

**ThinkPad**

# User Guide

ThinkPad L450

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

- *Safety, Warranty, and Setup Guide*
- *Regulatory Notice*
- “Important safety information” on page iv
- Appendix G “Notices” on page 97

The latest *Safety, Warranty, and Setup Guide* and the *Regulatory Notice* are available on the Lenovo® Support Web site at:  
<http://www.lenovo.com/UserManuals>

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## Read this first

Be sure to follow the important tips given here to get the most use and enjoyment out of your computer. Failure to do so might lead to discomfort or injury, or cause your computer to fail.

### Protect yourself from the heat that your computer generates.



When your computer is turned on or the battery is charging, the base, the palm rest, and some other parts may become hot. The temperature they reach depends on the amount of system activity and the level of charge in the battery.

Extended contact with your body, even through clothing, could cause discomfort or even a skin burn.

- Avoid keeping your hands, your lap, or any other part of your body in contact with a hot section of the computer for any extended time.
- Periodically take hands from using the keyboard by lifting your hands from the palm rest.

### Protect yourself from the heat generated by the ac power adapter.



When the ac power adapter is connected to an electrical outlet and your computer, it generates heat.

Extended contact with your body, even through clothing, may cause a skin burn.

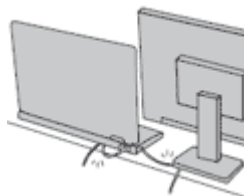
- Do not place the ac power adapter in contact with any part of your body while it is in use.
- Never use it to warm your body.

### Prevent your computer from getting wet.



To avoid spills and the danger of electrical shock, keep liquids away from your computer.

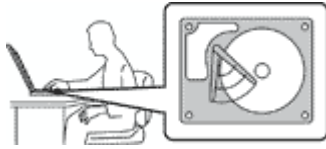
### Protect the cables from being damaged.



Applying strong force to cables may damage or break them.

Route communication lines, or the cables of an ac power adapter, a mouse, a keyboard, a printer, or any other electronic device, so that they cannot be walked on, tripped over, pinched by your computer or other objects, or in any way subjected to treatment that could interfere with the operation of your computer.

## Protect your computer and data when moving it.



Before moving a computer equipped with a hard disk drive or hybrid drive, do one of the following:

- Turn off the computer.
- Put the computer in sleep mode.
- Put the computer in hibernation mode.

This will help to prevent damage to the computer, and possible loss of data.

## Handle your computer gently.



Do not drop, bump, scratch, twist, hit, vibrate, push, or place heavy objects on your computer, display, or external devices.

## Carry your computer carefully.



- Use a quality carrying case that provides adequate cushioning and protection.
- Do not pack your computer in a tightly packed suitcase or bag.
- Before putting your computer in a carrying case, make sure that it is off, in sleep mode, or in hibernation mode. Do not put a computer in a carrying case while it is turned on.

## Important safety information

**Note:** Read the important safety information first.

This information can help you safely use your notebook computer. Follow and retain all information included with your computer. The information in this document does not alter the terms of your purchase agreement or the Lenovo Limited Warranty. For more information, see “Warranty Information” in the *Safety, Warranty, and Setup Guide* that comes with your computer.

Customer safety is important. Our products are developed to be safe and effective. However, personal computers are electronic devices. Power cords, power adapters, and other features can create potential safety risks that can result in physical injury or property damage, especially if misused. To reduce these risks, follow the instructions included with your product, observe all warnings on the product and in the operating instructions, and review the information included in this document carefully. By carefully following the information contained in this document and provided with your product, you can help protect yourself from hazards and create a safer computer work environment.

**Note:** This information includes references to power adapters and batteries. In addition to notebook computers, some products (such as speakers and monitors) ship with external power adapters. If you have such a product, this information applies to your product. In addition, computer products contain a coin-sized internal battery that provides power to the system clock even when the computer is unplugged, so the battery safety information applies to all computer products.

## Conditions that require immediate action

Products can become damaged due to misuse or neglect. Some product damage is serious enough that the product should not be used again until it has been inspected and, if necessary, repaired by an authorized servicer.

As with any electronic device, pay close attention to the product when it is turned on. On very rare occasions, you might notice an odor or see a puff of smoke or sparks vent from your product. Or you might hear sounds like popping, cracking or hissing. These conditions might merely mean that an internal electronic component has failed in a safe and controlled manner. Or, they might indicate a potential safety issue. However, do not take risks or attempt to diagnose the situation yourself. Contact the Customer Support Center for further guidance. For a list of Service and Support phone numbers, see the following Web site:  
<http://www.lenovo.com/support/phone>

Frequently inspect your computer and its components for damage or wear or signs of danger. If you have any question about the condition of a component, do not use the product. Contact the Customer Support Center or the product manufacturer for instructions on how to inspect the product and have it repaired, if necessary.

In the unlikely event that you notice any of the following conditions, or if you have any safety concerns with your product, stop using the product and unplug it from the power source and telecommunication lines until you can speak to the Customer Support Center for further guidance.

- Power cords, plugs, power adapters, extension cords, surge protectors, or power supplies that are cracked, broken, or damaged.
- Signs of overheating, smoke, sparks, or fire.
- Damage to a battery (such as cracks, dents, or creases), discharge from a battery, or a buildup of foreign substances on the battery.
- A cracking, hissing or popping sound, or strong odor that comes from the product.
- Signs that liquid has been spilled or an object has fallen onto the computer product, the power cord or power adapter.
- The computer product, power cord, or power adapter has been exposed to water.
- The product has been dropped or damaged in any way.
- The product does not operate normally when you follow the operating instructions.

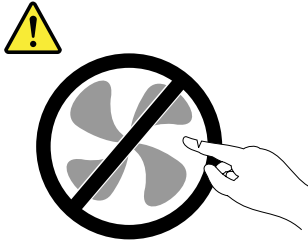
**Note:** If you notice these conditions with a product (such as an extension cord) that is not manufactured for or by Lenovo, stop using that product until you can contact the product manufacturer for further instructions, or until you get a suitable replacement.

## 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. 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.

## **Power cords and power adapters**



**DANGER**

**Use only the power cords and power adapters supplied by the product manufacturer.**

**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 cords 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.**

**Always connect power cords and signal cables in the correct order and 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 pins 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.

## 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.

## 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.

## External devices

### CAUTION:

Do not connect or disconnect any external device cables other than 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.

## General battery notice



**DANGER**

Batteries supplied by Lenovo for use with your product have been tested for compatibility and should only be replaced with approved parts. A battery other than the one specified by Lenovo, or a disassembled or modified battery is not covered by the warranty.

Battery abuse or mishandling can cause overheating, liquid leakage, or an explosion. To avoid possible injury, do the following:

- Do not open, disassemble, or service any battery.
- Do not crush or puncture the battery.
- Do not short-circuit the battery, or expose it to water or other liquids.
- Keep the battery away from children
- Keep the battery away from fire.

Stop using the battery if it is damaged, or if you notice any discharge or the buildup of foreign materials on the battery leads.

Store the rechargeable batteries or products containing the rechargeable batteries at room temperature, charged to approximately 30 to 50% of capacity. We recommend that the batteries be charged about once per year to prevent overdischarge.

Do not put the battery in trash that is disposed of in landfills. When disposing of the battery, comply with local ordinances or regulations.

## Notice for removable rechargeable battery



**DANGER**

Only recharge the battery strictly according to instructions included in the product documentation.

If the battery is incorrectly replaced, there is danger of an explosion. The battery contains a small amount of harmful substance.

## Notice for non-rechargeable coin-cell battery



### DANGER

If the coin-cell battery is incorrectly replaced, there is danger of an explosion. The battery contains a small amount of harmful substance.

Do not heat to more than 100°C (212°F).

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

California Perchlorate Information:

Products containing manganese dioxide lithium coin-cell batteries may contain perchlorate.

Perchlorate Material - special handling may apply, See [www.dtsc.ca.gov/hazardouswaste/perchlorate](http://www.dtsc.ca.gov/hazardouswaste/perchlorate)

## Heat and product ventilation



### DANGER

Computers, ac power adapters, and many accessories can generate heat when turned on and when batteries are charging. Notebook computers can generate a significant amount of heat due to their compact size. Always follow these basic precautions:

- When your computer is turned on or the battery is charging, the base, the palm rest, and some other parts may become hot. Avoid keeping your hands, your lap, or any other part of your body in contact with a hot section of the computer for any extended length of time. When you use the keyboard, avoid keeping your palms on the palm rest for a prolonged period of time. Your computer generates some heat during normal operation. The amount of heat depends on the amount of system activity and the battery charge level. Extended contact with your body, even through clothing, could cause discomfort or even a skin burn. Periodically take breaks from using the keyboard by lifting your hands from the palm rest; and be careful not to use the keyboard for any extended length of time.
- Do not operate your computer or charge the battery near flammable materials or in explosive environments.
- Ventilation slots, fans and/or 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.
- When the ac power adapter is connected to an electrical outlet and your computer, it generates heat. Do not place the adapter in contact with any part of your body while using it. Never use the ac power adapter to warm your body. Extended contact with your body, even through clothing, may cause a skin burn.

For your safety, always follow these basic precautions with your 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 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).

## Electrical current safety information



### DANGER

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

To avoid a shock hazard:

- Do not use your computer during a lightning storm.
- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- Connect all power cords to a properly wired and grounded electrical outlet.
- Connect to properly wired outlets any equipment that will be attached to this product.
- Whenever possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Disconnect the attached power cords, battery, and all the cables before you open the device covers, unless instructed otherwise in the installation and configuration procedures.
- Do not use your computer until all internal parts enclosures are fastened into place. Never use the computer when internal parts and circuits are exposed.



### DANGER

Connect and disconnect cables as described in the following procedures when installing, moving, or opening covers on this product or attached devices.

To connect:

1. Turn everything OFF.
2. First, attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlets.
5. Turn devices ON.

To disconnect:

1. Turn everything OFF.
2. First, remove power cords from outlets.
3. Remove signal cables from connectors.
4. Remove all cables from devices.

The power cord must be disconnected from the wall outlet or receptacle before installing all other electrical cables connected to the computer.

The power cord may be reconnected to the wall outlet or receptacle only after all other electrical cables have been connected to the computer.



### DANGER

During electrical storms, do not perform any replacement and do not connect the telephone cable to or disconnect it from the telephone outlet on the wall.

## Liquid crystal display (LCD) notice

### CAUTION:

The LCD is made of glass, and rough handling or dropping the computer can cause the LCD to break. If the LCD breaks and the internal fluid gets into your eyes or on your hands, immediately wash the affected areas with water for at least 15 minutes; if any symptoms are present after washing, get medical care.

**Note:** For products with mercury-containing fluorescent lamps (for example, non-LED), the fluorescent lamp in the liquid crystal display (LCD) contains mercury; dispose of according to local, state, or federal laws.

## Using headphones or earphones

### CAUTION:

Excessive sound pressure from earphones and headphones can cause hearing loss. Adjustment of the equalizer to maximum increases the earphone and headphone output voltage and the sound pressure level. Therefore, to protect your hearing, adjust the equalizer to an appropriate level.

Excessive use of headphones or earphones for a long period of time at high volume can be dangerous if the output of the headphone or earphone connectors do not comply with specifications of EN 50332-2. The headphone output connector of your computer complies with EN 50332-2 Sub clause 7. This specification limits the computer's maximum wide band true RMS output voltage to 150 mV. To help protect against hearing loss, ensure that the headphones or earphones you use also comply with EN 50332-2 (Clause 7 limits) for a wide band characteristic voltage of 75 mV. Using headphones that do not comply with EN 50332-2 can be dangerous due to excessive sound pressure levels.

If your Lenovo computer came with headphones or earphones in the package, as a set, the combination of the headphones or earphones and the computer already complies with the specifications of EN 50332-1. If different headphones or earphones are used, ensure that they comply with EN 50332-1 (Clause 6.5 Limitation Values). Using headphones that do not comply with EN 50332-1 can be dangerous due to excessive sound pressure levels.

## Additional safety information



**DANGER**

**Plastic bags can be dangerous. Keep plastic bags away from babies and children to avoid danger of suffocation.**

### Notice for users in the U.S.A.

Many personal computer products and accessories contain cords, cables or wires, such as power cords or cords to connect the accessory to a personal computer. If this product has such a cord, cable or wire, then the following warning applies:

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

Save these instructions.



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## Chapter 1. Product overview

This chapter provides information about locations of connectors, locations of important product labels, computer features, specifications, operating environment, and preinstalled programs.

This chapter contains the following topics:

- “Locating computer controls, connectors, and indicators” on page 1
- “Locating important product information” on page 7
- “Features” on page 9
- “Specifications” on page 10
- “Operating environment” on page 11

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### Locating computer controls, connectors, and indicators

This section introduces the computer hardware features to give you the basic information you need to start using the computer.

#### Front view



Figure 1. Front view

<b>1</b> Camera (available on some models)	<b>2</b> Microphones (available on some models)
<b>3</b> Power button	<b>4</b> Fingerprint reader (available on some models)
<b>5</b> ThinkPad® trackpad	<b>6</b> Media-card slot (available on some models)
<b>7</b> TrackPoint® pointing stick	<b>8</b> TrackPoint buttons

### **1 Camera (available on some models)**

Use the camera to take pictures or hold a video conference. For more information, see “Using the camera” on page 25.

### **2 Microphones (available on some models)**

The microphones capture sound and voice when used with a program capable of handling audio.

### **3 Power button**

Press the power button to turn on the computer or put the computer into sleep mode.

If your computer is completely unresponsive, you can turn off the computer by pressing and holding the power button for four or more seconds. If the computer cannot be turned off, see “Computer stops responding” on page 39 for more information.

### **4 Fingerprint reader (available on some models)**

Fingerprint authentication provides simple and secure user access by associating your fingerprint with your passwords.

**Note:** Fingerprint reader might not work on the Ubuntu® operating system.

### **ThinkPad pointing device**

#### **5 ThinkPad trackpad**

#### **7 TrackPoint pointing stick**

#### **8 TrackPoint buttons**

The keyboard contains the ThinkPad pointing device. Pointing, selecting, and dragging are all part of a single process that you can perform without moving your fingers from a typing position. For more information, see “ThinkPad pointing device” on page 16.

### **6 Media-card slot**

Your computer has a media-card slot. Insert your flash media card into the media-card slot to read the data on the card. For more information, see “Using a flash media card or a SmartCard” on page 26.



## Right-side view



Figure 2. Right-side view

<b>1</b> SIM-card slot (available on some models)	<b>2</b> USB 3.0 connectors
<b>3</b> Mini DisplayPort® connector	<b>4</b> Ethernet connector
<b>5</b> Video graphics array (VGA) connector	<b>6</b> Security-lock slot

### **1 SIM-card slot**

If your computer supports the wireless Wide Area Network (wireless WAN) feature, a Subscriber Identification Module (SIM) card might be required to establish wireless WAN connections. Depending on the country or region of delivery, the SIM card might be already installed in the SIM-card slot.

### **2 USB 3.0 connectors**

The Universal Serial Bus (USB) 3.0 connectors are used for connecting USB-compatible devices, such as a USB mouse, a USB storage device, or a digital camera.

**Note:** When you attach a USB cable to the USB connector, ensure that the USB mark is facing upward. Otherwise the connector might get damaged.

### **3 Mini DisplayPort connector**

Use the mini DisplayPort connector to connect your computer to a compatible projector, external monitor, or high-definition television. This compact connector enables a plug-and-play setup and supports adapters that can plug into DVI, VGA, or High-Definition Multimedia Interface (HDMI™) connectors. The mini DisplayPort connector of your computer supports audio as well as video streaming. For more information, see “Using an external display” on page 24.

### **4 Ethernet connector**

Connect the computer to a local area network (LAN) with the Ethernet connector.



## DANGER

**To avoid the risk of electrical shock, do not connect the telephone cable to the Ethernet connector. You can only connect an Ethernet cable to this connector.**

The Ethernet connector has two indicators that show the status of the network connection. When the green indicator is on, it indicates that the computer is connected to a LAN and a session with the network is available. When the indicator blinks yellow, data is being transmitted.

### 5 VGA connector

Use the VGA connector to connect the computer to a VGA-compatible video device, such as a VGA monitor.

### 6 Security-lock slot

To protect your computer from theft, purchase a security cable lock that fits this security-lock slot to lock your computer to a stationary object.

**Note:** You are responsible for evaluating, selecting, and implementing the locking device and security feature. Lenovo makes no comments, judgments, or warranties about the function, quality, or performance of the locking device and security feature.

## Left-side view



Figure 3. Left-side view

<b>1</b> ac power connector	<b>2</b> Fan louvers
<b>3</b> Always On USB 3.0 connector	<b>4</b> Combo audio connector
<b>5</b> Smart-card slot (available on some models)	

### 1 ac power connector

Connect the ac power adapter to the power connector to provide ac power to the computer and charge the battery.

## 2 Fan louvers

The fan louvers and the internal fan enable air to circulate in the computer to ensure proper cooling, especially the cooling of the microprocessor.

**Note:** To ensure proper airflow, do not place any obstacle in front of the fan louvers.

## 3 Always On USB 3.0 connector

By default, the Always On USB connector enables you to charge some mobile digital devices and smartphones in the following situations:

- When your computer is on or in sleep mode
- When your computer is in hibernation mode or is turned off, but connected to ac power

## 4 Combo audio connector

Connect headphones or a headset that has a 3.5 mm (0.14-inch) 4-pole plug to the audio connector to listen to the sound from the computer.

### Notes:

- If you are using a headset with a function switch, do not press this switch while using the headset. If you press it, the headset microphone will be disabled, and the integrated microphones on the computer will be enabled instead.
- The combo audio connector does not support a conventional microphone. For more information, see “Using audio features” on page 25.

## 5 Smart-card slot (available on some models)

Your computer might have a smart-card slot. For more information, see “Using a flash media card or a SmartCard” on page 26.

## Bottom view

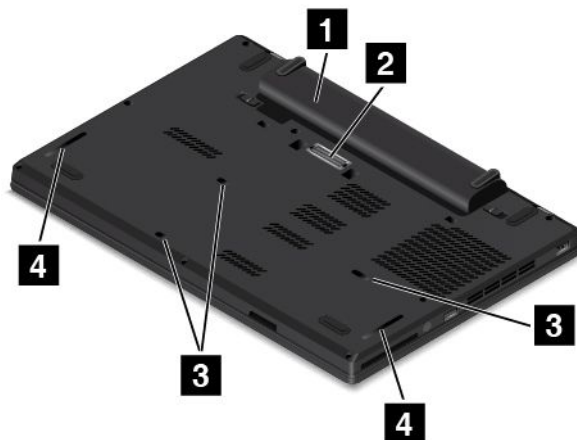


Figure 4. Bottom view

1 Battery	2 Docking station connector (available on some models)
3 Keyboard drainage holes	4 Speakers

### 1 Battery

Use your computer with battery power whenever ac power is unavailable.

### 2 Docking station connector (available on some models)

You can use the connector to connect the computer to a supported docking station to extend the computer capabilities when you are at the office or at home.

