lenovo

ThinkStation
User Guide

Machine Types: 7782, 7783, 7784, 7821, 7823, and 7824

Note

Before using this information and the product it supports, be sure to read and understand the “Important safety information” on page iii and Appendix A “Notices” on page 71.

First Edition (May 2011)

Contents

Important safety information

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

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

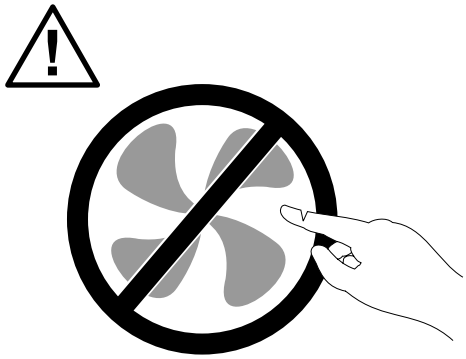
Service and upgrades

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

Note: Some computer parts can be upgraded or replaced by the customer. Upgrades typically are referred to as options. Replacement parts approved for customer installation are referred to as Customer Replaceable Units, or CRUs. Lenovo provides documentation with instructions when it is appropriate for customers to install options or replace CRUs. You must closely follow all instructions when installing or replacing parts. The Off state of a power indicator does not necessarily mean that voltage levels inside a product are zero. Before you remove the covers from a product equipped with a power cord, always make sure that the power is turned off and that the product is unplugged from any power source. For more information on CRUs, refer to Chapter 4 “Installing or replacing hardware” on page 21. 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.

DANGER



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

CAUTION:

Before replacing any CRUs, turn off the computer and wait three to five minutes to let the computer cool before opening the cover.

Static electricity prevention

Static electricity, although harmless to you, can seriously damage computer components and options. Improper handling of static-sensitive parts can cause damage to the part. When you unpack an option or CRU, do not open the static-protective package containing the part until the instructions direct you to install it.

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

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

Power cords and power adapters

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

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

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

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

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

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 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.

External devices

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

Heat and product ventilation

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

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

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

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

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

Operating environment

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

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

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

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

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

Modem safety information

CAUTION:
To reduce the risk of fire, use only No. 26 AWG or larger (for example, No. 24 AWG) telecommunication line cord listed by Underwriters Laboratories (UL) or certified by the Canadian Standards Association (CSA).

To reduce the risk of fire, electrical shock, or injury when using telephone equipment, always follow basic safety precautions, such as:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

- Use caution when installing or modifying telephone lines.
- Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning.
- Do not use the telephone to report a gas leak in the vicinity of the leak.

Laser compliance statement

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

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

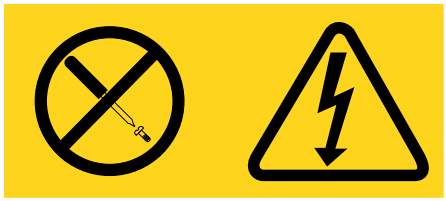
DANGER

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

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

Power supply statement

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



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

Cleaning and maintenance

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

Russia Compliance Mark for Market Access

Chapter 1. Product overview

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

Features

This section provides information about the computer features. The following information covers a variety of models. For information about your specific model, use the Setup Utility program. See Chapter 6 “Using the Setup Utility program” on page 55.

Microprocessor

Your computer comes with one of the following microprocessors (internal cache size varies by model type):

- Intel® Core™ i3 microprocessor
- Intel Xeon® Quad Core microprocessor
- Intel Pentium® microprocessor

Memory

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

Internal drives

- Optical drive: DVD-ROM, DVD-R, or Blu-ray (optional)
- Serial Advanced Technology Attachment (SATA) hard disk drive

Video subsystem

- Integrated graphics for a Video Graphics Array (VGA) connector and a DisplayPort connector (not applicable on some models)
- Peripheral Component Interconnect (PCI) Express x16 graphics card slot on the system board for a discrete graphics card

Audio subsystem

- Integrated high-definition (HD) audio
- Audio line-in connector, audio line-out connector, and microphone connector on the rear panel
- Microphone connector and headphone connector on the front panel
- Internal speaker

Connectivity

- 100/1000 Mbps integrated Ethernet controller

System management features

- Ability to store power-on self-test (POST) hardware test results

- Desktop Management Interface (DMI)

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

- Intel Standard Manageability

  Intel Standard Manageability is hardware and firmware technology that builds certain functionality into computers in order to make them easier and less expensive for businesses to monitor, maintain, update, upgrade, and repair.

- Intel Matrix Storage Manager

  Intel Matrix Storage Manager is a device driver that provides support for SATA RAID 5 arrays and SATA RAID 10 arrays on specific Intel chipset system boards to facilitate increased hard disk performance.

- Preboot Execution Environment (PXE)

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

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

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

- Wake on LAN

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

- Wake on Ring

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

- Windows Management Instrumentation (WMI)

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

Input/Output (I/O) features

- 9-pin serial port (one standard)
- Eight Universal Serial Bus (USB) connectors (two on the front panel and six on the rear panel)
- One Ethernet connector
- One Personal System/2 (PS/2) keyboard connector (optional)
- One PS/2 mouse connector (optional)
- Three audio connectors on the rear panel (audio line-in connector, audio line-out connector, and microphone connector)
- Two audio connectors on the front panel (microphone connector and headphone connector)

For more information, see “Locating connectors, controls, and indicators on the front of your computer” on page 6 and “Locating connectors on the rear of your computer” on page 7.

Expansion

- One card reader drive bay
- One PCI Express x1 card slot
- One PCI Express x16 graphics card slot
- Two hard disk drive bays

- Two optical drive bays
- Two PCI card slots

Power supply

Your computer comes with one 280-watt automatic voltage-sensing power supply.

Security features

- Computrace Agent software embedded in firmware
- Cover presence switch (also called intrusion switch)
- Ability to enable or disable a device
- Ability to enable and disable USB connectors individually
- Keyboard with fingerprint reader (shipped with some models)
- Power-on password (POP), administrator password, and hard disk drive password to deter unauthorized use of your computer
- Startup sequence control
- Startup without keyboard or mouse
- Support for an integrated cable lock (Kensington lock)
- Support for a padlock
- Trusted Platform Module (TPM)

For more information, see Chapter 3 “Security” on page 17.

