager**. If you are prompted for an administrator password or confirmation, type the password or provide confirmation.
  4. If an exclamation mark is displayed next to an adapter name under **Network adapters**, you might not be using the correct driver or the driver is not enabled. To update the driver, right-click the highlighted adapter.
  5. Click **Update Driver Software**, and then follow the instructions on the screen.
- The switch port and the adapter have the same duplex setting.  
If you configured the adapter for full duplex, ensure that the switch port is also configured for full duplex. Setting the wrong duplex mode can degrade performance, cause data loss, or result in lost connections.
  - You have installed all networking software that is necessary for your network environment.  
Check with your LAN administrator for the necessary networking software.

### **The adapter stops working for no apparent reason**

Symptom: The adapter stops working for no apparent reason.

Action: The network driver files may be corrupt or missing. Update the driver by referring to the “Solution” description for the procedure to make sure that the correct device driver is installed.

### **The Wake on LAN feature is not working**

Symptom: The Wake on LAN (WOL) feature is not working.

Actions:

- Make sure that WOL is enabled in the BIOS Setup Utility program.
- If it is, check with your LAN administrator for the necessary settings.

### **If your computer is a Gigabit Ethernet model and you use a speed of 1000 Mbps, the connection fails or errors occur**

Symptom: If your computer is a Gigabit Ethernet model and you use a speed of 1000 Mbps, the connection fails or errors occur.

Actions:

- Use Category 5 wiring and make sure that the network cable is securely connected.
- Connect to a 1000 BASE-T hub/switch (not 1000 BASE-X).

### **If your computer is a Gigabit Ethernet model, it cannot connect to the network at 1000 Mbps. Instead, it connects at 100 Mbps**

Symptom: If your computer is a Gigabit Ethernet model, it cannot connect to the network at 1000 Mbps. Instead, it connects at 100 Mbps.

Actions:

- Try another cable.
- Make sure that the link partner is set to auto-negotiate.
- Make sure that the switch is 802.3ab-compliant (gigabit over copper).

### **A wireless LAN problem**

Symptom: You cannot connect using the built-in wireless networking card.

Actions:

- Make sure that your wireless LAN driver is the latest version. Check the Web site and verify the driver version supported by Access Connections is the latest documented in the readme file.
- Make sure that your computer is within range of a wireless access point.
- Make sure that the wireless radio is enabled by double-clicking the Access Connections icon in the Windows notification area.
- Check Network Name (SSID), and your encryption information. Use Access Connections to verify this case-sensitive information.

## A wireless WAN problem

Message: Unauthorized WAN card is plugged in - Power off and remove the WAN card.

Action: The WAN card is not supported on this computer. Remove it.

**Note:** Some computer models do not have a wireless WAN.

## Bluetooth problem

Symptom: Sound does not come from the Bluetooth headset or headphone but comes from the local speaker even though the headset or headphone is connected using the Headset profile or AV profile.

Action: Do the following:

1. Exit the application that uses the sound device (for example, Windows Media Player).
2. Open Control Panel.

**Note:** For detailed information on how to open Control Panel on Windows 8 and Windows 8.1, see “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.

3. Click **Hardware and Sound → Sound**.
4. Select the **Playback** tab.
5. If you are using the Headset profile, select **Bluetooth Hands-free Audio** and click the **Set Default** button. If you are using the AV profile, select **Stereo Audio** and click the **Set Default** button.
6. Click **OK** to close the Sound window.

## Option problems

Use this information to diagnose problems with Lenovo hardware options that do not have their own troubleshooting information.

Select your symptom from the following list:

- “An option that was just installed does not work” on page 103
- “An option that previously worked does not work now” on page 104

### An option that was just installed does not work

Symptom: An option that was just installed does not work.

Action: Verify that:

- The option is designed for your computer.
- You followed the installation instructions supplied with the option and the installation instructions provided with your computer, and all option files (such as device drivers, if required) are installed correctly.
- You have not loosened other installed options or cables.