**Note:** The docking station connector might not work on the Ubuntu operating system.

### 3 Keyboard drainage holes

The keyboard drainage holes can help drain out liquid from your computer if you accidentally spill water or drink over the keyboard.

### 4 Speakers

Your computer is equipped with a pair of stereo speakers.

## Status indicators

The status indicators show the current status of your computer.

**Note:** Some indicators might not work on the Ubuntu operating system.



### **1 Fn Lock indicator**

The Fn Lock indicator shows the status of Fn Lock function. For more information, see “Special keys” on page 14.

### **2 Speaker-mute indicator**

When the speaker-mute indicator is on, the speakers are muted.

### **3 Microphone-mute indicator**

When the microphone-mute indicator is on, the microphones are muted.

### **4 Camera-status indicator**

When the camera-status indicator is on, the camera is in use.

### **5 6 System-status indicators**

The indicator in the ThinkPad logo and the indicator in the center of the power button show the system-status of the computer.

- **Blinks for three times:** The computer is initially connected to power.
- **Solid on:** The computer is on (in normal mode).
- **Off:** The computer is off or in hibernation mode.
- **Blinks fast:** The computer is entering sleep or hibernation mode.
- **Blinks slowly:** The computer is in sleep mode.

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## **Locating important product information**

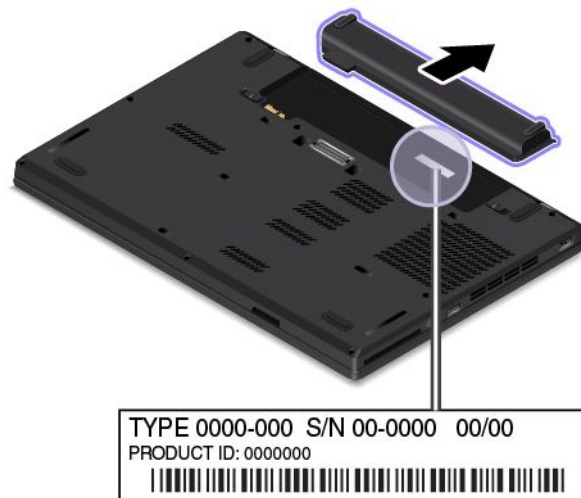
This section provides information to help you locate the following labels that contain important product information:

- “Machine type and model label” on page 7
- “FCC ID and IC Certification number label” on page 8

## **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 illustration shows the location of the machine type and model of your computer.



## FCC ID and IC Certification number label

The FCC and IC Certification information is identified by a label located on the computer base cover as shown in the following illustration.

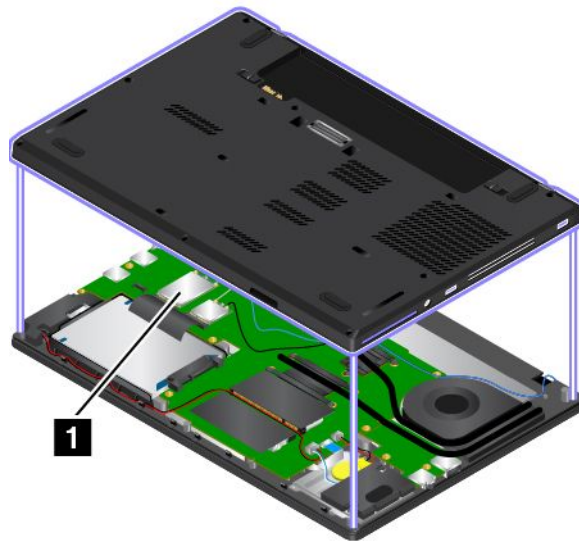


The content of this label differs depending on the wireless modules that come with your computer:

- For a preinstalled wireless module, this label identifies the actual FCC ID and IC certification number for the wireless module installed by Lenovo.

**Note:** Do not remove or replace a preinstalled wireless module by yourself. For module replacement, you must contact Lenovo service first. Lenovo is not responsible for any damage caused by unauthorized replacement.

- For a user-replaceable wireless WAN module, this label directs you to consult this user guide for the actual FCC ID and IC certification number.  
The FCC ID and IC Certification number label for the user-replaceable wireless WAN module is affixed to the wireless module **1** (available on some models) installed in your computer.



**Note:** For the user-replaceable wireless module, ensure that you use only Lenovo-authorized wireless modules for the computer. Otherwise, an error message will be displayed and the computer will beep when you turn on the computer.

---

## Features

This topic lists the features of your computer.

### Memory

- Double data rate 3 low voltage synchronous dynamic random access memory modules (DDR3 LV SDRAM)

### Storage device

- 2.5-inch form factor, 7-mm or 9.5-mm height hard disk drive (available on some models)
- 2.5-inch form factor, 7-mm height solid-state drive (available on some models)
- 2.5-inch form factor, 7-mm height hybrid drive (available on some models)
- M.2 solid-state drive for caching only (available on some models)

### Display

- Display size: 14 inches (355.6 mm)
- Display resolution: 1920-by-1080 or 1366-by-768
- Color display uses the Thin Film Transistor (TFT) technology

- Brightness control
- Camera (available on some models)
- Microphones (available on some models)

### **Keyboard**

- 6-row keyboard
- ThinkPad pointing device
- Function keys

### **Interface**

- Digital-media-card reader (4-in-1)
- ac power connector
- Combo audio connector
- Docking station connector (available on some models)
- External monitor connectors (VGA connector and mini DisplayPort connector)
- One Always On USB 3.0 connector
- RJ45 Ethernet connector
- SIM-card slot (available on some models)
- Smart-card slot (available on some models)
- Two USB 3.0 connectors

### **Wireless features**

- Global Positioning System (GPS) satellite receiver (available on models with wireless WAN)
- Integrated wireless LAN
- Integrated Bluetooth
- Wireless WAN (available on some models)

### **Security features**

- Fingerprint reader (available on some models)

---

## **Specifications**

This section lists the physical specifications for your computer.

### **Size**

- Width: 339 mm (13.35 inches)
- Depth: 235 mm (9.25 inches)
- Height: 24.3 mm (0.96 inch)

### **Heat output (depending on the model)**

- 45 W (154 Btu/hr) maximum
- 65 W (222 Btu/hr) maximum

### **Power source (ac power adapter)**

- Sine-wave input at 50 to 60 Hz



- Input rating of the ac power adapter: 100 to 240 V ac, 50 to 60 Hz

---

## Operating environment

This section provides information about the operating environment of your computer.

Environment:

- Maximum altitude without pressurization: 3048 m (10 000 ft)
- Temperature
  - At altitudes up to 2438 m (8000 ft)
    - Operating: 5.0°C to 35.0°C (41°F to 95°F)
    - Storage: 5.0°C to 43.0°C (41°F to 109°F)
  - At altitudes above 2438 m (8000 ft)
    - Maximum temperature when operating under the unpressurized condition: 31.3°C (88°F)
- **Note:** When you charge the battery, its temperature must be at least 10°C (50°F).
- Relative humidity:
  - Operating: 8% to 80%
  - Storage: 5% to 95%

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

### Attention:

- Keep electrical appliances such as an electric fan, a radio, an air conditioner, and a microwave oven away from the computer. The strong magnetic fields generated by these appliances can damage the monitor and data on the hard disk drive or hybrid 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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## Chapter 2. Using your computer

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

This chapter contains the following topics:

- “Registering your computer” on page 13
- “Frequently asked questions” on page 13
- “Special keys” on page 14
- “ThinkPad pointing device” on page 16
- “Power management” on page 19
- “Connecting to the network” on page 22
- “Using an external display” on page 24
- “Using audio features” on page 25
- “Using the camera” on page 25
- “Using a flash media card or a SmartCard” on page 26

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### Registering your computer

When you register your computer, information is entered into a database, which enables Lenovo to contact you in case of a recall or other severe problem. In addition, some locations offer extended privileges and services to registered users.

When you register your computer with Lenovo, you also will receive the following benefits:

- Quicker service when you call Lenovo for help
- Automatic notification of free software and special promotional offers

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

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### Frequently asked questions

This topic provides a few tips to help you optimize the use of your ThinkPad notebook computers.

To ensure that you receive the best performance from your computer, browse the following Web page to find information such as aids for troubleshooting and answers to frequently asked questions:

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

#### How do I access the user guide?

Lenovo provides you a preinstalled User Guide containing detailed information about your computer. To access the User Guide, go to the following directory:

`/usr/share/doc/lenovo-doc`

#### Where can I find and install software programs?

The Ubuntu operating system comes with a Ubuntu Software Center. To find and install a software program, do the following:

1. Click the **Ubuntu Software Center** icon from the Launch bar.
2. Follow the instructions on the screen.

### How do I access the Lenovo Limited Warranty?

This product is covered by the terms of the Lenovo Limited Warranty (LLW), version L505-0010-02 08/2011. You can view the LLW in a number of languages from the Lenovo Support Web site. Read the Lenovo Limited Warranty at:  
[http://www.lenovo.com/warranty/llw\\_02](http://www.lenovo.com/warranty/llw_02)

The LLW also is preinstalled on the computer. To access the LLW, go to the following directory:  
`/usr/share/doc/lenovo-doc`

If you cannot view the LLW either from the Web site or from your computer, contact your local Lenovo office or reseller to obtain a printed version of the LLW.

### How do I access the Ubuntu help system?

The Ubuntu help system provides information about how to use the Ubuntu operating system. To access the help system from the Unity desktop, move your pointer to the Launch bar, and then click the **Help** icon. If you cannot find the Help icon from the Launch bar, click the **Search** icon, and type Help to search it.

To learn more about the Ubuntu operating system, go to:  
<http://www.ubuntu.com/support>

### Where can I find support information?

If you need help, service, technical assistance, or more information about the Ubuntu operating system or other applications, contact the provider of the Ubuntu operating system or the provider of the application. If you need service and support for your computer hardware and hardware components shipped with your computer, contact Lenovo. For more information about how to contact Lenovo, refer to the *Safety and Warranty Guide* or go to <http://www.lenovo.com/support>.

### How do I restore the computer to the factory default settings?

You can restore the computer to the factory default settings when it fails or when you decide to reinstall the operating system. This will restore your computer back to the initial state when you first started it up after receiving it from the store. Ensure that you have backed up your critical data to avoid data loss, and then do the following:

1. Press the power button to turn on the computer. When the Lenovo logo is displayed on the screen, repeatedly press and release Shift or Esc depending on your BIOS program settings. When the GRUB boot menu opens, release Shift or Esc.
2. Select **Restore Ubuntu XX.XX to factory state** and press Enter. The process begins.
3. Follow the instructions on the screen to complete the operation.

---

## Special keys

Your computer has several special keys to help you work easily and effectively.


The keyboard has several function keys, which consist of the Fn key **1** and the other function keys **2**.













-  : Enables or disables the Fn Lock function.

**When the Fn Lock function is disabled:** The Fn Lock indicator is off. To initiate the special function of each key, press the function keys directly. To input F1–F12, press the Fn key and the corresponding function key.

**When the Fn Lock function is enabled:** The Fn Lock indicator turns on. To input F1–F12, press the function keys directly. To initiate the special function of each key, press the Fn key and the corresponding function key.

- : Mutes or unmutes the speakers. When the speakers are muted, the speaker-mute indicator turns on.

If you mute the sound and turn off your computer, the sound will remain muted when you turn on your computer again. To turn on the sound, press the speaker mute key , the volume-down key , or volume-up key .

- : Decreases the speaker volume.
- : Increases the speaker volume.
- : Mutes or unmutes the microphones. When the microphones are muted, the microphone-mute indicator turns on.
- : Darkens the display.
- : Brightens the display.
- : Switches the display output location between the computer display and an external monitor.
- : Enables or disables the built-in wireless networking features. For more information on the wireless features, refer to “Wireless connections” on page 22.

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## ThinkPad pointing device

The ThinkPad pointing device enables you to perform all the functions of a traditional mouse, such as pointing, clicking, and scrolling. With the ThinkPad pointing device, you also can perform a variety of touch gestures, such as rotating and zooming in or out.

The ThinkPad pointing device consists of the following two devices:

- 1** TrackPoint pointing device
- 2** Trackpad



By default, both the TrackPoint pointing device and the trackpad are active with the touch gestures enabled.

## TrackPoint pointing device

The TrackPoint pointing device enables you to perform all the functions of a traditional mouse, such as pointing, clicking, and scrolling.

The TrackPoint pointing device consists of the following four components:

- 1** Pointing stick
- 2** Left-click button (primary-click button)
- 3** Right-click button (secondary-click button)
- 4** Scroll bar



To use the TrackPoint pointing device, refer to the following instructions:

**Note:** Place your hands in the typing position and use your index finger or middle finger to apply pressure to the pointing-stick nonslip cap. Use either thumb to press the left-click button or right-click button.

- **Point**  
Use the pointing stick **1** to move the pointer on the screen. To use the pointing stick, apply pressure to the pointing-stick nonslip cap in any direction parallel to the keyboard. The pointer moves accordingly but the pointing stick itself does not move. The speed at which the pointer moves depends on the amount of pressure you apply to the pointing stick.
- **Left-click**  
Press the left-click button **2** to select or open an item.
- **Right-click**  
Press the right-click button **3** to display a shortcut menu.
- **Scroll**  
Press and hold the dotted scroll bar **4** while applying pressure to the pointing stick in the vertical or horizontal direction. Then you can scroll through the document, Web site, or apps.

## Trackpad

The entire trackpad is sensitive to finger touch and movement. You can use the trackpad to perform all the pointing, clicking, and scrolling functions of a traditional mouse.

The trackpad can be divided into two zones:

- 1** Left-click zone (primary-click zone)
- 2** Right-click zone (secondary-click zone)



To use the trackpad, refer to the following instructions:

- **Point**  
Slide one finger across the surface of the trackpad to move the pointer accordingly.
- **Left-click**  
Press the left-click zone **1** to select or open an item.  
You also can tap anywhere on the surface of the trackpad with one finger to perform the left-click action.
- **Right-click**  
Press the right-click zone **2** to display a shortcut menu.  
You also can tap anywhere on the surface of the trackpad with two fingers to perform the right-click action.
- **Scroll**  
Put two fingers on the trackpad and move them in the vertical or horizontal direction. This action enables you to scroll through the document, Web site, or apps. Ensure that you position your two fingers slightly apart from each other.

With the trackpad, you also can perform a variety of touch gestures. For information about using the touch gestures, see “Trackpad touch gestures” on page 18.

## Trackpad touch gestures

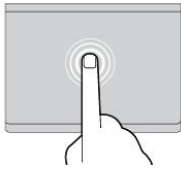
The entire trackpad surface is sensitive to finger touch and movement. You can use the trackpad to perform the same point and click actions as you would using a traditional mouse. You also can use the trackpad to perform a variety of touch gestures.

This topic introduces the frequently used touch gestures such as tapping, dragging, scrolling, and rotating. For more gestures, see the help information system of the ThinkPad pointing device.

### Notes:

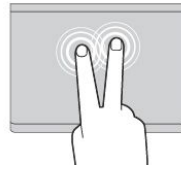
- When using two or more fingers, ensure that you position your fingers slightly apart.
- Some gestures are not available if the last action was done from the TrackPoint pointing device.
- Some gestures are only available when you are using certain apps.





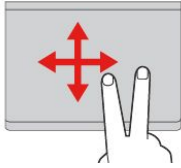
### Tap

Tap anywhere on the trackpad with one finger to select or open an item.



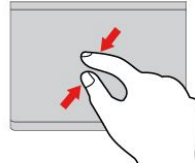
### Two-finger tap

Tap anywhere on the trackpad with two fingers to display a shortcut menu.



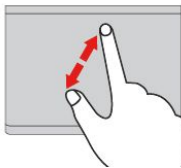
### Two-finger scroll

Put two fingers on the trackpad and move them in the vertical or horizontal direction. This action enables you to scroll through the document, Web site, or apps.



### Two-finger zoom out

Put two fingers on the trackpad and move them closer together to zoom out.



### Two-finger zoom in

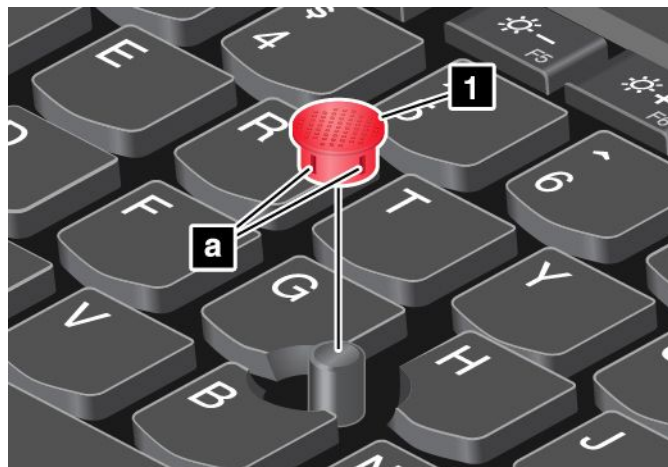
Put two fingers on the trackpad and move them farther apart to zoom in.

## Replacing the cap of pointing stick

The cap **1** on the end of the pointing stick is removable. After you use the cap for a period of time, you might consider replacing the cap with a new one.

To get a new cap, contact Lenovo. For information about contacting Lenovo, see Chapter 7 “Getting support” on page 71.

**Note:** Ensure that you use a cap with grooves **a** as shown in the following illustration.



## Power management

When you use your computer away from electrical outlets, you depend on battery power to keep your computer running. Different computer components consume power at different rates. The more you use the power-intensive components, the faster you consume battery power.

Spend more time unplugged with ThinkPad batteries. Mobility has revolutionized business by enabling you to take your work wherever you go. With ThinkPad batteries, you will be able to work longer without being tied to an electrical outlet.

## Using the ac power

The power to run your computer can come either from the battery or from ac power. While you use ac power, the batteries charge automatically.

Your computer comes with an ac power adapter and a power cord.

- ac power adapter: Converts ac power for notebook computer use.
- Power cord: Connects the ac outlet and the ac power adapter.

### Connecting to ac power

To connect the computer to ac power, do the following:

**Attention:** Using an improper power cord might cause severe damage to your computer.

**Note:** Ensure that you perform the actions in the order in which they are listed.

1. Connect the power cord to the ac power adapter.
2. Connect the ac power adapter to the power connector of the computer.
3. Connect the power cord into an electrical outlet.

### Tips for using the ac power adapter

- When the ac power adapter is not in use, disconnect it from the electrical outlet.
- Do not bind the power cord tightly around the ac power adapter transformer pack when it is connected to the transformer.
- Before you charge the batteries, make sure that their temperature is at least 10°C (50°F).
- You can charge the batteries when the ac power adapter is connected to the computer. You need to charge the batteries in any of the following situations:
  - When the battery icon in the notification area shows a low percentage of battery power remaining.
  - When the batteries have not been used for a long time

## Checking the battery status

The battery-status icon in the notification area displays the percentage of battery power remaining.

The rate at which you use battery power will determine how long you can use the battery of your computer between charges. Because each computer user has different habits and needs, it is difficult to predict how long a battery charge will last. There are two main factors:

- How much energy is stored in the battery when you begin to work.
- The way you use your computer:
  - How often you access the storage drive.
  - How bright you make the computer display.
  - How often you use the wireless features.