Preinstalled software programs

Your computer is preinstalled with software programs to help you work more easily and securely. For more information, see “Software overview” on page 4.

Preinstalled operating system

Your computer is preinstalled with the Microsoft® Windows® 7 operating system.

Operating system(s), certified or tested for compatibility[1] (varies by model type)

- Linux®
- Microsoft Windows XP Professional SP 3

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

Specifications

This section lists the physical specifications for your computer.

Dimensions

Width: 175 mm (6.89 inches)

Height: 425.2 mm (16.74 inches) (floor to top of handle)

Depth: 430.8 mm (16.96 inches)

Weight

Maximum configuration as shipped: 11.2 kg (24.7 lbs)

Environment

- Air temperature:

  Operating: 10°C to 35°C (50°F to 95°F)

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

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

  Note: The allowable upper temperature limit decreases by 1°C (1.8°F) for every 300 m (1000 ft) above sea level.
- Humidity:

  Operating: 20% to 80% (non-condensing)

  Non-operating: 20% to 90% (non-condensing)
- Altitude:

  Operating: -50 to 10 000 ft (-15.2 to 3 048 m)

  Non-operating: -50 to 35 000 ft (-15.2 to 10 668 m)

Electrical input

- Input voltage:
  - Low range:

    Minimum: 100 V ac

    Maximum: 127 V ac

    Input frequency range: 50 to 60 Hz
  - High range:

    Minimum: 200 V ac

    Maximum: 240 V ac

    Input frequency range: 50 to 60 Hz

Software overview

The computer comes with a preinstalled operating system and several software programs provided by Lenovo.

Software provided by Lenovo

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

Lenovo ThinkVantage Tools

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

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

The following table lists the programs that you can access from the Lenovo ThinkVantage Tools program. To access a program, double-click the corresponding icon.

Table 1. Program icon names in Lenovo ThinkVantage Tools

Program name	Icon name in Lenovo ThinkVantage Tools
Create Recovery Media	Factory Recovery Disks
Lenovo ThinkVantage Toolbox	System Health and Diagnostics
ThinkVantage Rescue and Recovery®	Enhanced Backup and Restore

Lenovo Welcome

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

Lenovo ThinkVantage Toolbox

The Lenovo ThinkVantage Toolbox program helps you maintain your computer, improve computing security, diagnose computer problems, get familiar with the innovative technologies provided by Lenovo, and get more information about your computer. See “Lenovo ThinkVantage Toolbox” on page 64 for detailed information.

Product Recovery

The Product Recovery program enables you to restore the contents of the hard disk drive to the factory default settings.

ThinkVantage Rescue and Recovery

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

Note: If the **Enhanced Backup and Restore** icon in the Lenovo ThinkVantage Tools program is dimmed, it indicates that you need to install the ThinkVantage Rescue and Recovery program manually before enabling its features. To install the ThinkVantage Rescue and Recovery program, do the following:

1. Click **Start → All Programs → Lenovo ThinkVantage Tools**, and double-click **Enhanced Backup and Restore**.
2. Follow the instructions on the screen.
3. When the installation process completes, the **Enhanced Backup and Restore** icon is activated.

Adobe Reader

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

Antivirus software

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

Locations

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

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

Figure 1 “Front connector, control, and indicator locations” on page 6 shows the locations of the connectors, controls, and indicators on the front of your computer.

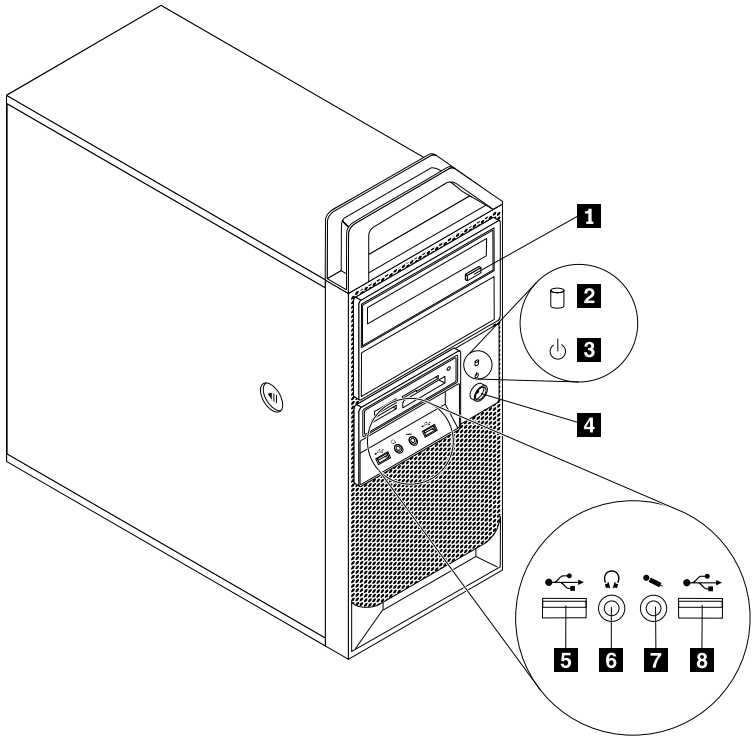


Figure 1. Front connector, control, and indicator locations

1 Optical drive eject/close button
2 Hard disk drive activity indicator
3 Power indicator
4 Power switch
5 USB connector (USB port 1)
6 Headphone connector
7 Microphone connector
8 USB connector (USB port 2)

Locating connectors on the rear of your computer

Figure 2 “Rear connector locations” on page 7 shows the locations of the connectors on the rear of your computer. Some connectors on the rear of your computer are color-coded to help you determine where to connect the cables on your computer.