- If the option is an adapter, you have provided enough hardware resources for the adapter to function correctly. See the documentation supplied with the adapter (as well as the documentation for any other installed adapters) to determine the resources required for each adapter.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

## **An option that previously worked does not work now**

Symptom: An option that previously worked does not work now.

Actions:

- Verify that all option hardware and cable connections are secure.
- If the option comes with its own test instructions, use those instructions to test the option.
- If the failing option is a SCSI option, verify that:
  - The cables for all external SCSI options are connected correctly.
  - The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly.
  - All external SCSI options are turned on. External SCSI options must be turned on before the computer is turned on. For more information, see your SCSI documentation.
- Verify that the option and any required device drivers are installed correctly.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

## **Performance and lockup problems**

Poor performance and lockup problems can be a result of any of the following:

- “Insufficient free hard disk drive space” on page 104
- “Excessive number of fragmented files” on page 105
- “Insufficient memory” on page 105

Make a selection from the above list to find out more about the corrective actions you can take.

### **Insufficient free hard disk drive space**

Solutions: Free up hard disk drive space.

- Clean out your Inbox, Sent Items, and Deleted Items folders from your e-mail application.
- Clean up your C drive.
  1. Depending on your Windows version, do one of the following:
    - For Windows 7: Click the Start button to open the Start menu, and then click **Computer**.
    - For Windows 8: Open File Explorer, and then click **Computer**.
    - For Windows 8.1: Open File Explorer.
    - For Windows 10: Click the Start button to open the Start menu, and then click **File Explorer → This PC**.
  2. Right-click your C drive and then click **Properties**.
  3. Check the amount of free space, and then click **Disk Cleanup**.

4. A list of unnecessary file categories is displayed. Select each file category you want to delete, and then click **OK**.
- Turn some Windows features off or remove some unnecessary programs.
    1. Open Control Panel by doing one of the following:
      - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**.
      - For Windows 8 or Windows 8.1: See “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.
      - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
    2. View Control Panel using Large icons or Small icons, and then click **Programs and Features**.
    3. Do one of the following:
      - To turn some Windows features off, click **Turn Windows features on or off**. Follow the instructions on the screen.
      - To remove some unnecessary programs, select the program you want to remove, and then click **Uninstall/Change** or **Uninstall**.

## Excessive number of fragmented files

Solution: Use the Windows disk defragmentation or disk optimization feature to clean up the files.

**Note:** Depending on the volume of the storage drives and amount of data stored on the storage drives, the disk-defragmentation process might take up to several hours.

1. Close any open programs and windows.
2. Depending on your Windows version, do one of the following:
  - For Windows 7: Click the Start button to open the Start menu, and then click **Computer**.
  - For Windows 8: Open File Explorer, and then click **Computer**.
  - For Windows 8.1: Open File Explorer.
  - For Windows 10: Click the Start button to open the Start menu, and then click **File Explorer** → **This PC**.
3. Right-click your C drive and then click **Properties**.
4. Click the **Tools** tab.
5. Depending on your Windows version, do one of the following:
  - For Windows 7: Click **Defragment now**.
  - For Windows 8, Windows 8.1, or Windows 10: Click **Optimize**. Select the desired drive, and then click **Optimize**.
6. Follow the instructions on the screen.

## Insufficient memory

Symptom: Insufficient memory

In general, the more memory that is installed, the better the Windows operating system runs.

Action: Install additional memory. For information about purchasing memory, see Chapter 11 “Getting information, help, and service” on page 111. For step-by-step instructions on installing memory, see “Installing or replacing a memory module” on page 39.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

## Printer problems

Symptom: The printer does not work.

Actions: Verify that:

1. The printer is turned on and is online.
2. Paper is loaded correctly.
3. The printer signal cable is securely connected to the correct parallel, serial, or USB connector on the computer.

**Note:** Non-IEEE-approved printer signal cables might cause unpredictable problems.

1. Any device drivers and other software that came with the printer are correctly installed.
2. You have assigned the printer port correctly in your operating system, application program, or BIOS settings. For more information about BIOS settings, see Chapter 7 “Using the Setup Utility program” on page 77.