## Charging the battery

It is recommended that you charge the battery or replace it with a charged battery when the battery power remaining is low. For example:

- When you find that the percentage of power remaining is low.
- When the power alarm alerts you

If an ac outlet is convenient, plug the ac power adapter into it, and then insert the connector into the computer. The battery will be fully charged in about three to six hours. The charging time is affected by the battery size and the physical environment. You can check the battery charging status at any time through the battery-status icon in the notification area.

**Note:** To maximize the life of the battery, the computer does not start recharging the battery if the remaining power is greater than 95%.

## Handling the battery

This system supports only batteries specially designed for this specific system and manufactured by Lenovo or an authorized builder. The system does not support unauthorized batteries or batteries designed for other systems. If an unauthorized battery or a battery designed for another system is installed, the system will not charge.

**Attention:** Lenovo has no responsibility for the performance or safety of unauthorized batteries, and provides no warranties for failures or damage arising out of their use.

**Note:** If an unauthorized battery is installed, the following message will be displayed: “The battery installed is not supported by this system and will not charge. Please replace the battery with the correct Lenovo battery for this system.”



### **DANGER**

**Do not attempt to disassemble or modify the battery.**

**Attempting to do so can cause an explosion, or liquid leakage from the battery.**

**A battery other than the one specified by Lenovo, or a disassembled or modified battery is not covered by the warranty.**



### **DANGER**

**If the rechargeable battery is incorrectly replaced, there is danger of an explosion. The battery contains a small amount of harmful substances. To avoid possible injury:**

- **Replace only with a battery of the type recommended by Lenovo.**
- **Keep the battery away from fire.**
- **Do not expose it to excessive heat.**
- **Do not expose it to water or rain.**
- **Do not short-circuit it.**
- **Store it in a cool dry place.**
- **Keep it away from children.**

The battery is a consumable supply. If your battery begins to discharge too quickly, replace the battery with a new one of the type recommended by Lenovo. For more information about replacing the battery, contact your Customer Support Center.



Do not drop, crush, puncture the battery, or make it subject to strong forces. Battery abuse or mishandling can cause the battery to overheat, which can cause gasses or flame to “vent” from the battery or coin-cell battery. If your battery is damaged, or if you notice any discharge from your battery or the buildup of foreign materials on the battery leads, stop using the battery and obtain a replacement from the battery manufacturer.



Only recharge the battery strictly according to instructions included in the product documentation.



Do not put the battery in trash that is disposed of in landfills. When disposing of the battery, comply with local ordinances or regulations and your company's safety standards.



There is a danger of an explosion if the coin-cell battery is incorrectly placed. The lithium battery contains lithium and can explode if it is not properly handled, or disposed of. Replace only with a battery of the same type. To avoid possible injury or death, do not: (1) throw or immerse into water, (2) allow it to heat to more than 100°C (212°F), or (3) attempt to repair or disassemble it. Dispose of it as required by local ordinances or regulations and your company's safety standards.

---

## Connecting to the network

Your computer has one or more network cards that enable you to connect your computer to the Internet and other network connections.

### Ethernet connections

You can connect your computer to a local network or a broadband connection by using the built-in Ethernet feature of the computer.



Your computer has an Ethernet connector. To avoid the risk of electrical shock, do not connect the telephone cable to the Ethernet connector.

### Wireless connections

Wireless connection is the transfer of data without the use of cables but by means of radio waves only.

#### Attention:

- If you want to use the wireless features on an airplane, check the wireless services with the airline before boarding the airplane.
- If there are restrictions on the use of computer wireless features on an airplane, you need to disable the wireless features of your computer before boarding.

Depending on the wireless devices installed on your computer, you might be able to use the following wireless networks:

- Wireless LAN connection
- Wireless WAN connection

## Using the wireless LAN connection

A wireless local area network (LAN) covers a relatively small geographic area, such as an office building or a house. Devices based on the 802.11 standards can connect to this type of network.

Your computer comes with a built-in wireless network card and a configuration utility to help you establish wireless connections and monitor the connection status. This enables you to stay connected to your network while you are at the office, in a meeting room, or at home, with no need for a wired connection.

To establish a wireless LAN connection, do the following:

### Tips for using the wireless LAN feature

To achieve the best connection, use the following guidelines:

- Place your computer so that there are as few obstacles as possible between the wireless LAN access point and the computer.
- Open your computer lid to an angle of slightly more than 90 degrees.
- If you use the wireless feature (the 802.11 standards) of your computer simultaneously with a Bluetooth option, the data transmission speed can be delayed and the performance of the wireless feature can be degraded.

## Establishing wireless LAN connection

To establish a wireless-LAN connection, do the following:

1. Click the wireless-network-connection-status icon in the top-right corner of the screen. Then click **Enable Networking** to enable the wireless feature.
2. Click a network to connect to it. Provide required information if needed.

## Using the wireless WAN connection

Wireless Wide Area Network (wireless WAN) which uses cellular networks for data transmission, enables you to establish wireless connections over remote public or private networks. These connections can be maintained over a large geographical area, such as a city or an entire country, by use of multiple antenna sites or satellite systems maintained by wireless service providers.

Some ThinkPad notebook computers come with a built-in wireless WAN card integrated with some wireless WAN technologies, such as 1xEV-DO, HSPA, 3G, GPRS, or LTE. By using the built-in wireless WAN card and the configuration utility that comes with your computer, you can establish wireless WAN connections and monitor the connection status.

**Note:** The wireless WAN service is provided by authorized service providers in some countries.

### Tips for using the wireless WAN feature

To achieve the best connection, use the following guidelines:

- Keep your computer away from your body.
- Place your computer on a flat surface and open your computer lid to an angle of slightly more than 90 degrees.
- Place your computer away from concrete or brick walls that might dampen cellular signals.

- Best reception will be available near windows and other locations where cellular phone reception is the strongest.

## Using the Bluetooth connection

Bluetooth can connect devices a short distance from one another, and is commonly used for connecting peripheral devices to a computer, transferring data between hand-held devices and a personal computer, or remotely controlling and communicating with devices such as mobile phones.

Depending on the model, your computer might support the Bluetooth feature. To transfer data through the Bluetooth feature, do the following:

**Note:** If you use the wireless feature (the 802.11 standards) of your computer simultaneously with a Bluetooth option, the data transmission speed can be delayed and the performance of the wireless feature can be degraded.

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## Using an external display

You can use an external display such as a projector or a monitor to give presentations or to expand your workspace. This topic introduces how to connect an external display, choose display modes, and change display settings.

Your computer supports the following video resolution, provided that the external monitor also supports that resolution.

- Up to 1920 x 1200, with an external display connected to the VGA connector
- Up to 3840 x 2160, with an external display connected to the mini DisplayPort connector

For more information about the external display, refer to the manuals provided with it.


## Connecting an external display

You can use either a wired display or a wireless display. The wired display can be connected to the mini DisplayPort connector or VGA connector by a cable. The wireless display can be added through the Wi-Di or Miracast function.

To connect a wired display, do the following:

1. Connect the external display to an appropriate video connector on your computer, such as the VGA connector or mini DisplayPort connector.
2. Connect the external display to an electrical outlet.
3. Turn on the external display.

## Choosing a display mode

You can display your desktop and apps on the computer display, the external display, or both. To choose how to display the video output, press the display-mode switching key  and then select a display mode you prefer.

There are four display modes:

- **Disconnect:** Displays the video output only on your computer screen.

**Note:** Depending on the situation, you might see **Disconnect**, **PC screen only**, **Computer only**, or **Disconnect projector**.

- **Duplicate:** Displays the same video output on both your computer screen and an external display.

- **Extend:** Extends the video output from your computer display to an external display. You can drag and move items between the two displays.
- **Projector only:** Shows the video output only on an external display.

**Note:** Depending on the situation, you might see **Projector only** or **Second screen only**.

## Changing display settings

You can change the settings for both the computer display and the external display. For example, you can define which one is the main display and which one is the secondary display. You also can change the resolution and orientation.

To change display settings, do the following:

1. Right-click on the desktop and select **Screen Resolution**.
2. Select the display that you want to configure.
3. Change display settings as you want.

**Note:** If you set a higher resolution for the computer display than the external display, only part of the screen can be shown on the external display.

---

## Using audio features

Your computer is equipped with the following items:

- Speakers
- Microphones
- Combo audio connector, 3.5 mm (0.14 inch) in diameter

Your computer also has an audio chip that enables you to enjoy various multimedia audio features, such as the following:

- Compliant with Intel® High Definition Audio
- Playback of Musical Instrument Digital Interface (MIDI) and Moving Picture Experts Group Audio Layer-3 (MP3) files
- Recording and playback of pulse-code modulation (PCM) and Waveform Audio File Format (WAV) files
- Recording from various sound sources, such as a headset attached

The following table shows which functions of the audio devices attached to the connector on your computer.

*Table 1. Audio feature list*

Connector	Headset with a 3.5-mm, 4-pole plug	Conventional headphone	Conventional microphone
Combo audio connector	Headphone and microphone functions supported	Headphone function supported	Not supported

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## Using the camera

If your computer has an integrated camera, you can use the camera to preview your video image and take a snapshot of your current image.

When the camera is started, the green camera-in-use indicator turns on.

You also can use the integrated camera with other programs that provide features such as photographing, video capturing, and video conferencing. To use the camera with other programs, open one of the programs and start the photographing, video capturing, or video conferencing function. Then, the camera starts automatically and the green camera-in-use indicator turns on. For more information about using the camera with a program, refer to the help information system of the program.

For more information on using the camera with a program, refer to the help information system of the program.

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## Using a flash media card or a SmartCard

Depending on the model, your computer might have a SmartCard or a media card reader slot.

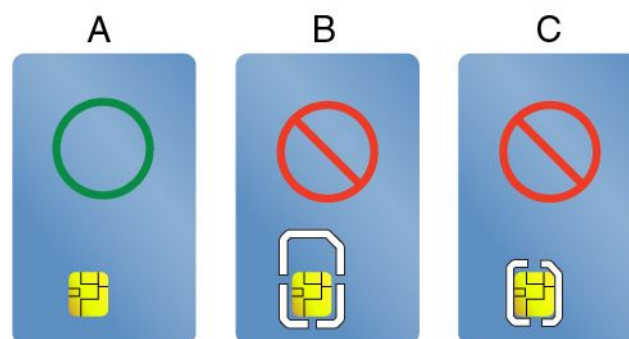
If your computer has a media card reader slot, it supports the following cards:

- MultiMediaCard (MMC)
- Secure Digital eXtended-Capacity (SDXC) card
- Secure Digital (SD) card
- Secure Digital High-Capacity (SDHC) card

**Note:** Your computer does not support the content protection for recordable media (CPRM) feature for the SD card

### Attention:

- While transferring data to or from a flash media card, such as an SD card, do not put your computer into sleep or hibernation mode before the data transfer is completed; otherwise, your data could become damaged.
- Depending on the model, the computer might also have an integrated smart-card reader. Ensure that you insert a correct type of smart card (as shown in figure A) into the smart-card reader. Do not insert a non-support card or a card with slits (as shown in figure B and figure C) into the smart-card reader. Otherwise, the smart card reader might get damaged.



## Inserting a flash media card or a SmartCard

**Attention:** Before you start installing a card, touch a metal table or a grounded metal object. This action reduces any static electricity from your body. The static electricity could damage the card.

To insert a card, do the following:

1. Locate the appropriate type of slot for your card. See “Locating computer controls, connectors, and indicators” on page 1 .
2. Make sure that the card is correctly oriented:
  - For the flash media card: The metal contacts are facing down and pointing toward the card slot.



- For smart card: The metal contacts are facing upward and pointing toward the card slot.
3. Press the card firmly into the card slot.



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## Chapter 3. You and your computer

This chapter provides information about accessibility, comfort, and travelling with your computer.

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### 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.

Lenovo is committed to providing the latest information and technology to our customers with disabilities. Refer to the accessibility information that outlines our efforts in this area. See “Accessibility information” on page 30.

### Ergonomic information



Working in the virtual office might mean adapting to frequent changes in your environment. For example, adapting to the surrounding light sources, proper seating, and the placement of your computer hardware, can help you improve your performance and achieve greater comfort.

This example shows someone in a conventional setting. Even when not in such a setting, you can follow many of these tips. Develop good habits, and they will serve you well.



**General posture:** Make minor modifications in your working posture to deter the onset of discomfort caused by long periods of working in the same position. Frequent, short breaks from your work also help to prevent minor discomfort associated with your working posture.

**Display:** Position the display to maintain a comfortable viewing distance of 510-760 mm (20-30 inches). Avoid glare or reflections on the display from overhead lighting or outside sources of light. Keep the

display screen clean and set the brightness to levels that enable you to see the screen clearly. Press the brightness-down key  or brightness-up key  to adjust display brightness.

**Head position:** Keep your head and neck in a comfortable and neutral (vertical, or upright) position.

**Chair:** Use a chair that gives you good back support and seat height adjustment. Use chair adjustments to best suit your desired posture.

**Arm and hand position:** If available, use chair arm rests or an area on your working surface to provide weight support for your arms. Keep your forearms, wrists, and hands in a relaxed and neutral (horizontal) position. Type with a soft touch without pounding the keys.

**Leg position:** Keep your thighs parallel to the floor and your feet flat on the floor or on a footrest.

### ***What if you are traveling?***

It might not be possible to observe the best ergonomic practices when you are using your computer while on the move or in a casual setting. Regardless of the setting, try to observe as many of the tips as possible. Sitting properly and using adequate lighting, for example, will help you maintain desirable levels of comfort and performance.

### ***Questions about vision?***

The visual display screens of ThinkPad notebook computers are designed to meet the highest standards and to provide you with clear, crisp images and large, bright displays that are easy to see, yet easy on the eyes. Of course, any concentrated and sustained visual activity can be tiring. If you have questions on eye fatigue or visual discomfort, consult a vision-care specialist for advice.

## **Comfort**

Observe the following guidelines to achieve greater comfort and improve performance.

**Active sitting and rest breaks:** The longer you sit and work with your computer, the more important it is to observe your working posture. Follow “Ergonomic information” on page 29 and practice “active sitting” to avoid discomfort associated with your working postures. Making minor voluntary postural changes and taking short frequent work breaks are the key ingredients for healthy computing. Your computer is light and mobile; you can easily reposition your working surface to accommodate many posture modifications.

**Work area setup options:** Familiarize yourself with all of your office furniture so that you know how to adjust your work surface, seat, and other work tools to accommodate your preferences for comfort. If your work area is not in an office setting, be sure to take special note of employing active sitting and taking work breaks. Many ThinkPad product solutions are available to help you modify and expand your computer to best suit your needs. You can find some of these options at <http://www.lenovo.com/accessories/services/index.html>. Explore your options for docking solutions and external products that provide the adjustability and features that you want.

## **Accessibility information**

Lenovo is committed to providing people with disabilities greater access to information and technology. Some technologies are already provided in your operating system. Others can be purchased through vendors.

The following information provides ways to help users who have hearing, vision, and mobility limitations get the most out of their computer experience.

## Screen-reader technologies

Screen-reader technologies are primarily focused on software program interfaces, help information systems, and a variety of online documents. To enable or disable the screen-reader technology, do the following:

1. Click **System Settings**. The system settings window opens.
2. Click **Universal Access** under the **System** section.
3. On the **Seeing** tab, click the radio button for **Screen Reader** to enable or disable the screen reader.

## Customizable text size

Depending on your preference, you can change only the text size instead of changing the size of everything on the desktop. To change the text size, do the following:

1. Click **System Settings**. The system settings window opens.
2. Click **Universal Access** under the **System** section.
3. On the **Seeing** tab, click the radio button for **Large Text** to change the text size.

## Screen resolution

You can make your documents easier to read by adjusting the screen resolution of your computer.

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

For alternatives on increasing the size of text and other objects, see “Customizable text size” on page 31.

## On-screen keyboard

If you prefer to type or enter data into your computer without using a physical keyboard, you can use on-screen keyboard. On-screen keyboard displays a visual keyboard with all the standard keys. You can select keys using the mouse or another pointing device, or you can tap to select the keys if your computer supports multi-touch screen.

To enable or disable the on-screen keyboard, do the following:

1. Click **System Settings**. The system settings window opens.
2. Click **Universal Access** under the **System** section.
3. On the **Typing** tab, click the radio button for **On Screen Keyboard** to enable or disable the on-screen keyboard.

## Personalized keyboard

The tactile bumps on the keyboard provide a reference point from which you can easily locate all keys on the keyboard without visual assistance.

## Industry-standard connectors

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

For more information on the location and function of each connector, see “Locating computer controls, connectors, and indicators” on page 1 .

## Smart latches

The smart latches on some ThinkPad notebook computer lid and the removable battery enable you to open your computer lid and remove the removable battery using only one hand with physical strength of less than 22.2 N.

## 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 to explain the image so that visually impaired users can understand the image when they use a screen reader.

To open and view PDF files, your computer must have the Adobe Reader program installed. The Adobe Reader program also is available for download at:  
<http://www.adobe.com>

For more information about the accessibility features, go to  
<https://help.ubuntu.com/community/Accessibility>.

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## Traveling with your computer

This topic provides information to help you work with your computer when you are travelling.

### Travel tips

Use the following travel tips to travel more confidently and efficiently with your computer.

- Although it is safe to allow your computer to go through the x-ray machines at airport security stations, it is important to keep your eyes on the computer at all times to prevent theft.
- Consider bringing an electrical adapter for use in an airplane or automobile.
- If you carry an ac power adapter, detach the ac cord from it to avoid damaging the cord.

### Travel tips on airplanes

If you carry your computer into an airplane, take note of the following tips:

- If you intend to use your computer or wireless services (such as Internet and Bluetooth), check with the airline for restrictions and availability of services before boarding the airplane. If there are restrictions on the use of computers with wireless features on the airplane, you must abide by those restrictions. If necessary, disable wireless features before boarding.
- Be careful about the seat in front of you on airplanes. Angle your computer display so that it does not get caught when the person in front of you leans back.
- When taking off, remember to turn off your computer or put it into hibernation mode.

### Travel accessories

The following is a checklist of items to consider packing when you are going to travel:

- ThinkPad ac power adapter
- External mouse, if you are accustomed to using one
- Ethernet cable
- Extra battery, charged
- A quality carrying case that provides adequate cushion and protection
- External storage device

If you are traveling to another country, you might want to consider an ac power adapter for the country to which you are travelling.

To purchase travel accessories, go to <http://www.lenovo.com/accessories>.

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## Chapter 4. Preventing problems

An important part of owning a ThinkPad notebook computer is maintenance. With proper care, you can avoid common problems. The chapter provides information that can help you keep your computer running smoothly.

- “General tips for preventing problems” on page 33
- “Making sure device drivers are current” on page 33
- “Taking care of your computer” on page 34

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### General tips for preventing problems

- Check the capacity of your hard disk drive or hybrid drive from time to time. If the hard disk drive or hybrid drive gets too full, the operating system will slow down and might produce errors.
- Empty your recycle bin on a regular basis.
- Use disk defragment tool regularly on your hard disk drive or hybrid drive to improve data seek and read times.
- To free up disk space, uninstall unused application programs.