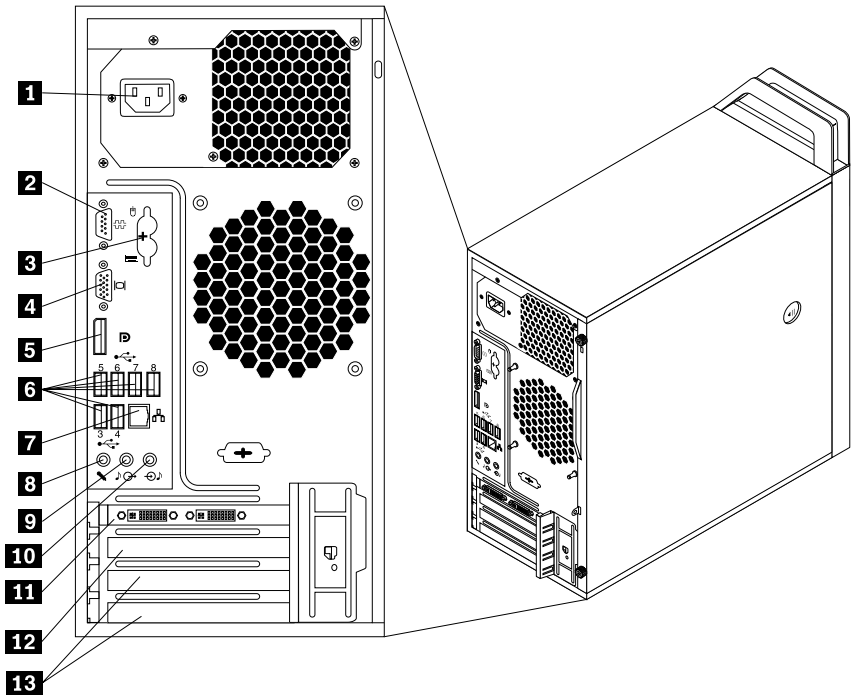


Figure 2. Rear connector locations

1 Power cord connector

2 Serial port

3 PS/2 keyboard and mouse connectors (optional)

4 VGA monitor connector

5 DisplayPort connector

6 USB connectors (USB port 3 to port 8)

7 Ethernet connector

8 Microphone connector

9 Audio line-out connector

10 Audio line-in connector

11 PCI Express x16 card slot (graphics card available in some models)

12 PCI Express x1 card slot

13 PCI card slots (2)

Connector	Description
Audio line-in connector	Used to receive audio signals from an external audio device, such as a stereo system. When you attach an external audio device, a cable is connected between the audio line-out connector of the device and the audio line-in connector of the computer.
Audio line-out connector	Used to send audio signals from the computer to external devices, such as powered stereo speakers (speakers with built-in amplifiers), headphones, multimedia keyboards, or the audio line-in connector on a stereo system or other external recording device.

Connector	Description
DisplayPort connector	Used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a DisplayPort connector. **Note:** The DisplayPort connector is not applicable on some models. If your computer has a graphics card installed, be sure to use a monitor connector on the graphics card.
Ethernet connector	Used to attach an Ethernet cable for a local area network (LAN). **Note:** To operate the computer within FCC Class B limits, use a Category 5 Ethernet cable.
Microphone connector	Used to attach a microphone to your computer when you want to record sound or if you use speech-recognition software.
PS/2 keyboard connector (optional)	Used to attach a keyboard that uses a PS/2 keyboard connector.
PS/2 mouse connector (optional)	Used to attach a mouse, a trackball, or other pointing devices that use a PS/2 mouse connector.
Serial port	Used to attach an external modem, a serial printer, or other devices that use a 9-pin serial port.
USB connector	Used to attach a device that requires a USB connector, such as a USB keyboard, a USB mouse, a USB scanner, or a USB printer. If you have more than eight USB devices, you can purchase a USB hub, which you can use to connect additional USB devices.
VGA monitor connector	Used to attach a VGA monitor or other devices that use a VGA monitor connector. **Note:** The VGA connector is not applicable on some models. If your computer has a graphics card installed, be sure to use a monitor connector on the graphics card.

Locating components

Figure 3 “Component locations” on page 9 shows the locations of the various components in your computer. To remove the computer cover, see “Removing the computer cover” on page 22.

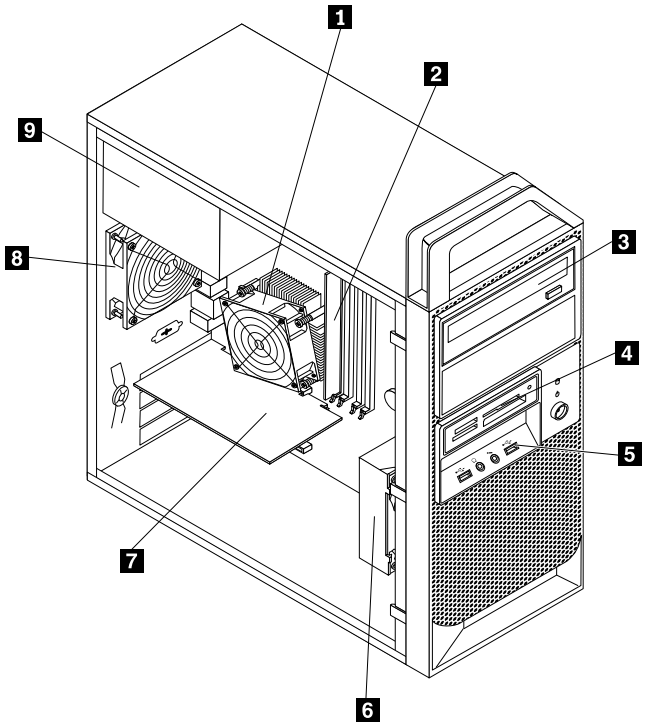


Figure 3. Component locations

1 Heat sink and fan assembly
2 Memory module(s)
3 Optical drive
4 Card reader (available in some models)
5 Front audio and USB assembly
6 Front fan assembly
7 Graphics card (available in some models)
8 Rear fan assembly
9 Power supply assembly

Locating parts on the system board

Figure 4 “System board part locations” on page 10 shows the locations of the parts on the system board.