If the problem persists, run the tests described in the documentation that comes with your printer. If you cannot correct the problem, have the computer serviced. See Chapter 11 “Getting information, help, and service” on page 111.

## Serial port problems

Use this information to troubleshoot the serial port and devices attached to the serial port.

Symptom: Serial port cannot be accessed.

Actions:

- Make sure that the serial cable is securely connected to the serial port on the computer and to the serial device. If the serial device has its own power cord, make sure that it is attached to a properly grounded electrical outlet.
- If the serial device has its own On/Off switch, make sure that it is in the On position.
- If the serial device has an Online switch, make sure that it is in the Online position.
- If the serial device is a printer, make sure that paper is loaded correctly.
- Verify that any software supplied with the serial device is correctly installed. Refer to the documentation for the serial-device option.
- Make sure that the serial-port adapter, if you added one, is properly installed and firmly seated.

If these actions do not correct the problem, run the diagnostic programs (see “Diagnostic programs” on page 108 for instructions). If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

## Software problems

Select your symptom from the following list:

- “When using a sort feature, dates do not sort in the correct order” on page 107
- “Software does not work as expected” on page 107

## When using a sort feature, dates do not sort in the correct order

Symptom: When using a sort feature, dates do not sort in the correct order.

Action: Some software developed before the year 2000 used only the last two digits of a year to sort dates, always assuming the first two digits were 19. Consequently, these programs sort dates out of order. Check with your software manufacturer to see if any updates are available. Many software manufacturers make updates available from the World Wide Web.

## Software does not work as expected

Symptom: Software does not work as expected.

Actions:

- Most software programs have built-in help systems that provide instructions for most tasks. If you are having difficulty performing a specific task within a software program, refer to the help system for that program. Help systems are typically accessible from a menu or button in the program, and frequently from the F1 key.
- If you have difficulty with the Windows operating system or one of its components, refer to the Windows help system.
- To determine if problems are caused by newly installed software, verify that:
  - Your computer has the minimum memory requirements needed to use the software. See the information supplied with the software to verify memory requirements. (If you just installed an adapter or memory, you might have a memory-address conflict.)
  - The software is designed to operate on your computer.
  - Other software works on your computer.
  - The software you are using works correctly on another computer.
- If you received any error messages while using the software program, see the printed documentation supplied with the software or the help system for that software for a description of the messages and solutions to the problem.
- Check with your software manufacturer to see if any updates are available. Many software manufacturers make updates available from the World Wide Web.
- If the software program used to work correctly, but does not work correctly now, do the following:
  - On the Windows 7 operating system, click **Start → Control Panel → System and Security → System → System Protection → System Restore**. Then, follow the instructions on the screen.
  - On the Windows 8 or Windows 8.1 operating system, open Control Panel and click **System and Security → System → System Protection → System Restore**. Then, follow the instructions on the screen.

**Note:** For detailed information on how to open Control Panel on Windows 8 and Windows 8.1, see “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.

1. Open Control Panel by doing one of the following:
  - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**.
  - For Windows 8 or Windows 8.1: See “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.
  - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
2. View Control Panel using Large icons or Small icons, and then click **Recovery → Open System Restore**.
3. Follow the instructions on the screen.

- If you are unable to resolve the problem through other methods, uninstall the software program and reinstall it.

If these actions do not correct the problem, you might need technical assistance. Contact your software manufacturer or see Chapter 11 “Getting information, help, and service” on page 111 for details.

## USB problems

Symptom: The USB connectors cannot be accessed.

Actions:

- Make sure that the USB cable is securely connected to the USB connector and to the USB device. If the USB device has its own power cord, make sure that it is attached to a properly grounded electrical outlet.
- If the USB device has its own On/Off switch, make sure that it is in the On position.
- If the USB device has an Online switch, make sure that it is in the Online position.
- If the USB device is a printer, make sure that paper is loaded correctly.
- Make sure any device drivers or other software supplied with the USB device is correctly installed. Refer to the documentation for the USB device.
- Reset the device by detaching and reattaching the USB connector.