**Note:** You also might want to look for program duplication or overlapping versions.

- Clean out your Inbox, Sent, and Trash folders from your e-mail client program.
- Back up your data at least once a week. If critical data is present, it is a good idea to perform a daily backup operation. Lenovo has many backup options available for your computer. Rewritable optical drives are available for most machines and are easily installed.
- Schedule system restore operations to take a system snapshot periodically.
- Profile your machine at <http://www.lenovo.com/support> to keep up to date with current drivers and revisions.
- Keep up to date for device drivers on other non-Lenovo hardware. You might want to read the device driver information release notes prior to updating for compatibility or known issues.
- Keep a log book. Entries might include major hardware or software changes, driver updates, minor issues you have experienced, and how you resolved the minor issues.
- If required, you can find the contact information about the Customer Support Center for your country or region at <http://www.lenovo.com/support/phone>. When calling the Customer Support Center, make sure that you have your machine model type, serial number, and the computer in front of you. Also, if the computer is producing error codes, it is helpful to have the error screen on or the messages written down.

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### Making sure device drivers are current

Device drivers are programs that contain instructions for the operating system about how to operate or “drive” a certain piece of hardware. Each hardware component on your computer has its own specific driver. If you add a new component, the operating system needs to be instructed on how to operate that piece of hardware. After you install the driver, the operating system can recognize the hardware component and understand how to use it.

**Note:** Because drivers are programs, like any other file on your computer, they are susceptible to corruption and might not perform correctly if corruption occurs.

It is not always necessary to download the latest drivers. However, you should download the latest driver for a component if you notice poor performance from that component or if you added a new component. This might eliminate the driver as the potential cause of a problem.

### **Getting the latest drivers from the Web site**

You can download and install updated device drivers from the Lenovo Web site by doing the following:

1. Go to <http://www.lenovo.com/ThinkPadDrivers>.
2. Select the entry for your computer and then follow the instructions on the screen to download and install necessary software.

### **Getting the latest drivers using System Update**

The System Update program helps you keep the software on your computer up-to-date. Update packages are stored on Lenovo servers and can be downloaded from the Lenovo Support Web site. Update packages can contain applications, device drivers, UEFI BIOS flashes, or software updates. When the System Update program connects to the Lenovo Support Web site, the System Update program automatically recognizes the machine type and model of your computer, the installed operating system, and the language of the operating system to determine what updates are available for your computer. The System Update program then displays a list of update packages and categorizes each update as critical, recommended, or optional to help you understand the importance. You have complete control of which updates to download and install. After you select the update packages you want, the System Update program automatically downloads and installs the updates without any further intervention from you.

The System Update program is preinstalled on your computer and is ready to run. The only prerequisite is an active Internet connection. You can start the program manually, or you can use the schedule feature to enable the program to search for updates automatically at specified intervals. You also can predefine scheduled updates to search by severity (critical updates, critical and recommended updates, or all updates) so the list you choose from contains only those update types that are of interest to you.

For more information about how to use the System Update program, refer to the help information system of the program.

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## **Taking care of your computer**

Although your computer is designed to function reliably in normal work environments, you need to use common sense in handling it. By following the important tips in this topic, you will get the most use and enjoyment out of your computer.

### **Be careful about where and how you work**

- Store packing materials safely out of the reach of children to prevent the risk of suffocation from plastic bags.
- Keep your computer away from magnets, activated cellular phones, electrical appliances, or speakers (more than 13 cm or 5 inches).
- Avoid subjecting your computer to extreme temperatures (below 5°C/41°F or above 35°C/95°F).
- Some appliances, such as certain portable desktop fans or air purifiers, can produce negative ions. If a computer is close to such an appliance, and is exposed for an extended time to air containing negative ions, it might become electrostatically charged. Such a charge might be discharged through your hands when you touch the keyboard or other parts of the computer, or through connectors on I/O devices connected to it. Even though this kind of electrostatic discharge (ESD) is the opposite of a discharge from your body or clothing to the computer, it poses the same risk of a computer malfunction.



Your computer is designed and manufactured to minimize any effects of electrostatic charge. An electrostatic charge above a certain limit, however, can increase the risk of ESD. Therefore, when using the computer close to an appliance that can produce negative ions, give special attention to the following:

- Avoid directly exposing your computer to the air from an appliance that can produce negative ions.
- Keep your computer and peripherals as far as possible from such an appliance.
- Wherever possible, ground your computer to facilitate safe electrostatic discharge.

**Note:** Not all such appliances cause a significant electrostatic charge.

### **Be gentle with your computer**

- Avoid placing any objects (including paper) between the display and the keyboard or the palm rest.
- Your computer display is designed to be opened and used at an angle slightly greater than 90 degrees. Do not open the display beyond 180 degrees, as this might damage the computer hinge.
- Do not turn your computer over while the ac power adapter is plugged in. This could break the adapter plug.

### **Carry your computer properly**

- Before moving your computer, be sure to remove any media, turn off attached devices, and disconnect cords and cables.
- When picking up your open computer, hold it by the bottom. Do not pick up or hold your computer by the display.

### **Handle storage media and drives properly**

- If your computer comes with an optical drive, do not touch the surface of a disc or the lens on the tray.
- Wait until you hear the CD or DVD click into the center pivot of the drive before closing the tray.
- When installing the storage drive or optical drive, follow the instructions shipped with your hardware, and apply pressure only where needed on the device.
- After you replace the primary storage drive, reattach the cover of the drive slot.
- When replacing the storage drive, reattach the cover of the drive slot.
- Store your external and removable storage drive or optical drives in the appropriate containers or packaging when they are not being used.
- Before you install any of the following devices, touch a metal table or a grounded metal object. This action reduces any static electricity from your body. The static electricity could damage the device.
- While transferring data to or from a flash media card, such as an SD card, do not put your computer in sleep or hibernation mode before the data transfer is complete. To do so might cause damage to your data.

### **Taking care when setting passwords**

- Remember your passwords. If you forget a supervisor or hard disk password, Lenovo will not reset it, and you might have to replace your system board or storage drive.

### **Taking care of the fingerprint reader**

The following actions could damage the fingerprint reader or cause it not to work properly:

- Scratching the surface of the fingerprint reader with a hard, pointed object.
- Scraping the surface of the fingerprint reader with your fingernail or anything hard.
- Using or touching the fingerprint reader with a dirty finger.

If you notice any of the following conditions, gently clean the surface of the fingerprint reader with a dry, soft, lint-free cloth:

- The surface of the fingerprint reader is dirty or stained.
- The surface of the fingerprint reader is wet.
- The fingerprint reader often fails to enroll or authenticate your fingerprint.

### **Registering your computer**

- Register your ThinkPad computer with Lenovo at <http://www.lenovo.com/register>. For more information, see “Registering your computer” on page 13.

### **Be sure not to modify your computer**

- Only an authorized ThinkPad repair technician should disassemble and repair your computer.
- Do not modify or tape the latches to keep the display open or closed.

## **Cleaning the cover of your computer**

Occasionally clean your computer by doing the following:

1. Prepare a mixture of a gentle kitchen-use detergent. The detergent must not contain abrasive powder or strong chemicals such as acid or alkaline. Use five parts water to one part detergent.
2. Absorb the diluted detergent into a sponge.
3. Squeeze excess liquid from the sponge.
4. Wipe the cover with the sponge, using a circular motion and taking care not to let any excess liquid drip.
5. Wipe the surface to remove the detergent.
6. Rinse the sponge with clean running water.
7. Wipe the cover with the clean sponge.
8. Wipe the surface again with a dry, soft, lint-free cloth.
9. Wait for the surface to dry completely and remove any fibers from the cloth.

### **Cleaning your computer keyboard**

To clean the computer keyboard, do the following:

1. Apply some isopropyl rubbing alcohol to a soft, dust-free cloth.  
**Note:** Avoid spraying cleaner directly onto the keyboard.
2. Wipe each keytop surface with the cloth. Wipe the keys one by one; if you wipe several keys at a time, the cloth might hook onto an adjacent key and possibly damage it. Make sure that no liquid drips onto or between the keys.
3. Allow to dry.
4. 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.

### **Cleaning your computer display**

To clean the computer display, do the following:

1. Gently wipe the display with a dry, soft lint-free cloth. If you see a scratchlike mark on your display, it might be a stain transferred from the keyboard or the TrackPoint pointing stick when the cover was pressed from the outside.
2. Wipe or dust the stain gently with a soft, dry cloth.

3. If the stain remains, moisten a soft, lint-free cloth with water or a 50-50 mixture of isopropyl alcohol and water that does not contain impurities.

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

4. Wring out as much of the liquid as you can.
5. Wipe the display again; do not let any liquid drip into the computer.
6. Be sure to dry the display before closing it.



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## Chapter 5. Troubleshooting computer problems

This chapter provides information on what to do if you experience a problem with your computer.

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### Troubleshooting

If your computer has an error, it typically displays a message or an error code, or makes a beep when you turn it on. When you experience a problem, refer to the corresponding sections in this topic to try to solve the problem by yourself.

### Computer stops responding

**Print these instructions now and keep it with your computer for reference later.**

If your computer is completely unresponsive (you cannot use the ThinkPad pointing device or the keyboard), do the following:

1. Press and hold the power button on your computer until the computer turns off. After the computer is turned off, restart by pressing the power button. If the computer does not turn on, continue with step 2.

**Note:** Do not remove the battery and the ac power adapter to reset the computer.

2. While the computer is turned off, remove all power sources from the computer (battery and the ac power adapter). Hold down the power button for 10 seconds. Plug in the ac power adapter while keeping the battery out of the computer. If the computer does not turn back on, continue with step 3.
3. While the computer is off, remove all sources of power (battery and the ac power adapter). Remove all external devices that are attached to your computer (keyboard, mouse, printer, scanner, and so on). Repeat step 2. If step 2 is unsuccessful, continue with step 4.

**Note:** The following steps involve removing static sensitive components from your computer. Make sure that you are properly grounded and remove all sources of power attached to the computer. If you are uncomfortable or unsure about removing components, call the Customer Support Center for assistance.

4. While the computer is off, remove all sources of power and external hardware. Remove any non-original memory module added to your computer. After removing the extra memory module and reinstalling the original memory module, repeat step 2. If the computer still does not turn on, consult the user manual for other customer-replaceable components that are attached to your computer.

If the computer still does not start up, call the Customer Support Center and a Customer Support Specialist will assist you.

### Spills on the keyboard

With a mobile computer, there are increased chances of spilling liquids on the keyboard. Because most liquids conduct electricity, liquid spilled on the keyboard could create numerous short circuits, potentially causing irreparable damage to your computer.

**If you spill something on your computer:**

**Attention:** Be sure that no liquid creates a short circuit between you and the ac power adapter (if in use). Although you might lose some data or work by turning off the computer immediately, leaving the computer on might make your computer unusable.

1. Carefully unplug the ac power adapter immediately.

2. Turn off the computer immediately. If the computer does not turn off, remove the battery. The more quickly you stop the current from passing through the computer the more likely you will reduce damage from short circuits.
3. Wait until you are certain that all the liquid is dry before turning on your computer.

**Note:** If you want to replace your keyboard, you can purchase a new one.

## Networking problems

The following are the most common networking problems:

### Ethernet problems

- **Problem:** Your computer cannot connect to the network.

**Solution:** Make sure that:

- The cable is installed correctly.

The network cable must be securely connected both to the Ethernet connector of your computer and to 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 switch port and the adapter have the same duplex setting.

If you configured the adapter for full duplex, make sure that the switch port also is configured for full duplex. Setting 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.

- **Problem:** The adapter stops working for no apparent reason.

**Solution:** The network driver files might be corrupt or missing. Update the driver by referring to the above solution for the procedure to make sure that the correct device driver is installed.

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

**Solution:**

- 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).

- **Problem:** My computer is a Gigabit Ethernet model, it cannot connect to the network at 1000 Mbps. Instead, it connects at 100 Mbps.

**Solution:**

- 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

**Problem:** I cannot connect to the network using the built-in wireless network card.

**Solution:** Make sure that:

- Your wireless LAN driver is the latest version.

- Your computer is within range of a wireless access point.
- The wireless radio is enabled.

## A wireless WAN problem

**Problem:** A message is displayed indicating that an unauthorized WAN card is installed.

**Solution:** The WAN card is not supported on this computer. Remove the WAN card.

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

## Problems with the keyboard and other pointing devices

The following are the most common problems with keyboards and other pointing devices.

### ThinkPad pointing device problems

- **Problem:** The pointer drifts when the computer is turned on or after it resumes normal operation.  
**Solution:** The pointer might drift when you are not using the TrackPoint pointing device during normal operation. This is a normal characteristic of the TrackPoint pointing device and is not a defect. Pointer drifting might occur for several seconds under the following conditions:
  - When the computer is turned on
  - When the computer resumes normal operation
  - When the TrackPoint pointing device is kept pressed for a long time
  - When the temperature changes
- **Problem:** The TrackPoint pointing device or ThinkPad trackpad does not work.  
**Solution:** Ensure that the TrackPoint pointing device or ThinkPad trackpad is enabled in the ThinkPad pointing device setting window.

### Keyboard problems

- **Problem:** All or some keys on the keyboard do not work.  
**Solution:** If an external numeric keypad is connected:
  1. Turn off the computer.
  2. Remove the external numeric keypad.
  3. Turn on the computer and try using the keyboard again.

If the keyboard problem is resolved, carefully reconnect the external numeric keypad and the external keyboard. Make sure that you have seated the connectors correctly.



If keys on the keyboard still do not work, have the computer serviced.
- **Problem:** All or some keys on the external numeric keypad do not work.  
**Solution:** Make sure that the external numeric keypad is correctly connected to the computer.

## Problems with the display and multimedia devices


This topic includes the most common problems with displays and multimedia devices, including the computer display, the external monitor, audio devices, and the optical drive.

### Computer screen problems

- **Problem:** The screen is blank.  
**Solution:** Do the following:

- Press the display-mode switching key  to bring up the image.
  - If you are using the ac power adapter, or using the battery and the battery gauge shows that the battery is not depleted, press the brightness-up key  to make the screen brighter.
  - If your computer is in sleep mode, press Fn to resume from the sleep mode.
  - If the problem persists, follow the solution for the following problem.
- **Problem:** Incorrect characters are displayed on the screen.  
**Solution:** Did you install the operating system or program correctly? If they are installed and configured correctly, have the computer serviced.
  - **Problem:** The screen stays on even after you turn off your computer.  
**Solution:** Press and hold the power button for four seconds or more to turn off your computer; then turn it on again.
  - **Problem:** Missing, discolored, or bright dots appear on the screen every time you turn on your computer.  
**Solution:** This is an intrinsic characteristic of the TFT technology. Your computer display contains multiple thin-film transistors (TFTs). A small number of missing, discolored, or bright dots on the screen might exist all the time.

## External monitor problems

- **Problem:** The external monitor is blank.  
**Solution:** To bring up the image, press the display-mode switching key  and select the desired monitor. If the problem persists, do the following:
  1. Connect the external monitor to another computer to make sure that it works.
  2. Reconnect the external monitor to your computer.
  3. Refer to the manual shipped with the external monitor to check the resolutions and refresh rates that are supported.
    - If the external monitor supports the same resolution as the computer display or a higher resolution, view output on the external monitor or on both the external monitor and the computer display.
    - If the external monitor supports a lower resolution than the computer display, view output on the external monitor only. (If you view output on both the computer display and the external monitor, the external monitor screen will be blank or distorted.)
- **Problem:** The screen is unreadable or distorted.  
**Solution:** Make sure that the monitor information is correct and the appropriate monitor type is selected.
- **Problem:** Wrong characters are displayed on the screen.  
**Solution:** Did you follow the correct procedure when installing the operating system or program? If you did, have the external monitor serviced.
- **Problem:** The Extend desktop function does not work.  
**Solution:** Enable the Extend desktop function. See “Choosing a display mode” on page 24.
- **Problem:** If you use the Extend desktop function, you cannot set a higher resolution or higher refresh rate on the secondary display.  
**Solution:** Change the resolution and the color depth to lower settings for the primary display. Refer to the solution to the above problem.



- **Problem:** Display switching does not work.

**Solution:** If you use the Extend desktop function, disable it, and change the display output location. If a DVD movie or a video clip is playing, stop the playback, close the program, and then change the display output location.

- **Problem:** The screen position on the external monitor is incorrect when that monitor is set for a high resolution.

**Solution:** Sometimes, when you use a high resolution such as 1600x1200, the image is shifted to left or right on the screen. To correct this, first make sure that your external monitor supports the display mode (the resolution and the refresh rate) that you have set. If it does not, set a display mode that the monitor supports. If it does support the display mode you have set, go to the setup menu for the monitor itself and adjust the settings there. Usually the external monitor has buttons for access to the setup menu. For details, see the documentation that comes with the monitor.

## Audio problems

- **Problem:** A volume or balance slider cannot be moved.

**Solution:** The slider might be grayed out. This means that its position is fixed by the hardware and cannot be changed.

- **Problem:** The volume sliders do not stay in place when some audio programs are used.

**Solution:** It is normal for the sliders to change position when certain sound applications are used. The applications are aware of the settings in the **Sound window** and are allowed to change the settings themselves. **To open the Sound window, click **System Settings** → **Sound**.**

- **Problem:** The balance slider cannot completely mute one channel.

**Solution:** The control is designed to compensate for minor differences in balance and does not completely mute either channel.

- **Problem:** The sound cannot be turned off even if you set the Master volume control at minimum.

**Solution:** You still can hear some sound even though you have set the Master volume control at minimum. To turn off the sound completely, go to the Master volume control and select **Mute speakers**.

- **Problem:** When you connect a headphones to your computer while playing sound, a speaker does not produce sound.

**Solution:** Once the headphone is attached, the streaming is automatically redirected to it. If you want to listen to sound from the speakers again, be sure to set those speakers as the default device. For details, refer to the help information system for SmartAudio.

## Battery and power problems

This topic contains instructions on troubleshooting battery and power problems.

### Battery problems

- **Problem:** The battery cannot be fully charged in the standard charge time when the computer is powered off.

**Solution:** The battery might be over-discharged. Do the following:

1. Turn off the computer.
2. Connect the ac power adapter to the computer and let it charge.

If a quick charger is available, use it to charge the over-discharged battery.

If the battery cannot be fully charged in 24 hours, use a new battery.

- **Problem:** Your computer shuts down before the battery-status icon shows empty, or your computer operates after the battery-status icon shows empty.

**Solution:** Discharge and recharge the battery.

- **Problem:** The operating time for a fully charged battery is short.

**Solution:** Discharge and recharge the battery. If your battery operating time is still short, use a new battery.

- **Problem:** The computer does not operate with a fully charged battery.

**Solution:** The surge protector in the battery might be active. Turn off the computer for one minute to reset the protector; then turn on the computer again.

- **Problem:** The battery cannot be charged.

**Solution:** You cannot charge the battery when it is too hot. If the battery feels hot, remove it from the computer and allow it to cool to room temperature. After it cools, reinstall it and recharge the battery. If it still cannot be charged, have it serviced.