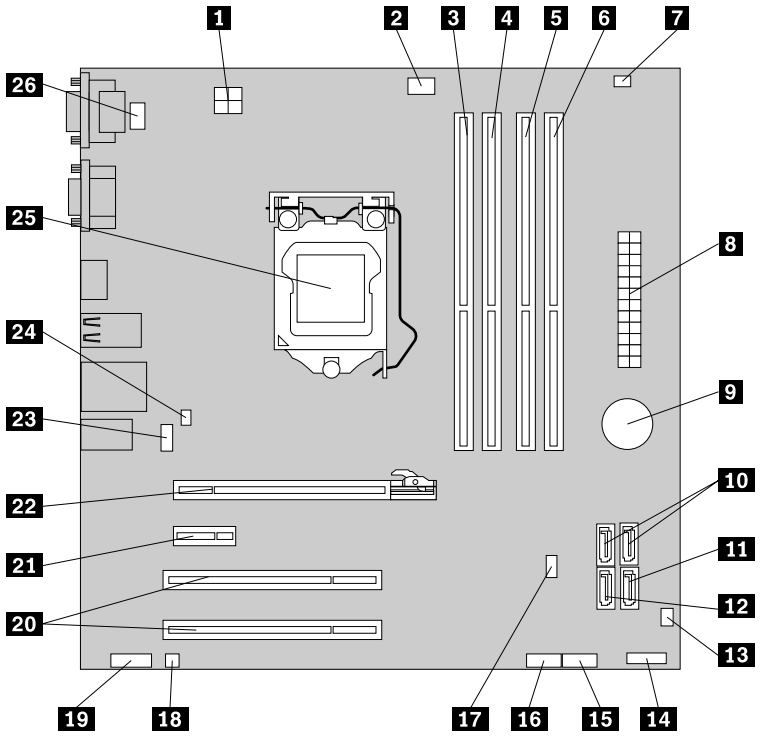


Figure 4. System board part locations

1 4-pin power connector

2 Microprocessor fan connector

3 Memory slot 1 (DIMM1)

4 Memory slot 2 (DIMM2)

5 Memory slot 3 (DIMM3)

6 Memory slot 4 (DIMM4)

7 Thermal sensor connector

8 24-pin power connector

9 Battery

10 SATA connectors 1 and 2 (SATA 3.0 connectors)

11 SATA connector 3 (SATA 2.0 connector)

12 eSATA connector

13 Front fan connector

14 Front panel connector for power switch and LED indicators

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

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

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

18 Internal speaker connector

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

20 PCI card slots (2)

21 PCI Express x1 card slot

22 PCI Express x16 graphics card slot

23 Rear fan connector

24 Cover presence switch connector (Intrusion switch connector)

25 Microprocessor

26 PS/2 keyboard and mouse connector

Locating internal drives

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

When installing or replacing an internal drive, it is important to note the type and size of the drive that you can install or replace in each bay and correctly connect the cables to the drive installed. Refer to the appropriate section in “Installing or replacing hardware” on page 21 for instructions on how to install or replace internal drives for your computer.

Figure 5 “Drive bay locations” on page 11 shows the locations of the drive bays.

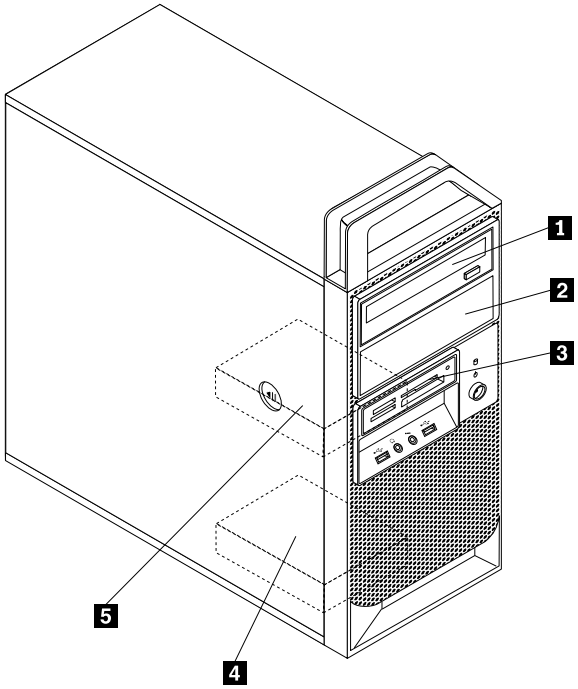


Figure 5. Drive bay locations

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

2 Bay 2 - Optical drive bay

3 Bay 3 - Card reader drive bay

4 Bay 4 - Secondary SATA hard disk drive bay

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

Machine type and model label

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

The following illustration shows the location of the machine type and model label.

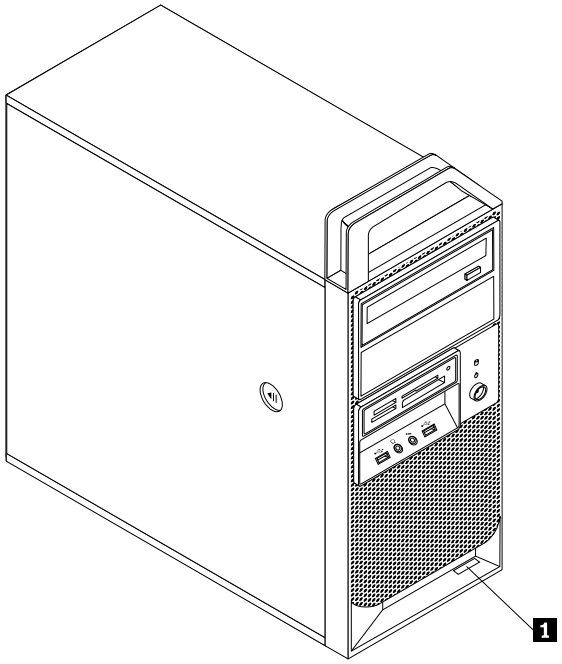


Figure 6. Machine type and model label

1 Machine type and model label

Chapter 2. You and your computer

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

Accessibility and comfort

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

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

Lenovo is committed to providing people with disabilities greater access to information and technology. As a result, the following information provides ways to help users that have hearing, vision, and mobility limitations get the most out of their computer experience.

Assistive technologies enable users to access information in the most appropriate way. Some of these technologies are already provided in your operating system, others can be purchased through vendors, or accessed through the World Wide Web:
http://www.lenovo.com/healthycomputing

Arranging your workspace

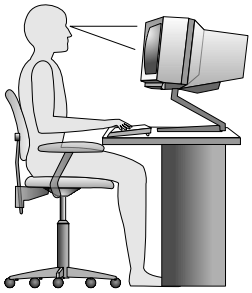
To get the most from your computer, arrange both the equipment you use and your work area to suit your needs and the kind of work you do. Your comfort is of foremost importance, but light sources, air circulation, and the location of electrical outlets can also affect the way you arrange your workspace.