If these actions do not correct the problem, run the diagnostic programs to test the USB connector (see “Diagnostic programs” on page 108 for instructions). If the USB device came with its own diagnostics, run those diagnostics against the USB device. If you need technical assistance, see Chapter 11 “Getting information, help, and service” on page 111.

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## Diagnostic programs

Diagnostic programs are used to test hardware components of your computer. Diagnostic programs can also report operating-system-controlled settings that interfere with the correct operation of your computer. You can use the preinstalled diagnostic program to diagnose computer problems, if your computer is running the Windows operating system.

### Notes:

1. Depending on the date when your computer was manufactured, your computer is preinstalled with either the Lenovo Solution Center program or the Lenovo ThinkVantage Toolbox program for diagnostic purposes. For more information about the Lenovo ThinkVantage Toolbox program, see “Lenovo ThinkVantage Toolbox” on page 109. For more information about the Lenovo Solution Center program, see “Lenovo Solution Center” on page 108.
2. You can also download the PC-Doctor for DOS diagnostic program from <http://www.lenovo.com/support>. See “PC-Doctor for DOS” on page 109 for detailed information.
3. If you are unable to isolate and repair the problem yourself after running the programs, save and print the log files created by the programs. You will need the log files when you speak to a Lenovo technical support representative.

## Lenovo Solution Center

The Lenovo Solution Center program enables you to troubleshoot and resolve computer problems. It combines diagnostic tests, system information collection, security status, and support information, along with hints and tips for maximum system performance.

### Notes:



- The Lenovo Solution Center program can be downloaded from <http://www.lenovo.com/diags>.
- If you are using a Windows operating system other than Windows 7, Windows 8, Windows 8.1, or Windows 10, go to <http://www.lenovo.com/diags> for the latest information on diagnostics for your computer.

To run the Lenovo Solution Center program, see “Lenovo programs” on page 5.

For additional information, refer to the Lenovo Solution Center help system.

**Note:** If you are unable to isolate and repair the problem yourself after running the program, save and print the log files. You will need the log files when you speak to a Lenovo technical support representative.

## Lenovo ThinkVantage Toolbox

The Lenovo ThinkVantage Toolbox program helps you maintain your computer, improve computing security, diagnose computer problems, get familiar with the innovative technologies provided by Lenovo, and get more information about your computer. You can use the diagnostics feature of the Lenovo ThinkVantage Toolbox program to test devices, diagnose computer problems, create bootable diagnostic media, update system drivers, and view system information.

To run the Lenovo ThinkVantage Toolbox program on the Windows 7 operating system, click **Start → All Programs → Lenovo ThinkVantage Tools → System Health and Diagnostics**. Follow the instructions on the screen.

Follow the instructions on the screen. For additional information, refer to the Lenovo ThinkVantage Toolbox help system.

## PC-Doctor for DOS

You can also download the latest version of the PC-Doctor for DOS diagnostic program from <http://www.lenovo.com/support>. The PC-Doctor for DOS diagnostic program runs independently of the Windows operating system. Use the PC-Doctor for DOS diagnostic program if you are unable to start the Windows operating system or if the two diagnostic programs preinstalled on your computer have not been successful in isolating a possible problem. You can run the PC-Doctor for DOS diagnostic program from a diagnostic disc that you created.

### Creating a diagnostic disc

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

To create a diagnostic disc, do the following:

1. Download a self-starting bootable CD/DVD image (known as an ISO image) of the diagnostic program from:  
<http://www.lenovo.com/support>
2. Use any CD/DVD burning software to create a diagnostic disc with the ISO image.

### Running the diagnostic program from a diagnostic disc

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

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

1. Make sure the optical drive that 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 80.
2. Make sure that the computer is turned on and then insert the disc into the optical drive. The diagnostic program opens.

**Note:** You can insert the disc into the optical drive when you are setting the startup device sequence. However, if you insert the disc into the optical drive when you have already entered the operating system, you need to restart the computer to access the diagnostic program.