## An ac power adapter problem

**Problem:** The ac power adapter is connected to the computer and the working electrical outlet, but the power adapter (power plug) icon is not displayed in the notification area.

**Solution:** Do the following:

1. Make sure that the connection of the ac power adapter is correct. For instructions on connecting the ac power adapter, see *Safety, Warranty, and Setup Guide* that comes with your computer.
2. If the connection of the ac power adapter is correct, turn off the computer, then disconnect the ac power adapter and remove the main battery.
3. Reinstall the battery and reconnect the ac power adapter, then turn on the computer.
4. If the power adapter icon still is not displayed in the notification area and the system-status indicator does not blink three times when an ac power source is connected, have the ac power adapter and your computer serviced.

## Power problems

**Print these instructions now and keep it with your computer for reference later.**

**If your computer is getting no power at all, check the following items:**

1. Verify the power button. Refer to “Status indicators” on page 6 .
2. Check all power connections. Remove any power strips and surge protectors to connect the ac power adapter directly to the ac power outlet.
3. Inspect the ac power adapter. Check for any physical damage, and make sure that the power cable is firmly attached to the adapter brick and the computer.
4. Verify the ac power source is working by attaching another device to the outlet.
5. Remove all devices and then test for system power with minimal devices attached.
  - a. Disconnect the ac power adapter and all cables from the computer.
  - b. Close the computer display, and turn the computer over.
  - c. Remove the battery. Refer to “Replacing the battery” on page 49.
  - d. Remove the memory module. Refer to “Replacing a memory module” on page 67.
  - e. Remove the hard disk drive or hybrid drive. Refer to “Replacing the internal storage drive” on page 59.
  - f. Wait for 30 seconds, and then reinstall the memory module and the known good battery or the ac power adapter to test the computer with minimal devices attached first.

g. Reinstall each device one at a time that you have removed in the earlier steps.

**If your computer does not run on battery power, check the following items:**

1. Remove and reseal the battery to make sure that it is properly connected. Refer to “Replacing the battery” on page 49.
2. Swap batteries with another similar model, if available.

If another similar ThinkPad model is available, then verify that the battery works in the other computer and that the battery for the other model works in this computer.

## **A power button problem**

**Problem:** The system does not respond, and you cannot turn off the computer.

**Solution:** Turn off the computer by pressing and holding the power button for 4 seconds or more. If the system is still not reset, remove the ac power adapter and the battery.

## **Problems with drives and other storage devices**

This section includes storage drive problems, and optical drive problems.

### **Hard disk drive or hybrid drive problems**

- **Problem:** The hard disk drive or hybrid drive makes a rattling noise intermittently.

**Solution:** The rattling noise might be heard:

- When the hard disk drive or hybrid drive begins or finishes getting access to data.
- When you carry the hard disk drive or hybrid drive.
- When you carry your computer.

This is a normal characteristic of a hard disk drive or hybrid drive and is not a defect.

## **A software problem**

**Problem:** A application does not run correctly.

**Solution:** Make sure that the problem is not being caused by the application.

Check that your computer has the minimum required memory to run the application. Refer to the manuals supplied with the application.

Check the following:

- The application is designed to operate with your operating system.
- Other applications run correctly on your computer.
- The necessary device drivers are installed.
- The application works when it is run on some other computer.

If an error message is displayed while you are using the application, refer to the manuals supplied with the application.

If the application still does not run correctly, contact your place of purchase or a service representative for help.

## **Problems with ports and connectors**

The following are the most common problems with ports and connectors.

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## Chapter 6. Replacing devices

Customer Replaceable Units (CRUs) are parts that can be upgraded or replaced by the customer. Your computer contains the following CRUs:

- ac power adapter and power cord
- Base cover assembly
- Internal storage drive (hard disk drive, solid-state drive, or hybrid drive)\*
- Memory module
- Removable battery
- Wireless LAN card
- Wireless WAN card\*
- Coin-cell battery
- dc-in cable assembly
- Planar brackets
- Smart card bracket
- Speakers

### Notes:

- \* Available on some models
- If you cannot find the instructions on how to install or replace a CRU in the *User Guide*, refer to the *Hardware Maintenance Manual*. The latest *Hardware Maintenance Manual* is available on the Lenovo Support Web site at: <http://www.lenovo.com/UserManuals>

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

- “Static electricity prevention” on page 47
- “Installing or replacing the SIM card” on page 48
- “Replacing the coin-cell battery” on page 51
- “Replacing the battery” on page 49
- “Replacing the keyboard” on page 53
- “Replacing the internal storage drive” on page 59
- “Replacing a wireless WAN card” on page 63
- “Replacing a memory module” on page 67

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## 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 a CRU, do not open the static-protective package that contains the part until the instructions direct you to install the part.

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 that contains 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 package and install the part without setting it down. When this is not possible, place the static-protective package on a smooth, level surface and place the part on the package.
- Do not place the part on the computer cover or other metal surface.

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## Installing or replacing the SIM card

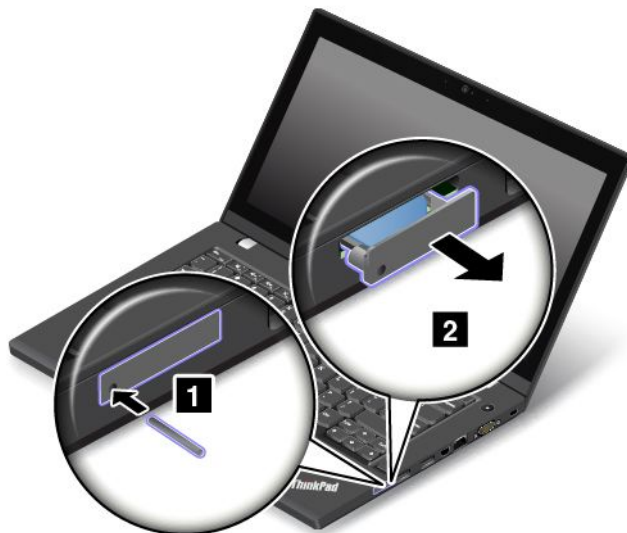
Before you start, print these instructions and read “Important safety information” on page iv .

SIM card is a small plastic card with Integrated Circuit (IC) chip mounted on one side of the card.

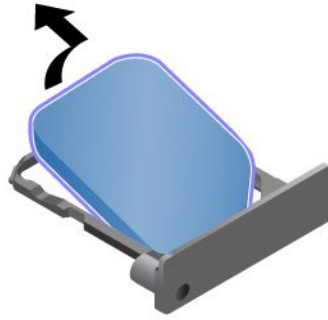
If your computer supports wireless WAN connections, your computer might require a SIM card to establish wireless WAN connections. Depending on the country or region of delivery, you might need to purchase a SIM card or a SIM card might already be installed in your computer or is part of the shipping contents that come with your computer.

To install or replace the SIM card, do the following:

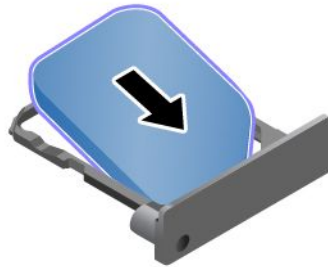
1. Turn off the computer or put the computer into hibernation mode. Then disconnect the ac power adapter and all cables from the computer.
2. Locate the SIM-card tray at the right side of the computer.
3. Insert a straightened paper clip into the hole in the SIM-card tray **1**. The SIM-card tray ejects **2**. Then, slide the SIM-card tray out of the computer.



4. Gently take the SIM card out of the tray.



5. Install a new SIM card into the tray.



6. Insert the tray into the computer.



7. Reconnect the ac power adapter and all cables.

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## Replacing the battery

Before you start, print these instructions and read “Important safety information” on page iv .

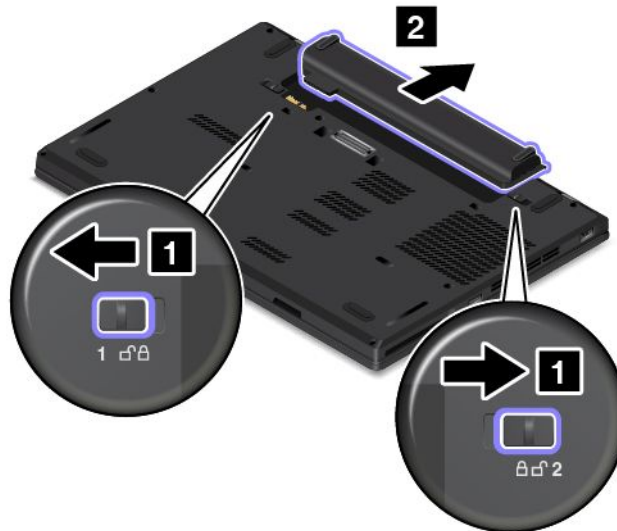
This system supports only batteries specially designed for this specific system and manufactured by Lenovo or an authorized builder. The system does not support unauthorized batteries or batteries designed for other systems. If an unauthorized battery or a battery designed for another system is installed, the system will not charge.

**Attention:** Lenovo has no responsibility for the performance or safety of unauthorized batteries, and provides no warranties for failures or damage arising out of their use.

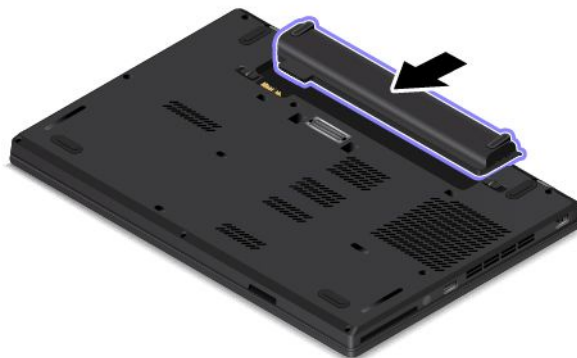
**Note:** If an unauthorized battery is installed, the following message will be displayed: “The battery installed is not supported by this system and will not charge. Please replace the battery with the correct Lenovo battery for this system.”

To replace the battery, do the following:

1. Turn off the computer. Then disconnect the ac power adapter and all cables from the computer.
2. Close the computer display, and turn the computer over.
3. Slide the battery latches to the unlocked position **1**. Then remove the battery **2**.



4. Insert a new battery until it clicks into place.



5. Turn the computer over again. Connect the ac power adapter and all cables.



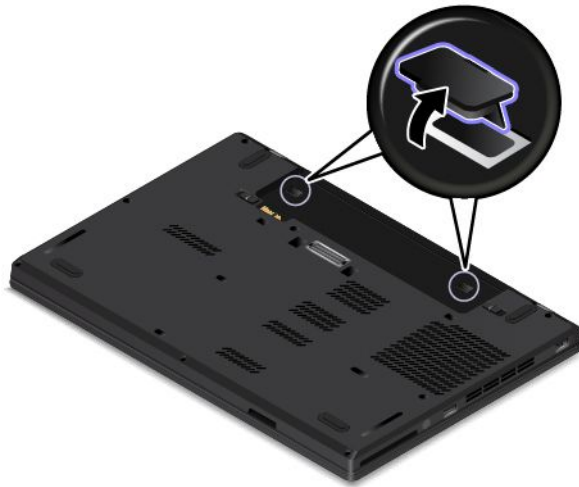
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## Replacing the coin-cell battery

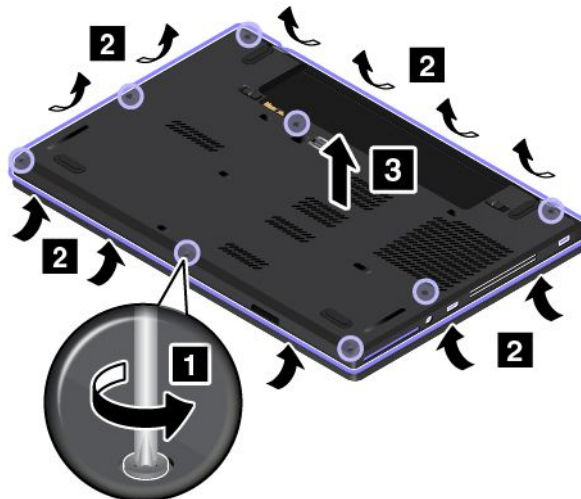
Before you start, print these instructions and read “Important safety information” on page iv .

To replace the coin-cell battery, do the following:

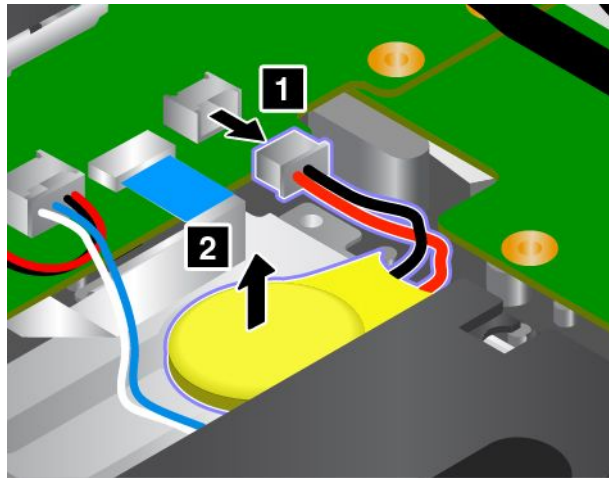
1. Turn off the computer. Then disconnect the ac power adapter and all cables from the computer.
2. Close the computer display and turn the computer over.
3. Remove the battery. See “Replacing the battery” on page 49.
4. If your computer came with a SIM-card tray, remove the SIM-card tray before you remove the bottom cover. See “Installing or replacing the SIM card” on page 48.
5. Remove the rubber caps.



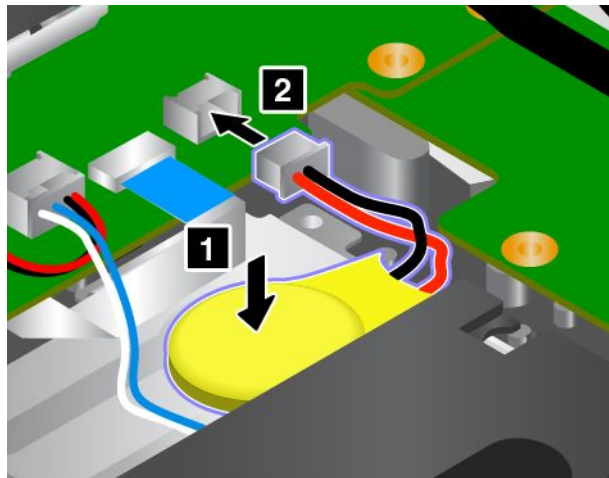
6. Loosen the screws **1**. Then remove the cover **2** **3**.



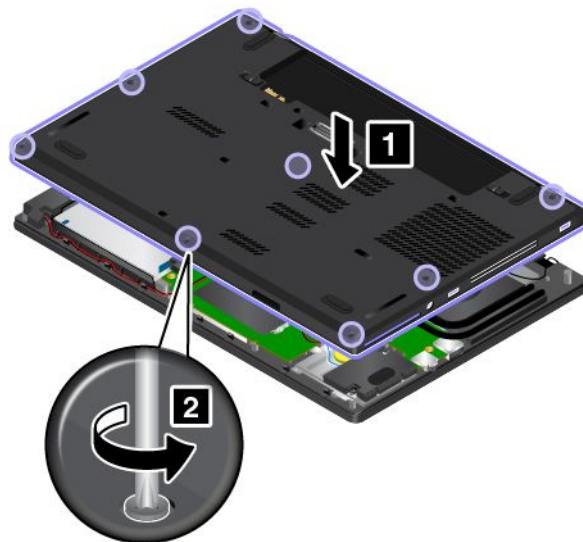
7. Detach the connector **1**. Then remove the coin-cell battery **2**.



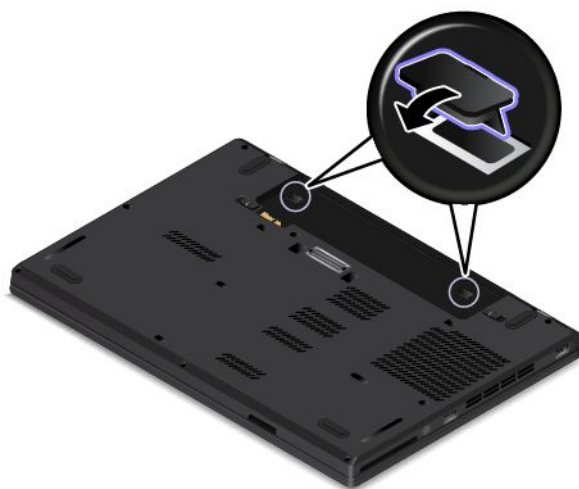
8. Install the new coin-cell battery **1**. Then attach the connector **2**.



9. Reinstall the computer cover **1**. Then tighten the screws **2**.



10. Reinstall the rubber caps.



11. Reinstall the battery. See “Replacing the battery” on page 49.

12. Turn the computer over again. Connect the ac power adapter and all cables.

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## Replacing the keyboard

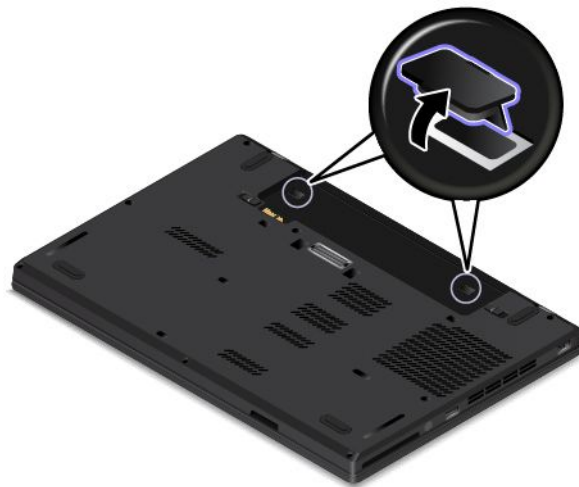
Before you start, print these instructions and read “Important safety information” on page iv .

To remove the keyboard, do the following:

1. Turn off the computer. Then disconnect the ac power adapter and all cables from the computer.
2. Close the computer display and turn the computer over.
3. Remove the battery. See “Replacing the battery” on page 49.
4. Find the keyboard multi-tool in the shipping package of the new keyboard. The following illustration shows a keyboard multi-tool.



5. Remove the rubber caps.



6. To reveal the screw heads beneath the keyboard frame, use the flat end of the multi-tool in the shipping package of the new keyboard to slide the keyboard forward by 2.5 mm (0.1 inch).



7. Use the cross end of the multi-tool to loosen the screws.



8. Pivot the keyboard slightly upward as shown by arrow **1** until you can see the connectors on the bottom side of the keyboard. Then turn over the keyboard as shown by arrow **2**.