Comfort

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

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

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



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

Glare and lighting

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

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

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

Air circulation

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

Electrical outlets and cable lengths

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

When arranging your workspace:

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

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

Register your computer with Lenovo

To register your computer, go to http://www.lenovo.com/register. Then, follow the instructions on the screen to complete the registration. This can help authorities return your computer to you if it is lost or stolen. Registering your computer also enables Lenovo to notify you about possible technical information and upgrades.

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.

Moving your computer to another country or region

When you move your computer to another country or region, you must take local electrical standards into consideration. This section provides information on the following:

- "Voltage-selection switch" on page 15
- "Replacement power cords" on page 15

Voltage-selection switch

Some computers are equipped with a voltage-selection switch located near the power-cord connection point on the computer and some computers do not have a voltage-selection switch. Before you install your computer or relocate your computer to another country or region, you must be certain that you have matched your computer to the voltage available at your electrical outlet.

CAUTION:
You must know the voltage of the electrical connection (outlet) where your computer will be connected. If you do not know the voltage, contact your local electric company or refer to official Web sites or other literature for travelers to the country or region where you are located.

If your computer has a voltage-selection switch, you must set the switch to match the voltage available at your electrical outlet. Setting the voltage-selection switch incorrectly will cause the computer to malfunction and might cause permanent damage to the computer. Do not connect the computer to an electrical outlet until you have verified that the voltage-selection switch setting matches the voltage available at the electrical outlets.

If your computer does not have a voltage-selection switch, inspect the voltage-rating label on the bottom of the computer and note the following:

- If the voltage-rating label shows a range of either "100-127 V" or "200-240 V," you must ensure that the voltage provided at the electrical outlet matches the voltage rating on the computer label. If it does not match, do not attempt to connect the computer to the electrical outlet, unless an external device such as a voltage-converting transformer is used.
- If the voltage-rating label shows a dual range of "100-127 V" and "200-240 V," this signifies that the computer is suitable for worldwide operation and the computer will automatically adjust to the voltage at the electrical outlet regardless of the country or region where the computer is being connected.

Replacement power cords

If you relocate your computer to a country or region that uses an electrical outlet style different from the type you are currently using, you will have to purchase either electrical plug adapters or new power cords. You can order power cords directly from Lenovo. See Appendix D "Power cord notice" on page 81 for power cord information and part numbers.

Chapter 3. Security

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

Security features

The following security features are available on your computer:

- Computrace Agent software embedded in firmware

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

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

- Cover presence switch (also called intrusion switch) (available in some models)

  The cover presence switch prevents your computer from logging in to the operating system when the computer cover is not properly installed or closed. To enable the cover presence switch connector on the system board, to the following:

  1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 55.
  2. Set the Administrator Password. See “Setting, changing, and deleting a password” on page 56.
  3. From the **Security** submenu, select **Chassis Intrusion Detection → Enabled**. The cover presence switch connector on the system board is enabled.

  When the cover presence switch detects that your computer cover is not properly installed or closed when you turn on the computer, an error message will be displayed. To bypass the error message and log in to the operating system, do the following:

  1. Properly install or close your computer cover. See “Completing the parts replacement” on page 45.
  2. Press F1 to enter the Setup Utility program. Then press F10 to save and exit the Setup Utility program. The error message will not be displayed again.

- Ability to enable and disable devices and USB connectors

  For more information, see “Enabling or disabling a device” on page 57.

- Integrated fingerprint reader (available on some models)

  Depending on the models of your computer, the keyboard may have an integrated fingerprint reader. By enrolling your fingerprint and associating it with a Power-on Password, a Hard Disk Password, or both passwords beforehand, you can start the computer, log on to the system, and enter the Setup Utility program by swiping your finger over the reader, without typing a password. Thus fingerprint authentication can replace passwords and enable simple and secure user access.

- Startup sequence control

  For more information, see “Selecting or changing the startup device sequence” on page 58.

- Startup without keyboard or mouse

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

- Trusted Platform Module (TPM)

  Trusted Platform Module is a secure cryptoprocessor that can store cryptographic keys that protect information stored in your computer.