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

**Note:** For additional help, press the F1 key.

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

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## Chapter 11. Getting information, help, and service

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

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### Information resources

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

### Lenovo ThinkVantage Tools

The Lenovo ThinkVantage Tools program guides you to a host of information sources and provides easy access to various tools to help you work more easily and securely.

To access the Lenovo ThinkVantage Tools program, click **Start → All Programs → Lenovo ThinkVantage Tools**.

### Windows help system

**Note:** If you use the online help for Windows 7, Windows 8, or Windows 8.1, or the help for Windows 10, ensure that your computer is connected to the Internet.

The Windows help system provides you with detailed information about using the Windows operating system.

To access the Windows help system, do one of the following:

- For Windows 7: Click the Start button to open the Start menu, and then click **Help and Support**. You can choose to use the online or offline help at the bottom of the screen.
- For Windows 8 or Windows 8.1: Move the pointer to the top-right or bottom-right corner of the screen to display the charms. Then, click **Settings → Help**. You can choose to use the online or offline help at the bottom of the screen.
- For Windows 10: Click the Start button to open the Start menu, and then click **Get started**.

### Safety and Warranty

The *Safety, Warranty, and Setup 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

The Lenovo Web site (<http://www.lenovo.com>) 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 for your computer, and special offers.
- Purchase additional services, such as support for hardware, operating systems, application programs, network setup and configuration, and custom installations.
- Purchase upgrades and extended hardware repair services.
- Download the latest device drivers and software updates for your computer model.
- Access the online manuals for your products.
- Access the Lenovo Limited Warranty.

- Access troubleshooting and support information for your computer model and other supported products.
- Find the service and support phone numbers for your country or region.
- Find a Service Provider located near you.

## Lenovo Support Web site

Technical support information is available on the Lenovo Support Web site at:  
<http://www.lenovo.com/support>

This Web site is updated with the latest support information such as the following:

- Drivers and software
- Diagnostic solutions
- Product and service warranty
- Product and parts details
- User guides and manuals
- Knowledge base and frequently asked questions

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## 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 10 “Troubleshooting and diagnostics” on page 91. For information on additional resources to help you troubleshoot your computer problem, see “Information resources” on page 111.

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

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 108.

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.

The following services are available during the warranty period:

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

These items are not covered by the warranty:

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

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

For a list of the Lenovo Support phone numbers for your country or region, go to <http://www.lenovo.com/support/phone> or refer to the *Safety, Warranty, and Setup Guide* that comes with your computer.

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

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

- Machine type and model
- Serial numbers of your hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

## Using other services

You might travel with your computer or relocate it to a country or region where the machine type for your desktop or notebook computer is sold. In such a situation, 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 or regions where service is available, go to <http://www.lenovo.com/support>.

For technical assistance with the installation of or questions related to Service Packs for your preinstalled Microsoft Windows product, go to the Microsoft Product Support Web site at <http://support.microsoft.com>. You also can contact the Lenovo Customer Support Center for help. 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 services; upgraded or extended hardware repair services; and custom installation services. 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>



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## Appendix A. Notices

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

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

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

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

Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

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## Trademarks

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

- Lenovo
- Rescue and Recovery
- The Lenovo logo
- The ThinkCentre logo
- ThinkCentre
- ThinkVantage

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

Linux is a registered trademark of Linus Torvalds.

DisplayPort is a Trademark of the Video Electronics Standards Association.

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



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## Appendix B. Regulatory information

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### Export classification notice

This product is subject to the United States Export Administration Regulations (EAR) and has an Export Classification Control Number (ECCN) of 4A994.b. It can be re-exported except to any of the embargoed countries in the EAR E1 country list.

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### Television output notice

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

This product incorporates copyright protection technology that is protected by method claims of certain U.S. patents and other intellectual property rights owned by Macrovision Corporation and other rights owners. Use of this copyright protection technology must be authorized by Macrovision Corporation, and is intended for home and other limited viewing uses only unless otherwise authorized by Macrovision Corporation. Reverse engineering or disassembly is prohibited.

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### Electronic emissions notices

The following information refers to Lenovo personal computer machine types 10AS, 10AV, 10DR, and 10DS.