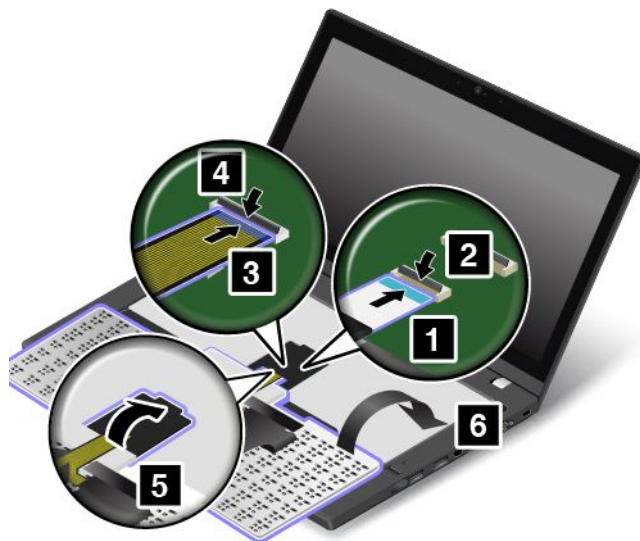


9. Put the keyboard on the palm rest and detach the connectors. Then remove the keyboard.



To install the new keyboard, do the following:

1. Attach the connectors, and then turn over the keyboard.



2. Insert the keyboard into the keyboard bezel as shown. Ensure that the front edge of the keyboard (the edge that is close to the display) is under the frame of the keyboard bezel.



3. Ensure that the screw heads are exposed completely. Otherwise, reveal the screw heads by sliding the keyboard frame forward with the flat end of the keyboard multi-tool.





4. Tighten the screws with the cross end of the keyboard multi-tool to secure the keyboard in place.



5. Slide the keyboard frame backward by 2.5 mm (0.1 inch) with the flat end of the keyboard multi-tool to hide the latches of the keyboard frame under the keyboard bezel.

**Note:** Do not press and hold the keys while sliding the keyboard frame, otherwise the keyboard frame cannot be moved.



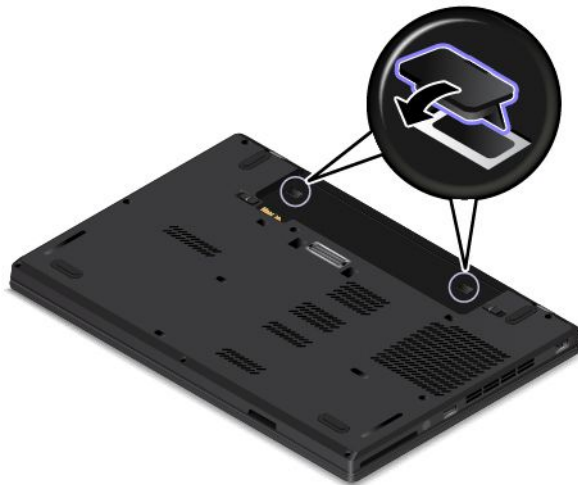


6. Insert the flat end of the keyboard multi-tool into the sides of the keyboard as shown to push the keyboard frame backward. Ensure that there is no gap between the keyboard frame and keyboard bezel.

**Note:** Do not press and hold the keys while sliding the keyboard frame, otherwise the keyboard frame cannot be moved.



7. Reinstall the rubber caps.



8. Reinstall the battery. See “Replacing the battery” on page 49.
9. Turn the computer over again. Connect the ac power adapter and all cables.

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## Replacing the internal storage drive

Before you start, print these instructions and read “Important safety information” on page iv .

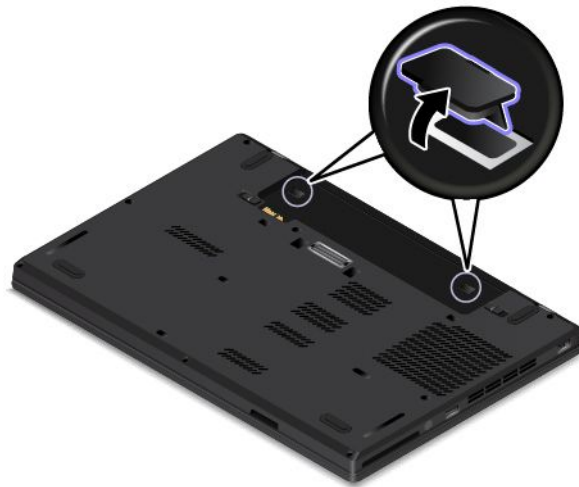
**Attention:** The internal storage drive (such as a hard disk drive, solid-state drive, or hybrid drive) is very sensitive. Incorrect handling can cause damage and permanent loss of data. Observe the following guidelines:

- Replace the storage drive only if you upgrade it or have it repaired. The connectors and slot of the storage drive are not designed for frequent changes or drive swapping.

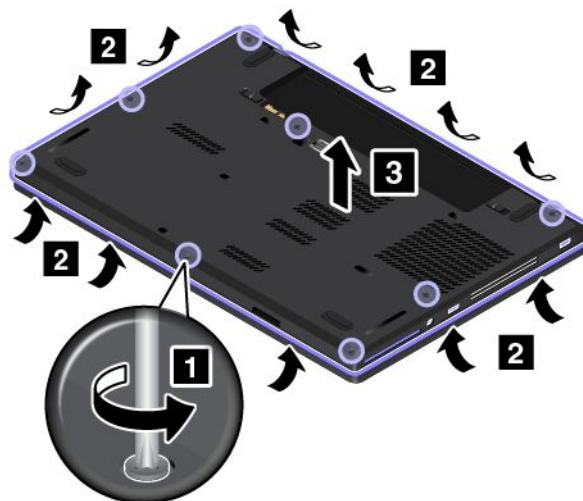
- Do not drop the drive or subject it to physical shocks. Put the drive on a material, such as soft cloth, that absorbs any physical shocks.
- Do not apply pressure to the cover of the drive.
- Do not touch the connector.
- Before removing the storage drive, make a backup copy of all the information on it and then turn off the computer.
- Never remove the drive while the computer is operating, in sleep mode, or in hibernation mode.

To replace the storage drive, do the following:

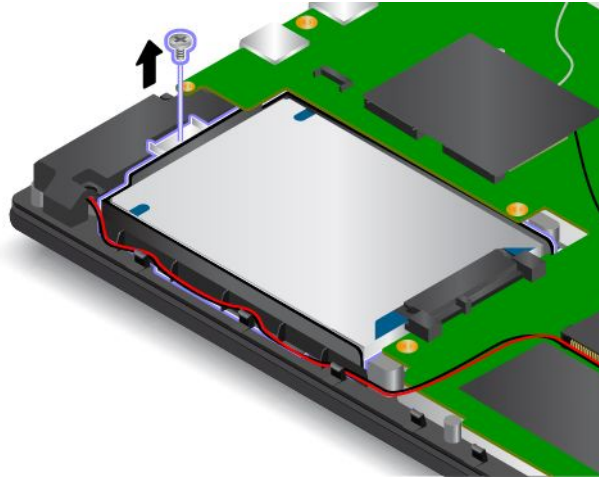
1. Turn off the computer. Then disconnect the ac power adapter and all cables from the computer.
2. Close the computer display and turn the computer over.
3. Remove the battery. See “Replacing the battery” on page 49.
4. If your computer came with a SIM-card tray, remove the SIM-card tray before you remove the bottom cover. See “Installing or replacing the SIM card” on page 48.
5. Remove the rubber caps.



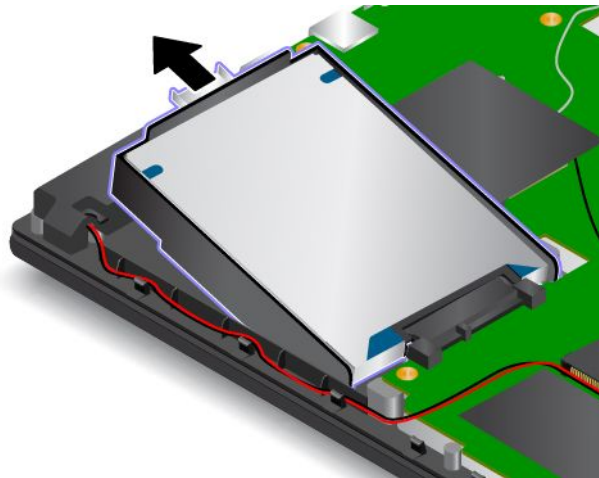
6. Loosen the screws **1**. Then remove the cover **2 3**.



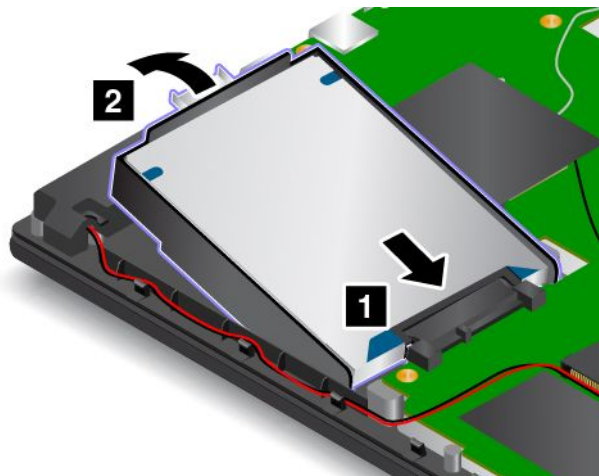
7. Remove the screw that secures the storage drive.



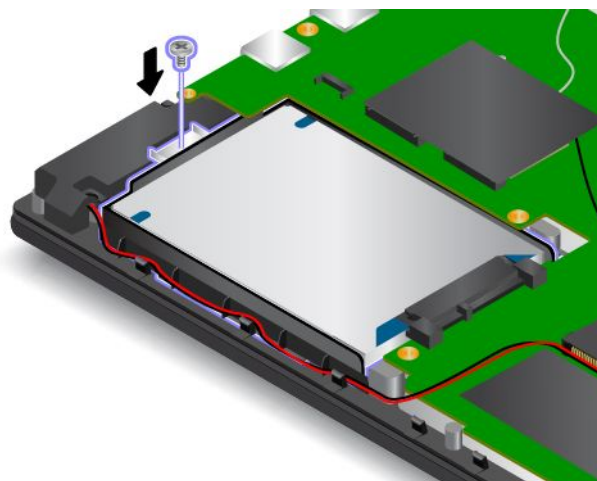
8. Remove the storage drive.



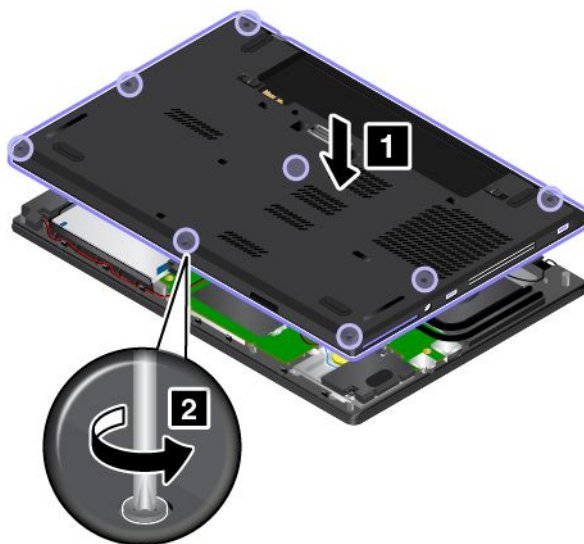
9. Place the new storage drive into the drive bay.



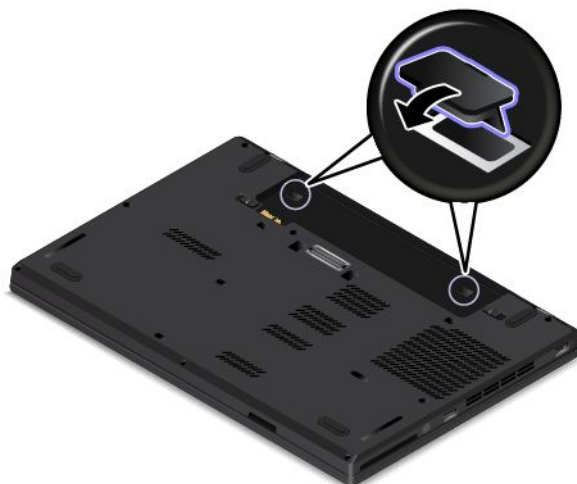
10. Install the screw **2** to secure the storage drive.



11. Reinstall the computer cover **1**. Then tighten the screws **2**.



12. Reinstall the rubber caps.



13. Reinstall the battery. See “Replacing the battery” on page 49.
14. Turn the computer over again. Connect the ac power adapter and all cables.

---

## Replacing a wireless WAN card

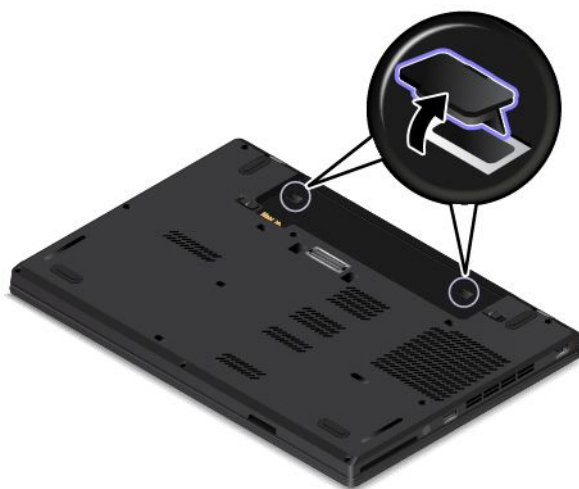
Before you start, print these instructions and read “Important safety information” on page iv .

**Note:** This information is only for the user-installable modules.

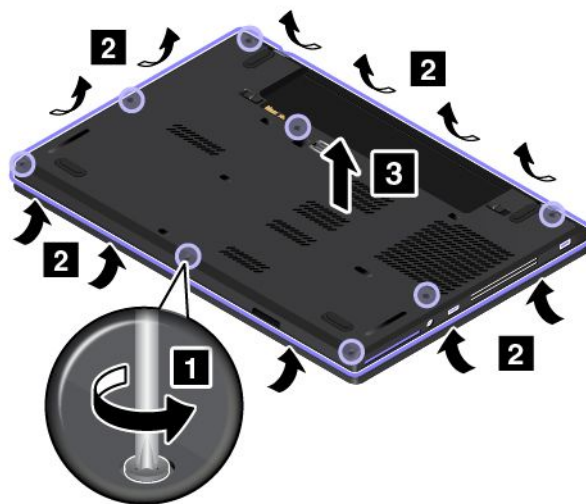
**Attention:** Before you start installing a wireless WAN card, touch a metal table or a grounded metal object. This action reduces any static electricity from your body. Static electricity could damage the card.

To replace the wireless WAN card, do the following:

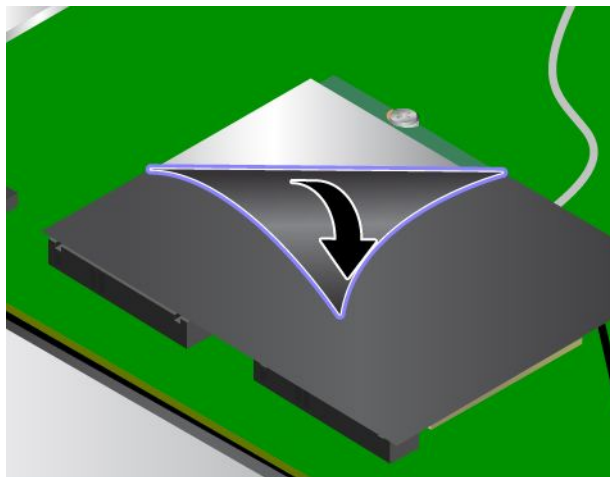
1. Turn off the computer. Then disconnect the ac power adapter and all cables from the computer.
2. Close the computer display and turn the computer over.
3. Remove the battery. See “Replacing the battery” on page 49.
4. If your computer came with a SIM-card tray, remove the SIM-card tray before you remove the bottom cover. See “Installing or replacing the SIM card” on page 48.
5. Remove the rubber caps.



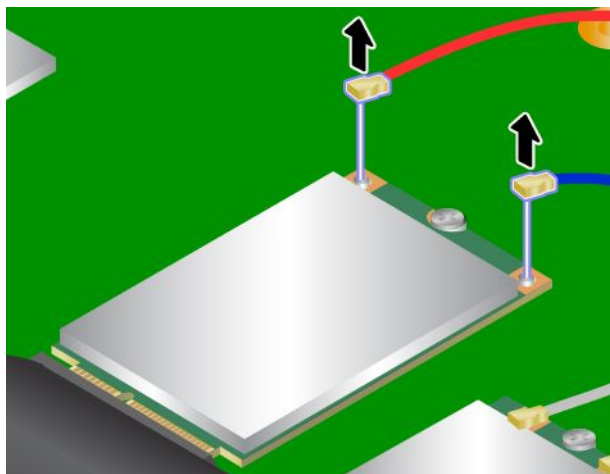
6. Loosen the screws **1**. Then remove the cover **2** **3**.



7. Open the film on the card and hold it when you are replacing the memory module.

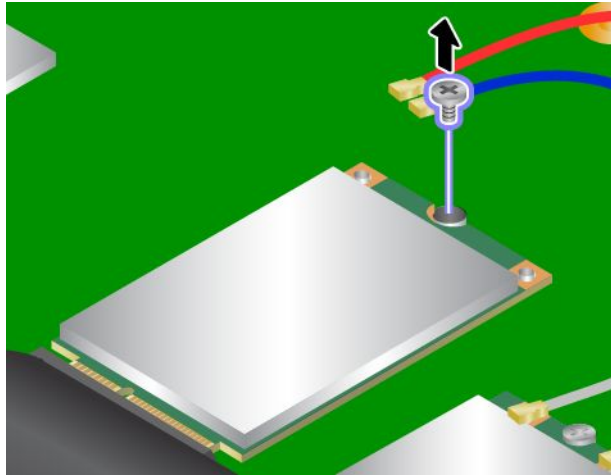


8. If a tool is provided with the new card to help you disconnect cables, use the tool to disconnect the cables from the old card. If no such a tool is provided, hold the cable connector with your fingers and gently disconnect each cable from the old card.

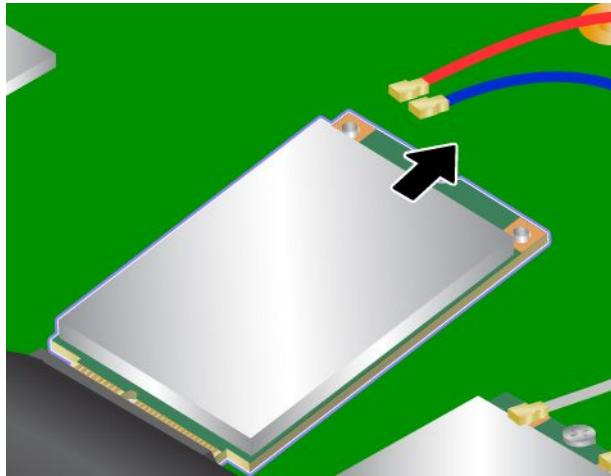




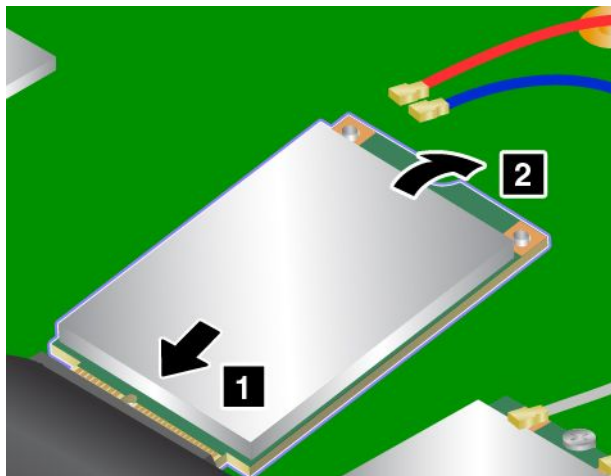
9. Remove the screw. The card pops up.