Locking the computer cover

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

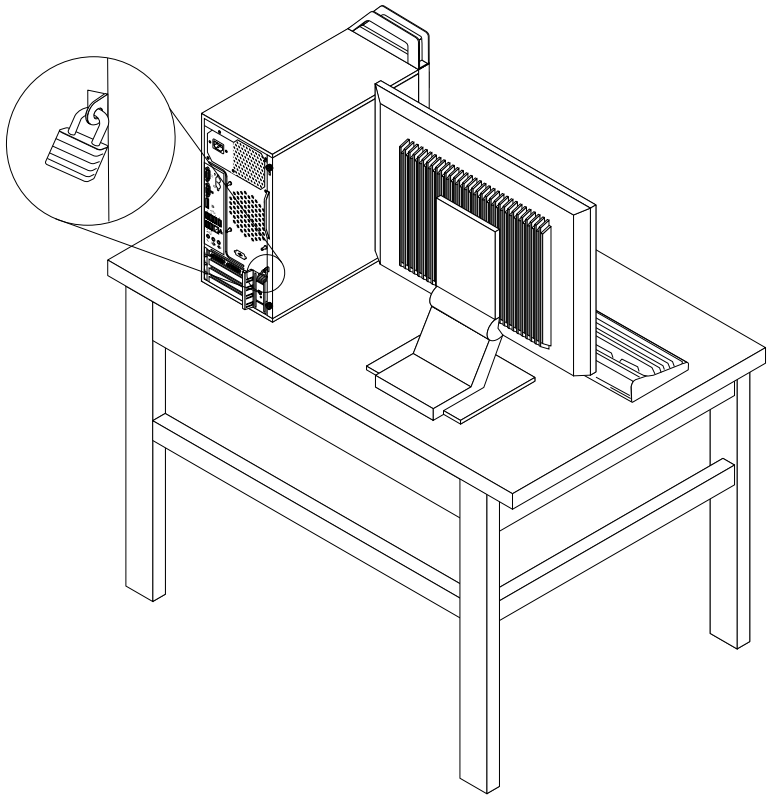


Figure 7. Installing a padlock

Attaching an integrated cable lock

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

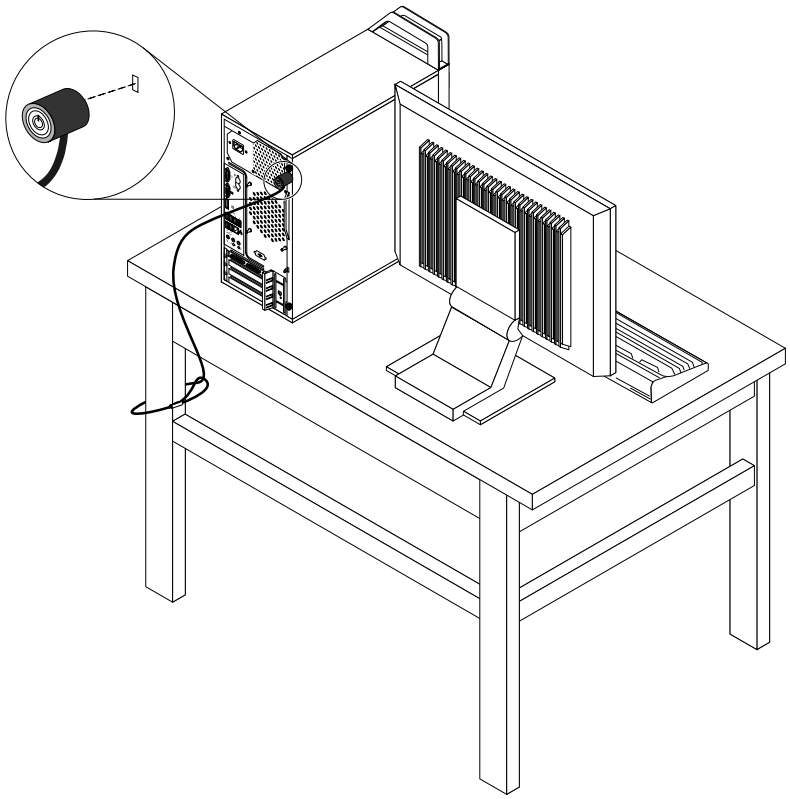


Figure 8. Integrated cable lock

Using passwords

You can set a variety of passwords through the Microsoft Windows operating system and through the BIOS of your computer to help deter unauthorized use of your computer.

BIOS passwords

You can use the BIOS Setup Utility program to set passwords to prevent unauthorized access to your computer and data. The following types of passwords are available:

- Power-On Password: When a Power-On Password is set, you are prompted to type a valid password each time the computer is turned on. The computer cannot be used until the valid password is typed in. For more information, see “Power-On Password” on page 56.
- Hard Disk Password: Setting a Hard Disk Password prevents unauthorized access to the data on the hard disk drive. When a Hard Disk Password is set, you are prompted to type a valid password each time you try to access the hard disk drive. For more information, see “Hard Disk Password” on page 56.

- Administrator Password: Setting an Administrator Password deters unauthorized users from changing configuration settings. If you are responsible for maintaining the configuration settings of several computers, you might want to set an Administrator Password. For more information, see “Administrator Password” on page 56.

You do not have to set any passwords to use your computer. However, using passwords improves computing security.

Windows passwords

Depending on your version of the Windows operating system, you can use passwords for a variety of features, including controlling login access, access to shared resources, network access, and individual user settings. For more information, see “Help and Support” on page 67.

Using and understanding firewalls

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

The Windows operating system preinstalled on your computer provides the Windows Firewall. For details on using the Windows Firewall, refer to “Help and Support” on page 67.

Protecting data against viruses

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

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

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

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

Chapter 4. Installing or replacing hardware

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

Handling static-sensitive devices

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

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

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

Installing or replacing hardware

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

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

Notes:

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

Installing external options

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

Removing the computer cover

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

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

CAUTION:

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

To remove the computer cover, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer.
2. Disconnect all power cords from electrical outlets.
3. Disconnect the power cords, Input/Output cables, and any other cables that are connected to the computer. See “Locating connectors, controls, and indicators on the front of your computer” on page 6 and “Locating connectors on the rear of your computer” on page 7.
4. Remove any locking device that secures the computer cover, such as a padlock or an integrated cable lock. See “Locking the computer cover” on page 18 and “Attaching an integrated cable lock” on page 19.
5. Remove any screws that secure the computer cover.
6. Press the cover-release button on the side of the computer and slide the cover to the rear of the computer to remove the cover.

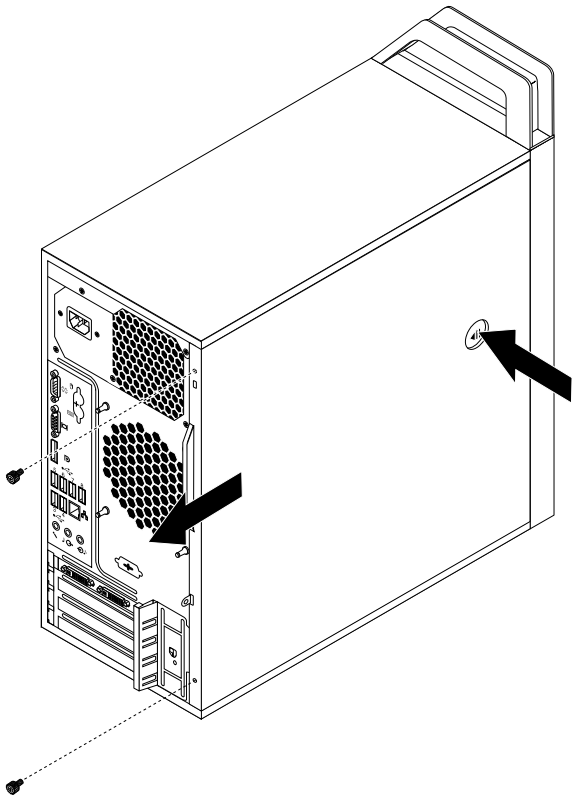


Figure 9. Removing the computer cover

Removing and reinstalling the front bezel

Attention: Do not open your computer or attempt any repair before reading and understanding the "Important safety information" on page iii.