### Federal Communications Commission Declaration of Conformity

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an authorized dealer or service representative for help.

Lenovo is not responsible for any radio or television interference caused by using other than specified or recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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

Responsible Party:  
Lenovo (United States) Incorporated  
1009 Think Place - Building One  
Morrisville, NC 27560  
Phone Number: 919-294-5900



### **Industry Canada Class B emission compliance statement**

CAN ICES-3(B)/NMB-3(B)

### **European Union - Compliance to the Electromagnetic Compatibility Directive**

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the installation of option cards from other manufacturers.

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

Lenovo, Einsteinova 21, 851 01 Bratislava, Slovakia



### **German Class B compliance statement**

#### **Deutschsprachiger EU Hinweis:**

#### **Hinweis für Geräte der Klasse B EU-Richtlinie zur Elektromagnetischen Verträglichkeit**

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

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

#### **Deutschland:**

#### **Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmitteln**

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

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

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

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:  
**Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse B.**

#### **Korea Class B compliance statement**

|                                                                     |
|---------------------------------------------------------------------|
| <b>B급 기기 (가정용 방송통신기자재)</b>                                          |
| 이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다 |

#### **Japan VCCI Class B compliance statement**

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

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

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

#### **Japan notice for ac power cord**

The ac power cord shipped with your product can be used only for this specific product. Do not use the ac power cord for other devices.

本製品およびオプションに電源コード・セットが付属する場合は、それぞれ専用のものになっていますので他の電気機器には使用しないでください。

#### **Lenovo product service information for Taiwan**

台灣 Lenovo 產品服務資訊如下:  
荷蘭商聯想股份有限公司台灣分公司  
台北市內湖區堤頂大道二段89號5樓  
服務電話：0800-000-702

#### **Keyboard and mouse compliance statement for Taiwan**

本產品隨貨附已取得經濟部標準檢驗局認可之PS/2或USB的鍵盤與滑鼠一組

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### **Eurasian compliance mark**



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### **Brazil audio notice**

Ouvir sons com mais de 85 decibéis por longos períodos pode provocar danos ao sistema auditivo.

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### **Mexico wireless-radio compliance information**

**Advertencia:** En Mexico la operación de este equipo está sujeta a las siguientes dos condiciones: (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

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## **Additional regulatory information**

For additional regulatory information, refer to the *Regulatory Notice* shipped with your computer. Depending on the configuration of your computer and the country or region where the computer was purchased, you might have received additional printed regulatory notices. All regulatory notices are available on the Lenovo Support Web site in electronic format. To access electronic copies of the documentation, go to <http://www.lenovo.com/UserManuals>.

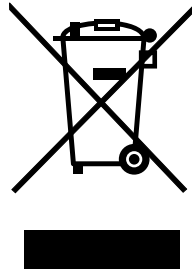
---

## Appendix C. WEEE and recycling information

Lenovo encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. Lenovo offers a variety of programs and services to assist equipment owners in recycling their IT products. For information on recycling Lenovo products, go to:  
<http://www.lenovo.com/recycling>

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### Important WEEE information



The WEEE marking on Lenovo products applies to countries with WEEE and e-waste regulations (for example, the European WEEE Directive, India E-Waste Management & Handling Rules, 2011). Appliances are labeled in accordance with local regulations concerning waste electrical and electronic equipment (WEEE). These regulations determine the framework for the return and recycling of used appliances as applicable within each geography. This label is applied to various products to indicate that the product is not to be thrown away, but rather put in the established collection systems for reclaiming these end of life products.

Users of electrical and electronic equipment (EEE) with the WEEE marking must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, and recovery of WEEE and to minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. For additional WEEE information, go to:  
<http://www.lenovo.com/recycling>

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### Recycling information for Japan

#### Collecting and recycling a disused Lenovo computer or monitor

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

#### Disposing of Lenovo computer components

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

#### Disposing of disused lithium batteries from Lenovo computers

A button-shaped lithium battery is installed on the system board of your Lenovo computer to provide power to the computer clock while the computer is off or disconnected from the main power source. If you want to replace it with a new one, contact your place of purchase or ask for a repair service provided by Lenovo. If you have replaced it by yourself and want to dispose of the disused lithium battery, insulate it with vinyl tape, contact your place of purchase, and follow their instructions. If you use a Lenovo computer at home and need to dispose of a lithium battery, you must comply with local ordinances and regulations.