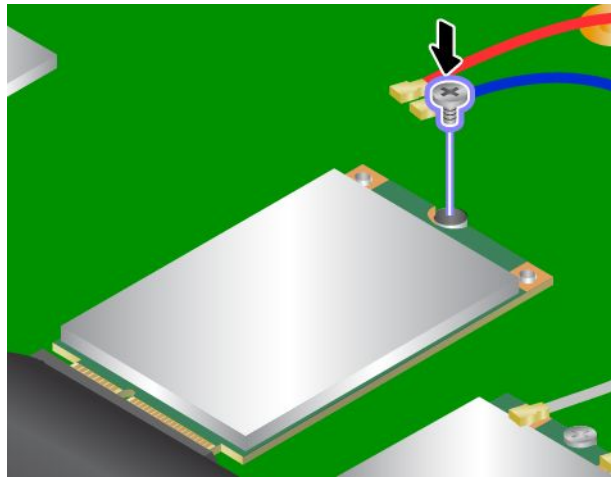
10. Remove the card.



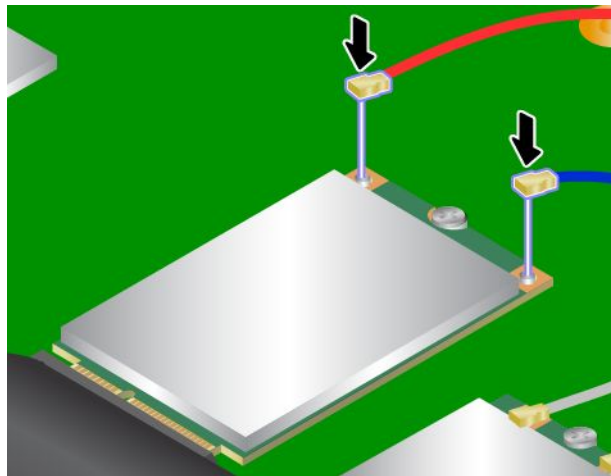
11. Insert the contact edge of the new card to the corresponding socket **1**. Pivot the new card downward **2**.



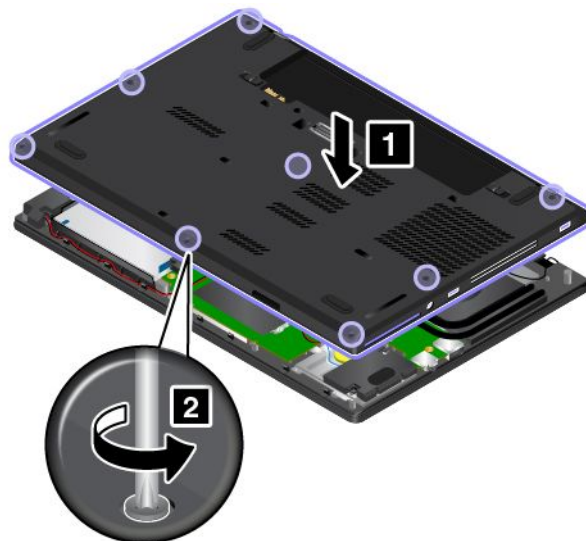
12. Install the screw to secure the new card.



13. Connect the antenna cables to the new card as shown. Then release the hand holding the film.

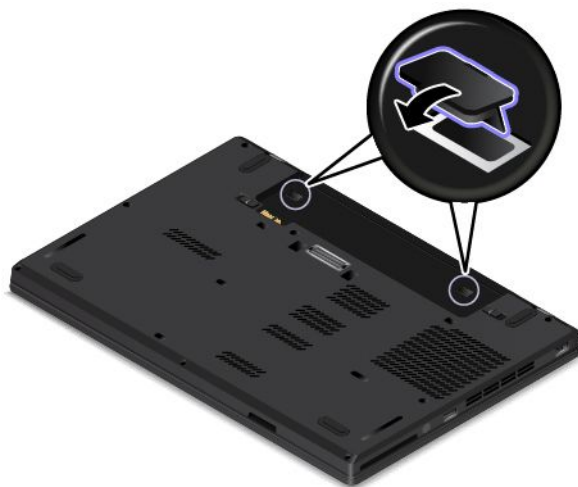


14. Reinstall the computer cover **1**. Then tighten the screws **2**.





15. Reinstall the rubber caps.



16. Reinstall the battery. See “Replacing the battery” on page 49.

17. Turn the computer over again. Connect the ac power adapter and all cables.

---

## Replacing a memory module

Before you start, print these instructions and read “Important safety information” on page iv .

Increasing memory capacity is an effective way to make programs run faster.

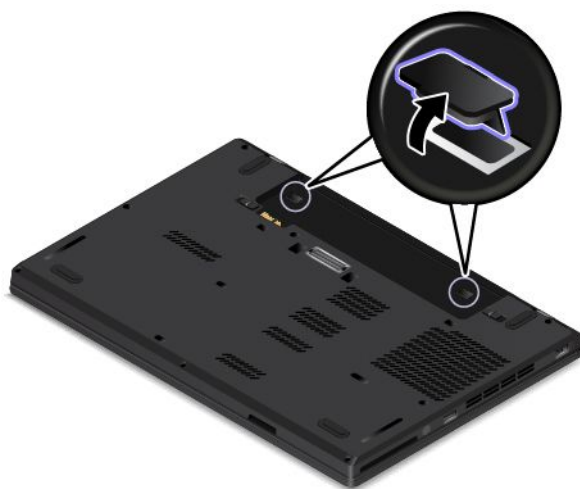
**Note:** The operating speed of a memory module has dependency on the system configuration. In some conditions, the memory module in your computer might not be able to operate at the maximum speed.

**Attention:** Before you start installing a memory module, touch a metal table or a grounded metal object. This action reduces any static electricity from your body. Static electricity could damage the memory module.

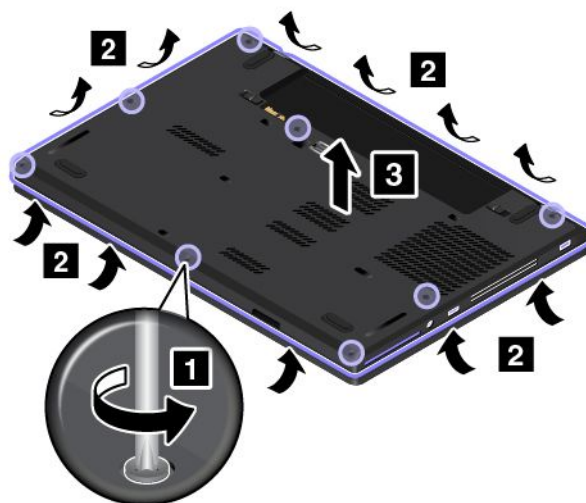
To replace a memory module, do the following:

1. Turn off the computer. Then disconnect the ac power adapter and all cables from the computer.
2. Close the computer display and turn it over.
3. Remove the battery. See “Replacing the battery” on page 49.
4. If your computer came with a SIM-card tray, remove the SIM-card tray before you remove the bottom cover. See “Installing or replacing the SIM card” on page 48.

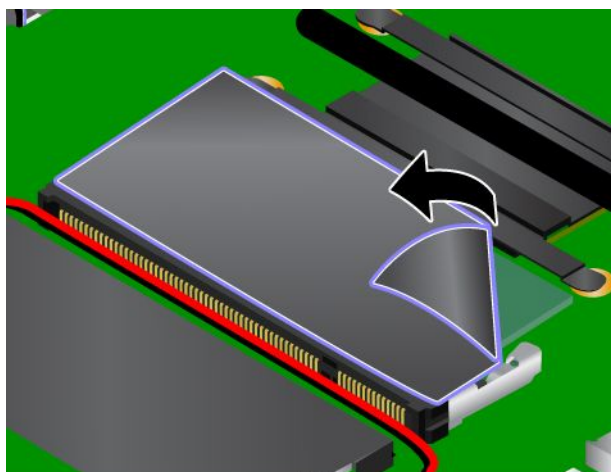
5. Remove the rubber caps.



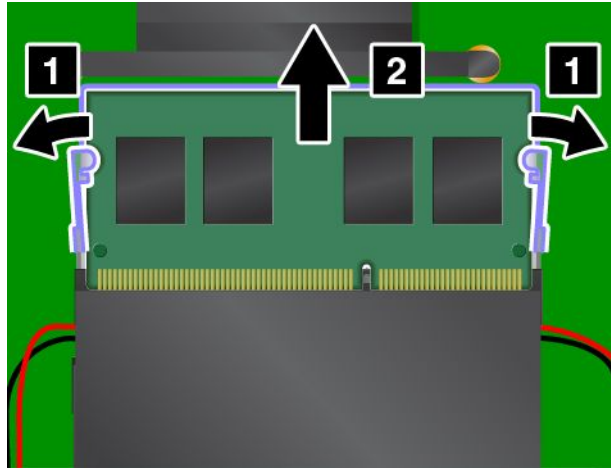
6. Loosen the screws **1**. Then remove the cover **2** **3**.



7. Open the film and hold it when you are replacing the memory module.

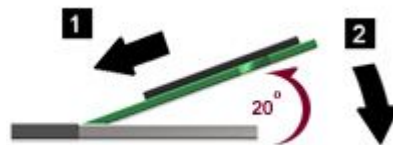
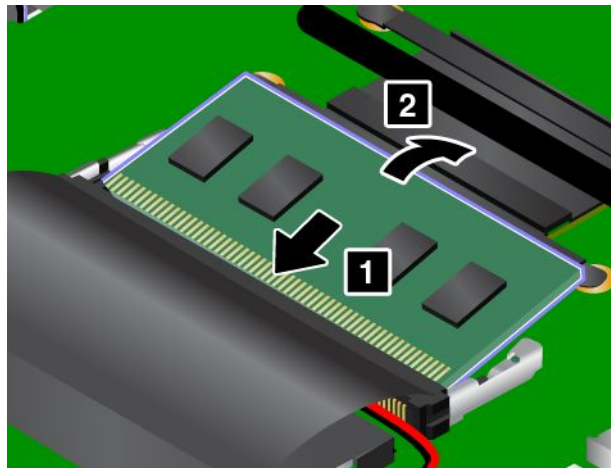


8. Open the latches on both sides of the memory slot at the same time **1**. Then remove the memory module **2**.

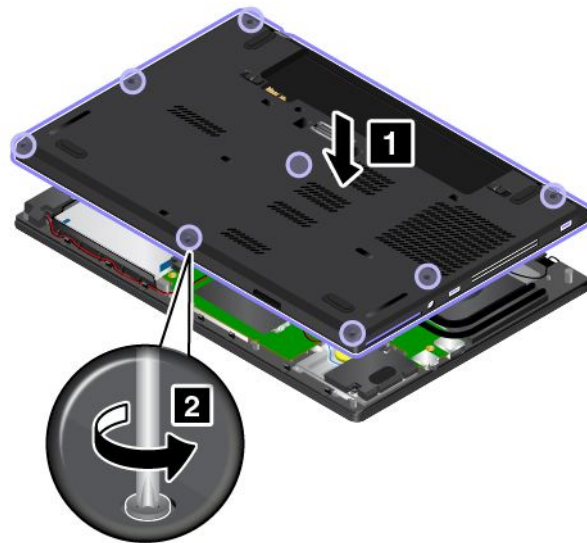


9. Place the notched end of the new memory module toward the contact edge side of the memory slot. Insert the memory module **1** into the slot at an angle of about 20 degrees. Pivot the memory module downward until it snaps into place **2**. Ensure that the memory module is firmly installed in the slot and cannot be moved easily. Then release the hand holding the film.

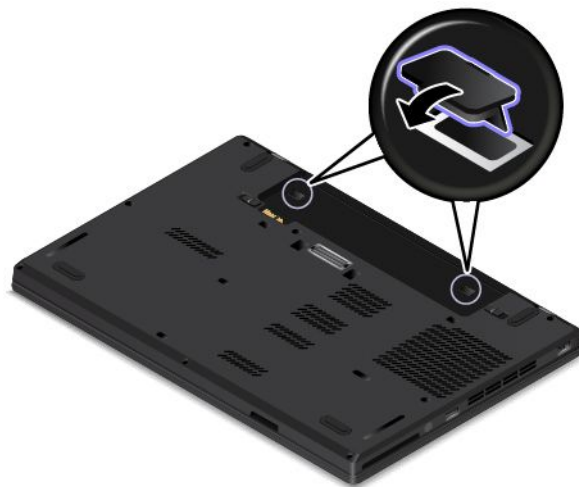
**Attention:** Do not touch the contact edge of the memory module. Otherwise the memory module might get damaged.



10. Reinstall the computer cover **1**. Then tighten the screws **2**.



11. Reinstall the rubber caps.



12. Reinstall the battery. See “Replacing the battery” on page 49.

13. Turn the computer over again. Connect the ac power adapter and all cables.

---

## Chapter 7. Getting support

This chapter provides information about getting help and support from Lenovo.

- “Before you contact Lenovo” on page 71
- “Getting help and service” on page 71
- “Purchasing additional services” on page 73

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### Before you contact Lenovo

Often, you can solve your computer problems by referring to the information in the explanations of error codes, running diagnostic programs, or by consulting the Lenovo Web site.

#### Registering your computer

Register your computer with Lenovo. For more information, see “Registering your computer” on page 13.

#### Downloading system updates

Downloading updated software might resolve problems you experience with your computer.

To download updated software, go to the following Web site and follow the instructions on the screen:  
<http://www.lenovo.com/support>

#### Recording information

Before you talk to a Lenovo representative, record the following important information about your computer.

#### Recording problem symptoms and details

Collect the answers to the questions below before you call for help. Then, you will be able to get help as quickly as possible.

- What is the problem? Is it continuous or intermittent?
- Is there an error message? What is the error code, if any?
- What operating system are you using? Which version?
- Which software programs were running at the time of the problem?
- Can the problem be reproduced? If so, how?

#### Recording system information

The serial number label is on the bottom of your computer. Record the machine type and the serial number.

- What is the name of your Lenovo product?
- What is the machine type?
- What is the serial number?

---

### Getting help and service

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

Information about your computer and preinstalled software, if any, is available in the documentation that comes with your computer. The documentation includes printed books, online books, readme files, and help files. In addition, information about Lenovo products is available on the World Wide Web.

## 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

## Calling Lenovo

If you have tried to correct the problem yourself and still need help, 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 personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- Lenovo hardware repair - If the problem is determined to be caused by Lenovo hardware under warranty, trained service personnel are available to provide the applicable level of service.
- Engineering change management - Occasionally, there might be changes that are required after a product has been sold. Lenovo or your reseller, if authorized by Lenovo, will make selected Engineering Changes (ECs) that apply to your hardware available.

The following items are not covered:

- Replacement or use of parts not manufactured for or by Lenovo or nonwarranted parts
- Identification of software problem sources
- Configuration of UEFI 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

For the terms and conditions of the Lenovo Limited Warranty that applies to your Lenovo hardware product, see "Warranty information" in the *Safety, Warranty, and Setup Guide* that comes with your computer.

If possible, be near your computer when you make your call in case the technical assistance representative needs to help you resolve a computer problem. Ensure that you have downloaded the most current drivers and system updates, run diagnostics, and recorded information before you call. When calling for technical assistance, have the following information available:

- Machine type and model
- Serial numbers of your computer, monitor, and other components, or your proof of purchase
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information for your system

## Telephone numbers

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. The latest phone numbers are available at <http://www.lenovo.com/support/phone>. If the number for your country or region is not provided, contact your Lenovo reseller or Lenovo marketing representative.

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## Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for Lenovo and non-Lenovo hardware, operating systems, and application programs; network setup and configuration services; upgraded or extended hardware repair services; and custom installations services. Service availability and service name might vary by country.

For more information about these services, go to:  
<http://www.lenovo.com/accessories/services/index.html>





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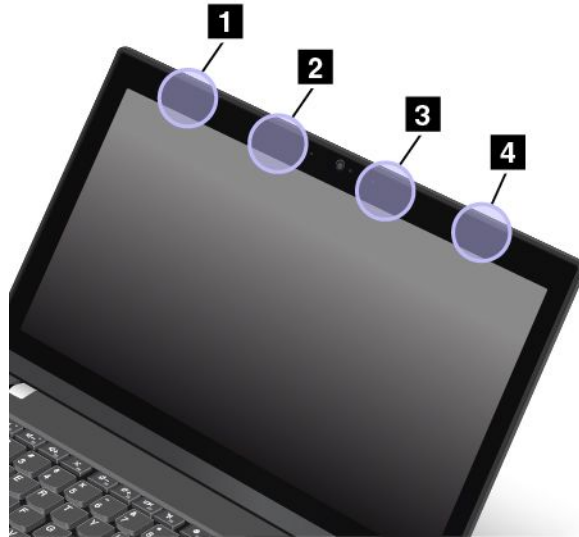
## Appendix A. Regulatory information

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### Location of the UltraConnect wireless antennas

ThinkPad notebook computers feature an integrated UltraConnect™ wireless antenna system built into the display for optimal reception, enabling wireless communication wherever you are.

#### Antenna location



- 1 Wireless LAN antenna (auxiliary)
- 2 Wireless WAN antenna (auxiliary)
- 3 Wireless WAN antenna (main)
- 4 Wireless LAN antenna (main)

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### Wireless related information

#### Wireless interoperability

Wireless LAN Card is designed to be interoperable with any wireless LAN product that is based on Direct Sequence Spread Spectrum (DSSS), Complementary Code Keying (CCK), and/or Orthogonal Frequency Division Multiplexing (OFDM) radio technology, and is compliant to:

- The 802.11b/g Standard, 802.11a/b/g, 802.11n or 802.11ac on Wireless LANs, as defined and approved by the Institute of Electrical and Electronics Engineers.
- The Wireless Fidelity (WiFi) certification as defined by the Wi-Fi Alliance.

A Bluetooth device is designed to be interoperable with any Bluetooth products that are compliant to Bluetooth Specification 4.0 as defined by the Bluetooth SIG.

**Note:** Depending on the Bluetooth card and the operating system you use, some profiles might not be available.

- Audio Gateway
- AV

- Basic Image
- Dial-up Networking
- File Transfer
- Generic Access
- Service Discovery
- Serial Port
- LAN Access using PPP
- Personal Area Network
- Generic Object Exchange
- Generic Object Push
- Synchronization
- Headset
- Printer
- Human Interface Devices (Keyboard/Mouse)
- Handsfree

### **Usage environment and your health**

Integrated wireless cards emit radio frequency electromagnetic energy like other radio devices. However, the level of energy emitted is far much less than the electromagnetic energy emitted by wireless devices like for example mobile phones.