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

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

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See "Removing the computer cover" on page 22.
3. Remove the front bezel by releasing the three plastic tabs on the left side and pivoting the front bezel outward.

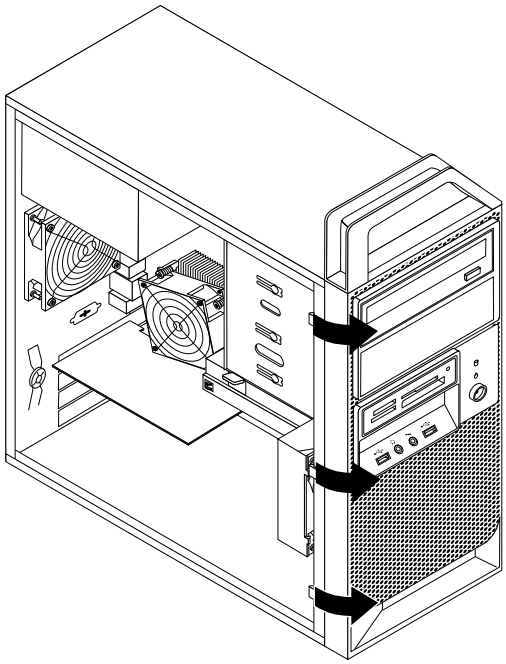


Figure 10. Removing the front bezel

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

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 45.

Installing or replacing a PCI card

Attention: Do not open your computer or attempt any repair before reading and understanding the "Important safety information" on page iii.

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

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

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. At the rear of the computer, press the release button **1** to open the card latch **2**.

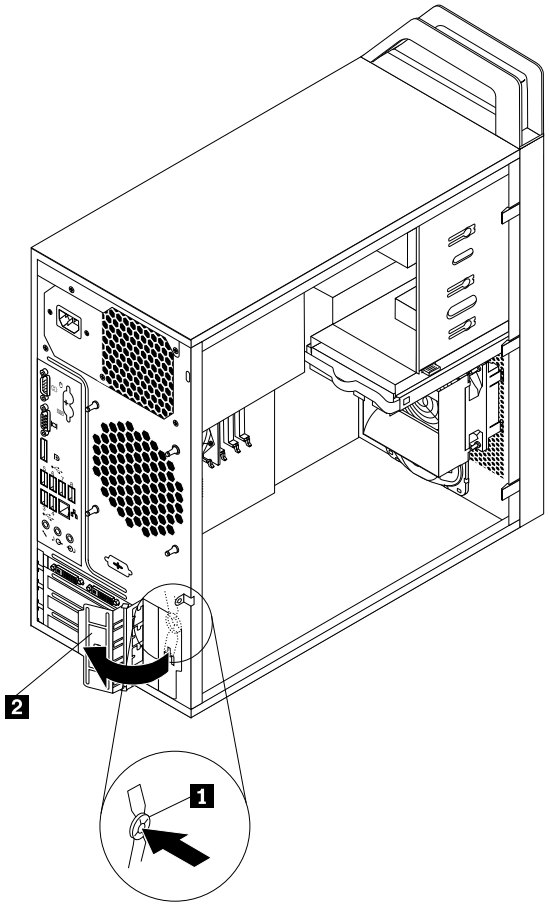


Figure 11. Opening the PCI card latch

4. Depending on whether you are installing or replacing a PCI card, do one of the following:
   - If you are installing a PCI card, remove the appropriate metal slot cover.
   - If you are replacing an old PCI card, grasp the old card that is currently installed and gently pull it out of the slot.

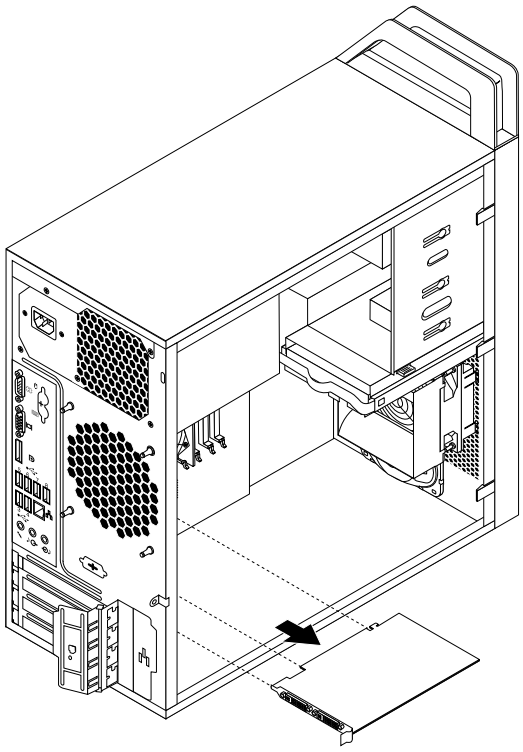


Figure 12. Removing a PCI card

Notes:

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

b. If the card is held in place by a retaining latch, disengage the card retaining latch in either of the two ways illustrated, depending on the retaining latch on the PCI card slot. Grasp the card and gently pull it out of the slot.

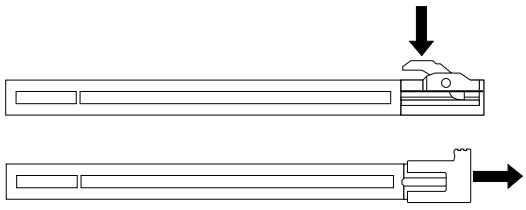


Figure 13. Disengaging the card retaining latch

5. Remove the new PCI card from its static-protective package.
6. Install the new card into the appropriate slot on the system board. See “Locating parts on the system board” on page 10.