---

## Recycling information for Brazil

### Declarações de Reciclagem no Brasil

#### Descarte de um Produto Lenovo Fora de Uso

Equipamentos elétricos e eletrônicos não devem ser descartados em lixo comum, mas enviados à pontos de coleta, autorizados pelo fabricante do produto para que sejam encaminhados e processados por empresas especializadas no manuseio de resíduos industriais, devidamente certificadas pelos órgãos ambientais, de acordo com a legislação local.

A Lenovo possui um canal específico para auxiliá-lo no descarte desses produtos. Caso você possua um produto Lenovo em situação de descarte, ligue para o nosso SAC ou encaminhe um e-mail para: [reciclar@lenovo.com](mailto:reciclar@lenovo.com), informando o modelo, número de série e cidade, a fim de enviarmos as instruções para o correto descarte do seu produto Lenovo.

---

## Battery recycling information for Taiwan

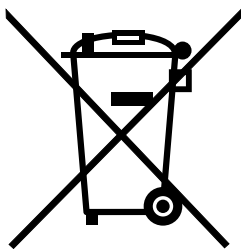


廢電池請回收

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## Battery recycling information for the European Union

EU



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

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

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





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## Appendix D. Restriction of Hazardous Substances Directive (RoHS)

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### European Union RoHS

Lenovo products sold in the European Union, on or after 3 January 2013 meet the requirements of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment ("RoHS recast" or "RoHS 2").

For more information about Lenovo progress on RoHS, go to:  
[http://www.lenovo.com/social\\_responsibility/us/en/RoHS\\_Communication.pdf](http://www.lenovo.com/social_responsibility/us/en/RoHS_Communication.pdf)

---

### China RoHS

产品中有害物质的名称及含量

| 部件名称     | 有害物质  |       |       |                 |               |                 |
|----------|-------|-------|-------|-----------------|---------------|-----------------|
|          | 铅(Pb) | 汞(Hg) | 镉(Cd) | 六价铬<br>(Cr(VI)) | 多溴连苯<br>(PBB) | 多溴二苯醚<br>(PBDE) |
| 印刷电路板组件* | X     | O     | O     | O               | O             | O               |
| 硬盘       | X     | O     | O     | O               | O             | O               |
| 光驱       | X     | O     | O     | O               | O             | O               |
| 内存       | X     | O     | O     | O               | O             | O               |
| 电脑I/O 附件 | X     | O     | O     | O               | O             | O               |
| 电源       | X     | O     | O     | O               | O             | O               |
| 键盘       | X     | O     | O     | O               | O             | O               |
| 鼠标       | X     | O     | O     | O               | O             | O               |
| 机箱/ 附件   | X     | O     | O     | O               | O             | O               |

本表格依据 SJ/T 11364 的规定编制。

○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

注：表中标记“×”的部件，皆因全球技术发展水平限制而无法实现有害物质的替代。

印刷电路板组件\*：包括印刷电路板及其零部件、电容和连接器

根据型号的不同，可能不会含有以上的所有部件，请以实际购买机型为准



在中华人民共和国境内销售的电子信息产品必须标识此标志，标志内的数字代表在正常使用状态下的产品的环保使用期限

---

### Turkish RoHS

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

### **Türkiye AEEE Yönetmeliğine Uygunluk Beyanı**

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

AEEE Yönetmeliğine Uygundur.