Due to the fact that integrated wireless cards operate within the guidelines found in radio frequency safety standards and recommendations, Lenovo believes they are safe for use by consumers. These standards and recommendations reflect the consensus of the scientific community and result from deliberations of panels and committees of scientists who continually review and interpret the extensive research literature.

In some situation or environment, the use of integrated wireless cards might be restricted by the proprietor of the building or responsible representatives of the organization. These situations and areas might for example include:

- Using the integrated wireless cards on board of airplanes, in hospitals or near petrol stations, blasting areas (with electro-explosive devices), medical implants or body-worn electronic medical devices, such as pace makers.
- In any other environment where the risk of interference to other devices or services is perceived or identified as harmful.

If you are uncertain of the policy that applies to the use of wireless devices in a specific organization (such as airport or hospital), you are encouraged to ask for authorization to use integrated wireless cards prior to turning on the computer.

### **Locating wireless regulatory notices**

For more information about the wireless regulatory notices, refer to the *Regulatory Notice* shipped with your computer.

If your computer is shipped without the *Regulatory Notice*, you can find it on the Web site at:  
<http://www.lenovo.com/UserManuals>

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## Certification related information

The following table contains information of the product name, compliance ID, and machine types.

Product name	Compliance ID	Machine types
ThinkPad L450	TP00069A	20DS
ThinkPad L450	TP00069A	20DT

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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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## Electronic emission notices

## Federal Communications Commission Declaration of Conformity

The following information refers to the ThinkPad L450, machine types 20DS and 20DT.

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.

EU contact: 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

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

## Japan VCCI Class B compliance statement

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

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

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

## Lenovo product service information for Taiwan

台灣 Lenovo 產品服務資訊如下：  
荷蘭商聯想股份有限公司台灣分公司  
台北市內湖區堤頂大道二段89號5樓  
服務電話：0800-000-702

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## Eurasian compliance mark



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## Brazil regulatory notice

Ouvir sons com mais de 85 decibéis por longos períodos pode provocar danos ao sistema auditivo.

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## Mexico regulatory notice

**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.



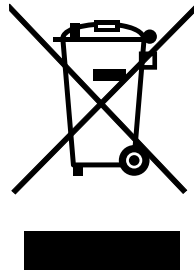
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## Appendix B. WEEE and recycling statements

Lenovo encourages owners of information technology equipment to responsibly recycle their equipment when it is no longer needed. Lenovo offers a variety of programs and services to assist equipment owners in recycling their IT products. Information on product recycling offerings can be found on Lenovo's Internet site at [http://www.lenovo.com/social\\_responsibility/us/en/](http://www.lenovo.com/social_responsibility/us/en/).

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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 China

《废弃电器电子产品回收处理管理条例》提示性说明

联想鼓励拥有联想品牌产品的用户当不再需要此类产品时，遵守国家废弃电器电子产品回收处理相关法律法规，将其交给当地具有国家认可的回收处理资质的厂商进行回收处理。更多回收服务信息，请点击进入<http://support.lenovo.com.cn/activity/551.htm>

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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, go to <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 inside your Lenovo computer to provide power to the computer clock while the computer is off or disconnected from the main power source. If you need to replace it with a new one, contact your place of purchase or contact Lenovo for service. If you need to dispose of a disused lithium battery, insulate it with vinyl tape, contact your place of purchase or an industrial-waste-disposal operator, and follow their instructions.

Disposal of a lithium battery must comply with local ordinances and regulations.

### **Disposing of a disused battery from Lenovo notebook computers**

Your Lenovo notebook computer has a lithium ion battery or a nickel metal hydride battery. If you are a company employee who uses a Lenovo notebook computer and need to dispose of a battery, contact the proper person in Lenovo sales, service, or marketing, and follow that person's instructions. You also can refer to the instructions at <http://www.lenovo.com/jp/ja/environment/recycle/battery/>.

If you use a Lenovo notebook computer at home and need to dispose of a battery, you must comply with local ordinances and regulations. You also can refer to the instructions at <http://www.lenovo.com/jp/ja/environment/recycle/battery/>.

---

## **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.



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## Battery recycling information for Taiwan

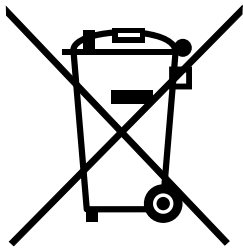


廢電池請回收

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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/lenovo/environment>

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## Battery recycling information for the United States and Canada



US & Canada Only



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## **Appendix C. 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	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI) )	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板组件	X	0	0	0	0	0
硬盘	X	0	0	0	0	0
光驱	X	0	0	0	0	0
LCD 面板 (LED 背光源)	X	0	0	0	0	0
键盘	X	0	0	0	0	0
内存	X	0	0	0	0	0
电池	X	0	0	0	0	0
电源适配器	X	0	0	0	0	0
底壳、顶盖和扬声器	X	0	0	0	0	0

注：

本表依据SJ/T 11364的规定编制。

0：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标准规定的限量要求以下。

X：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标准规定的限量要求。标有“X”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（PCB）及其组件、集成电路（IC）和连接器。某些型号的产品可能不包含上表中的某些部件，请以实际购买机型为准。

图示：



在中华人民共和国境内销售的电子信息产品上将印有“环保使用期限”（EPuP）符号。圆圈中的数字代表产品的正常环保使用期限。

## India RoHS

RoHS compliant as per E-Waste (Management & Handling) Rules, 2011.

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## 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 Electrical and Electronic Equipment (EEE).

### Türkiye EEE Yönetmeliğine Uygunluk Beyanı

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

EEE Yönetmeliğine Uygundur.

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## Ukraine RoHS

Цим підтверджуємо, що продукція Леново відповідає вимогам нормативних актів України, які обмежують вміст небезпечних речовин



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- Active Protection System
- Secure Data Disposal
- ThinkPad
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## Appendix E. İthalatçı – İmalatçı / Üretici Firma Bilgileri ve Diğer Bilgiler

### 1. İmalatçı ya da ithalatçı firmaya ilişkin bilgiler:

Ürünün ithalatçı firması, Lenovo Technology B.V. Merkezi Hollanda Türkiye İstanbul Şubesi'dir. Adresi ve telefonu şöyledir:

Üner Plaza. Eski Üsküdar Yolu.  
Erkut Sokak. No: 4 / 1 Kat: 3  
Kozyatağı,  
Kadıköy, İstanbul, Türkiye  
Tel: 90 216 570 01 00  
Faks: 90 216 577 01 00

### 2. Bakım, onarım ve kullanımda uyulması gereken kurallar:

Elektronik cihazlar için gösterilmesi gereken standart özeni göstermeniz yeterlidir. Cihaz çalışır durumda iken temizlik yapmayınız. Islak bezle, köpürtülmüş deterjanlarla, sulu süngerlerle temizlik yapmayınız. Son kullanıcılar onarım konusunda yetkili değildir. Arıza söz konusu olduğuna inanıyorsanız telefonla danışabilir ya da ürünü bu kitapta yer alan servis istasyonlarından birine götürebilirsiniz.

### 3. Taşıma ve nakliye sırasında dikkat edilecek hususlar:

Ürününüzü ve bağlı olduğu aygıtı taşıırken ya da nakliye sırasında dikkat etmeniz gereken birkaç nokta vardır. Aygıt taşımadan önce tüm bağlı ortamların çıkartılmış olması, bağlı aygıtların çözülmesi ve kabloların sökülmüş olması gerekir. Bu aygıtın zarar görmemesi için gereklidir.

Ayrıca aygıtınızı taşıırken uygun koruma sağlayan bir taşıma kutusu kullanılmasına dikkat edin. Bakıma ilişkin diğer ek bilgiler için kitabın ilgili bölümünden (eğer sağlanmışsa) yararlanabilirsiniz.

### 4. Aygıtla ilişkin bakım, onarım ya da temizliğe ilişkin bilgiler:

Aygıtla ilişkin kullanıcının yapabileceği bir bakım ya da onarım yoktur. Bakım ya da onarıma gereksinim duyarsanız bir Çözüm Ortağı'ndan destek alabilirsiniz. Ayrıca servis istasyonlarına ilişkin bilgileri kitabınızın eklerinde bulabilirsiniz.

### 5. Kullanım sırasında insan ya da çevre sağlığına zararlı olabilecek durumlar:

Bu tür durumlar söz konusu olduğunda ürüne özel olarak bu kitabın ilgili bölümünde detaylı olarak ele alınmıştır. Kitabınızda bu tür bir uyarı yoksa, kullanmakta olduğunuz ürün için böyle bir durum söz konusu değildir.

### 6. Kullanım hatalarına ilişkin bilgiler:

Burada belirtilenler ile sınırlı olmamak kaydı ile bu bölümde bazı kullanıcı hatalarına ilişkin örnekler sunulmuştur. Bu ve benzeri konulara özen göstermeniz yeterlidir. Kılavuz içinde daha ayrıntılı bilgiler verilebilir.

#### Örnekler:

Kabloların zorla ait olmadıkları yuvalara takılması  
Kumanda butonlarına gereğinden yüksek kuvvet uygulanması  
Aleti çalışır durumda taşımak, temizlemek vb. eylemler  
Alet üzerine katı ya da sıvı gıda maddesi dökülmesi  
Aletin taşıma sırasında korunmaması ve darbe alması

### 7. Ürünün özelliklerine ilişkin tanıtıcı ve temel bilgiler:

Ürünüze ilişkin tanıtıcı ve temel bilgileri kitabınızın ilgili bölümlerinde bulabilirsiniz.

### 8. Periyodik bakıma ilişkin bilgiler:

Ürün bir uzmanın yapması gereken periodik bakımı içermez.

**9. Bağlantı ve montaja ilişkin bilgiler:**

Aksamınızı çalışır hale getirebilmeniz için gerekli bağlantı ve montaj bilgileri bu kılavuzda yer almaktadır. Kuruluş işlemini kendiniz yapmak istemiyorsanız satıcınızdan ya da bir Servis İstasyonu'ndan ücret karşılığı destek alabilirsiniz.

**10. Bakanlıkça tespit ve ilan edilen kullanım ömrü:**

Bakanlıkça tespit ve ilan edilen kullanım ömrü 7 yıldır.

**11. Enerji tüketen mallarda, malın enerji tüketimi açısından verimli kullanımına ilişkin bilgiler:**

Ürüne ait kullanma kılavuzunda belirtilmiştir.

**12. Servis istasyonlarına ilişkin bilgiler:**

Bunlar kitabınızı aynı başlıklı bölümünde belirtilmiştir. Herhangi bir onarım ya da yedek parça ihtiyacı durumunda bu istasyonlardan birine başvurabilirsiniz.

**13. İthal edilmiş mallarda, yurt dışındaki üretici firmanın unvanı ve açık adresi ile diğer erişim bilgileri (telefon, telefaks ve e-posta vb.):**

Lenovo PC HK Limited  
23/F, Lincoln House, Taikoo Place  
979 King's Road, Quarry Bay  
Hong Kong  
Tel: +852-2516 4700  
Faks: +852-2516 5384

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## Appendix F. Servis İstasyonları ve Yedek Parça Malzemelerinin Temin Edileceği Adresler

Garanti süresi içerisinde müşteri arızalı ürünü aşağıda belirtilen merkezlere teslim ederek garanti hizmetinden yararlanır. Ürün yerinde garanti hizmeti içeriyorsa, bu merkezlerden birine telefon edebilirsiniz. Yedek parça malzemelerini de bu merkezlerden temin edebilirsiniz.

### Garanti Hizmetinin Alınabileceği Merkezler

Arızalı Ideapad / IdeaCentre /Lenovo B serisi/Lenovo G serisi /Lenovo H serisi /Lenovo V serisi ürünlerini ücretsiz servise gönderebilmeniz için aşağıdaki numaralardan servis kaydı açtırabilirsiniz.

Telefon: 0 212 336 03 66

Ücretsiz aramalar için: 00800 448 825 165 (Sadece sabit hatlardan aranabilir)

### BDH

Gülbahar Mah. Avni Dilligil Sk. Çelik iş merkezi No:2

Mecidiyeköy - Şişli/ İstanbul

Telefon: 0212 217 85 87

### ANKARA

#### **Bdh Bilişim Destek Hiz. San. Ve Tic. A.Ş.**

Adres: Çetin Emeç Bul. 7. cad. No: 37/5-6 Öveçler

Telefon: 0312 473 16 40

Fax: 0212 320 81 37

Web: <http://www.bdh.com.tr>

#### **Destek Bilgisayar Ve İletişim Hiz. Tic. A.Ş.**

Adres: Çetin Emeç Bul. 8. Cad. No: 18/4 06460 A.Öveçler

Telefon: 0312 473 51 00

### BURSA

#### **Bdh Bilişim Destek Hizmetleri San.Ve Tic.**

Fethiye Mah. Mudanya Cad. No: 327 Solukçu İş merkezi

Bodrum kat - Nilüfer

Telefon: 0224 241 62 68

Fax: 0212 320 81 37

Web: <http://www.bdh.com.tr>

#### **Netpro Bilgisayar Büro Makinaları Elektronik Sanayi Ve Özel Eğitim Hizmetleri Ticaret Ltd.Şti.**

Adres: Kükürtlü Mah. Eski Mudanya Cad. No:131/A D:1 Merkez

Telefon: 224 234 59 80

### DENİZLİ

#### **ALM Bilgisayar San. Tic. Ltd. Şti.**

Adresi: 2. Ticari Yol, Kazım Kaynak İş Merkezi, No:65 Kat:3 Denizli

Posta kodu: 20100

Web Adresi: <http://www.almbilgisayar.com.tr/>

Telefon: 258 264 28 55

Faks no: 258 265 74 77

## DİYARBAKIR

### **Metro Bilgisayar Eğitim Tic. ve San.Ltd. Şti.**

Adresi: Ali Emiri 5. Sokak, Kaçmaz Apartmanı, No:4/1 Diyarbakır

Posta kodu: 21100

Web Adresi: <http://www.metrobilgisayar.com.tr/>

Telefon: 412 223 94 36

Faks no: 422 224 55 07

## İSTANBUL

### **Bdh Bilişim Destek Hizmetleri San.Ve Tic.Aş.**

Gülbahar Mah. Avni Dilligil Sk. Çelik iş merkezi No:2

Mecidiyeköy - Şişli/ İstanbul

Telefon: 0212 217 85 87

Fax: 0212 320 81 37

Web: <http://www.bdh.com.tr>

### **Bilgi Birikim Sistemleri Elctr. ve Bilg.**

Endüstrisi Müh. Hiz. Ltd. Sti.

Adresi: Kocayol Caddesi, Kozyatağı Sokak, No: 3/B Kat:3

Kozyatağı İstanbul

Web Adresi: <http://www.bilgibirikim.com/>

Telefon: 216 373 98 00

Faks no: 216 373 99 33

### **D Yedi Yirmidört Bilişim Hizmetleri Ticaret A.S.**

Yeni Sahra Mah. Yavuz Selim Cad. No: 15 Kat: 1

Ataşehir / İstanbul

Telefon: 444 5724

Faks: 0216 470 95 35

### **İntegra Profesyonel Hiz. Ltd. Şti.**

Adres: Merkez Mah. Büyükdere Cad. No: 23 K: 2 Şişli/İstanbul

Telefon: 0212 373 93 93

### **Intercomp Bilgisayar Sanayi Ve Hizmetleri Ltd. Şti.**

Adres: Perpa Ticaret Merkezi B. Blok Kat 2 No:33

Telefon: 0212 222 57 45

### **Netservis Bilgisayar Sistemleri San. ve Tic. Ltd.Şti.**

Adresi: Kısıklı Caddesi, Türksoy Sokak, No: 1 Altunizade / İstanbul

Web Adresi: <http://netservis.com.tr/>

Telefon: 216 554 64 00

## İSTANBUL

### **Novatek Bilgisayar Sistemleri San.ve Tic.Ltd.Şti.**

Adresi: Ayazağa mah. Büyükdere cad. Üçyol mevki Noramin iş merkezi

No: 237/A 110 Şişli

Posta Kodu: 80300

Web Adresi: <http://www.novateknoloji.com/>

Telefon: 212 356 75 77

Faks no: 212 356 75 88

**Peritus Bilgisayar Sist. Dış Tic.San.Ltd.Şti.**

Adresi: Ziverbey Eğitim Mahallesi, Poyraz Sokak, Sadıkoğlu İş Merkezi 1, D: 15 Ziverbey  
Kadıköy İstanbul  
Posta kodu: 81040  
Web Adresi: <http://www.pbs.biz.tr/>  
Telefon: 216 345 08 00  
Faks no: 216 349 09 92

**Seri Bilgi Teknolojileri LTD ŞTİ.**

Alemdağ Cad. Masaldan İş Merkezi G Blok Kat: 2  
Çamlıca/İstanbul  
Telefon: 444 0 426

**İZMİR****Adapa Bilgi Sistemleri Tur.San. Ve Tic.A.Ş.**

Adres: Ankara Asfaltı No:26/3 Rod-Kar 2 İş Mer. D:305-309 Bornova  
Telefon: 0232 462 39 59

**Bdh Bilişim Destek Hizmetleri San.Ve Tic. A.Ş.**

Adres: Gazi bulvarı No: 37  
Çankaya  
Telefon: 0232 446 33 33  
Fax: 0212 320 81 37  
Web: <http://www.bdh.com.tr>

**Ege Bimtes Bilgi İşlem Mak.Ser.San.Ve Tic.Ltd.Şti**

Adres: Refik Saydam Blv. Caddesi No: 5  
Telefon: 0232-4890060

**MALATYA****Bdh Bilişim Destek Hizmetleri Sanayi Ve Ticaret A.Ş.**

Büyük Hüseyinbey Uçar sok. Deniz Apt. No: 12 Kat: 1/2  
Telefon: 0422 326 31 03  
Fax: 0212 320 81 37  
Web: <http://www.bdh.com.tr>

**SAMSUN****Bdh Bilişim Destek Hizmetleri San.Ve Tic.A.Ş.**

Adres: Mimarşinan Mah.Atatürk Bulvarı No:266/1-Atakum  
Telefon: 0362 437 96 31  
Fax: 0 212 320 81 37  
Web: <http://www.bdh.com.tr>

**VIP Bilgi İşlem Ltd. Şti.**

Adresi: İstiklal Caddesi, No:159/13 Samsun  
Posta kodu: 55060  
Web Adresi: <http://www.vipbilgiislem.com>  
Telefon: 362 230 88 52  
Faks no: 362 234 77 22

## **ŞANLIURFA**

### **Bdh Bilişim Destek Hizmetleri San.Ve Tic.**

Sarayönü Cad. Kızılay işhanı Zemin kat No: Z-8

Telefon: 0414 215 05 52

Fax: 0212 320 81 37

Web: <http://www.bdh.com.tr>

### **Bilban Bilgisayar Eğitim Tic. San. Ltd. Şti.**

Adresi: Kızılay işhanı, Kat: 1-2 Şanlıurfa

Web Adresi: <http://www.bilban.com.tr/>

Telefon: 414 215 05 52

Faks no: 414 212 22 12

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