---

### **Ukraine RoHS**

Цим підтверджуємо, що продукція Леново відповідає вимогам нормативних актів України, які обмежують вміст небезпечних речовин

---

### **India RoHS**

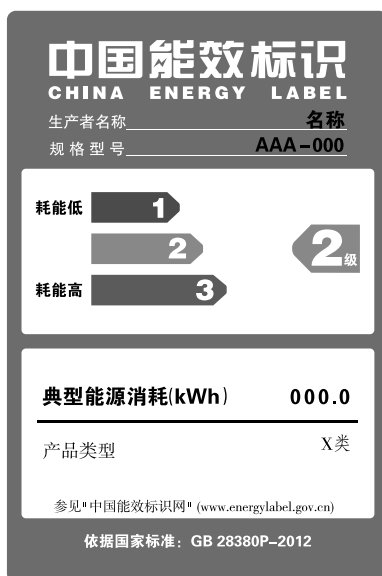
RoHS compliant as per E-Waste (Management & Handling) Rules, 2011.

## Appendix E. China Energy Label

### 微型计算机能效标识声明

为满足中国《微型计算机能源效率标识实施规则》和《微型计算机能效限定值及能效等级》的相关规定和要求，联想公司对其生产及销售的每一台微型计算机产品加施能效标识，声明如下：

1. 如果您的包装箱或者产品上贴有下图所示的标识，您所购买的机器就是经测试符合《微型计算机能效限定值及能效等级》规定的相应能效等级的产品。



**Note:** 上图以2级能效标贴模板为例进行说明，具体规格型号、能效等级、产品类别和典型能源消耗等信息请以包装箱或产品上粘贴的实际能效等级标贴提供的信息为准，也可登陆“中国能效标识网”<http://www.energylabel.gov.cn>进行详细查询。

2. 如果您所购买机器的包装箱或者产品无上图所示的标识，请您忽略此部分。

《微型计算机能源效率标识实施规则》和《微型计算机能效限定值及能效等级》是由国家发展改革委员会所推行的能效标识制度，旨在通过开发节能产品和有效的节能方式来保护环境。通过使用符合能效标识制度要求的产品可以减少电源消耗、有助于节省开支、营造更清洁的环境并降低温室气体排放量。

联想很荣幸能为用户提供符合相应能效等级设计要求的产品，也鼓励用户购买高能效的产品。

有关能效标识制度的更多信息，请访问“中国能效标识网”<http://www.energylabel.gov.cn>。



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## Appendix F. ENERGY STAR model information



ENERGY STAR® is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy aimed at saving money and protecting the environment through energy efficient products and practices.

Lenovo is proud to offer our customers products with an ENERGY STAR compliant designation. Some models of the following machine types have been designed and tested to conform to the ENERGY STAR program requirement for computers at the time of manufacture: 10DR and 10DS. For more information about ENERGY STAR ratings for Lenovo computers, go to <http://www.lenovo.com>.

By using ENERGY STAR compliant products and taking advantage of the power-management features of your computer, you reduce the consumption of electricity. Reduced electrical consumption contributes to potential financial savings, a cleaner environment, and the reduction of greenhouse gas emissions.

For more information about ENERGY STAR, go to:  
<http://www.energystar.gov>

Lenovo encourages you to make efficient use of energy an integral part of your day-to-day operations. To help in this endeavor, set the following power-management features to take effect when your computer has been inactive for a specified duration:

Table 1. ENERGY STAR power-management features

| Windows 7, Windows 8, Windows 8.1, or Windows 10 operating system                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power plan: ThinkCentre® Default <ul style="list-style-type: none"><li>• Turn off the display: After 10 minutes</li><li>• Put the computer to sleep: After 25 minutes</li><li>• Advanced power settings:<ul style="list-style-type: none"><li>– Turn off hard disk drives: After 20 minutes</li><li>– Hibernate: Never</li></ul></li></ul> |

To awaken your computer from a Sleep mode, press any key on your keyboard.

To change power settings, do the following:

1. Open Control Panel by doing one of the following:
  - For Windows 7: Click the Start button to open the Start menu, and then click **Control Panel**.
  - For Windows 8 or Windows 8.1: See “Accessing Control Panel on the Windows 8 or Windows 8.1 operating system” on page 18.
  - For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.
2. View Control Panel using Large icons or Small icons, and then click **Power Options**.

3. Follow the instructions on the screen.

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