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

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

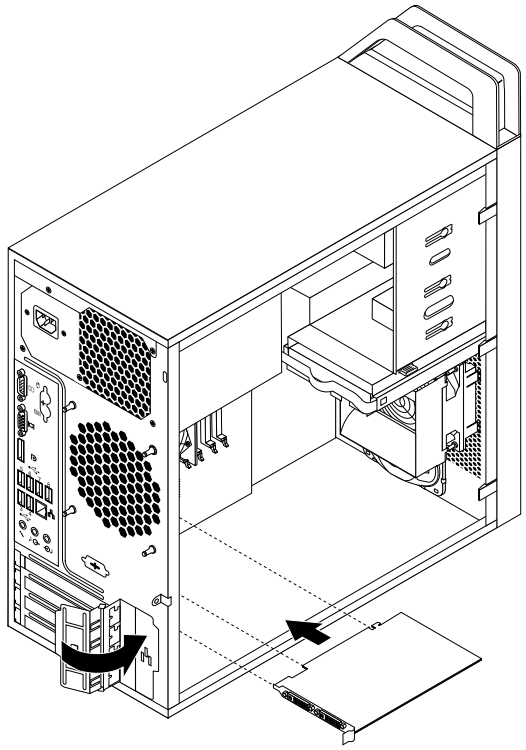


Figure 14. Installing a PCI card

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 45.

Installing or replacing a memory module

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

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

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

- Use 1 GB, 2 GB, or 4 GB DDR3 UDIMMs in any combination up to a maximum of 16 GB.
- Install memory modules in the sequence of DIMM 2, DIMM 4, DIMM 1, and DIMM 3. See “Locating parts on the system board” on page 10.

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

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. Lay the computer on its side for easier access to the system board.
4. Locate the memory slots. See “Locating parts on the system board” on page 10.

5. Remove any parts that might prevent your access to the memory slots. Depending on your computer model, you might need to remove the PCI Express x16 graphics card for easier access to the memory slots. See “Installing or replacing a PCI card” on page 23.
6. Depending on whether you are installing or replacing a memory module, do one of the following:
   - If you are replacing an old memory module, open the retaining clips and gently pull the memory module out of the memory slot.

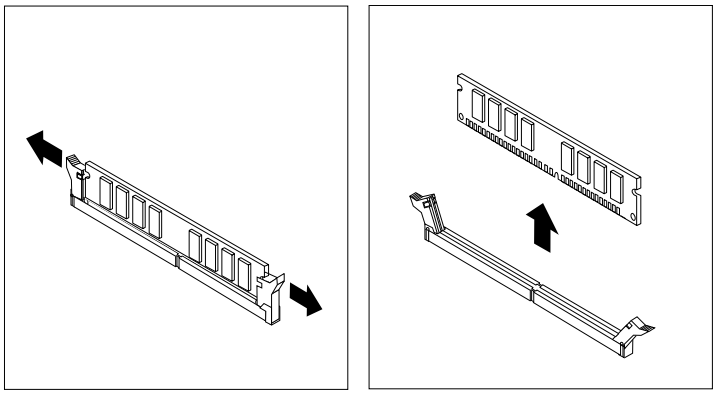


Figure 15. Removing a memory module

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

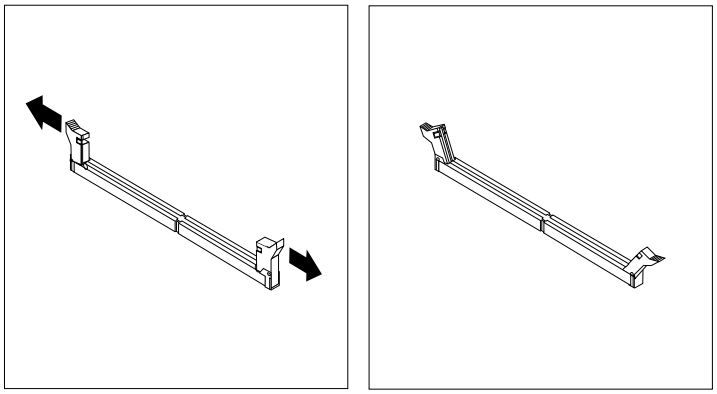


Figure 16. Opening the retaining clips

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

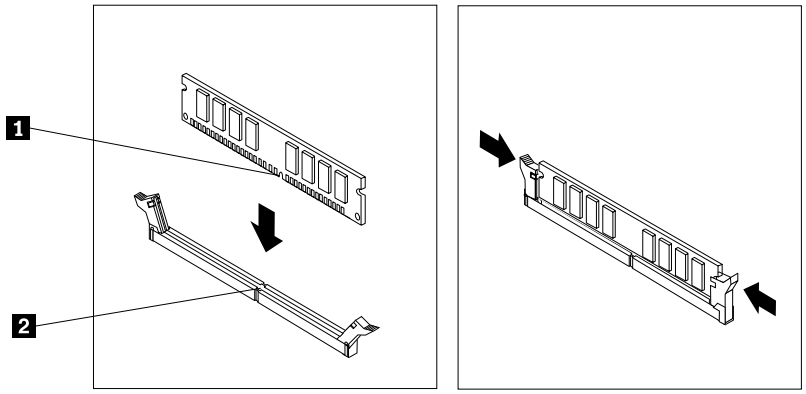


Figure 17. Installing a memory module

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

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 45.

Installing or replacing the optical drive

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

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

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

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 23.
4. Depending on whether you are installing or replacing an optical drive, do one of the following:
   - If you are installing a secondary optical drive, remove the plastic panel in the front bezel for the drive bay you want to use. If there is a metal static shield installed in the drive bay, remove the metal static shield.

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

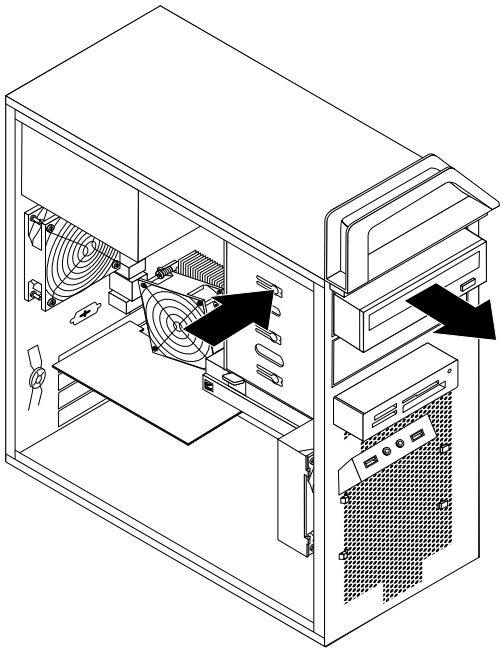


Figure 18. Removing the optical drive

5. Install the optical drive retainer on the side of the new optical drive.

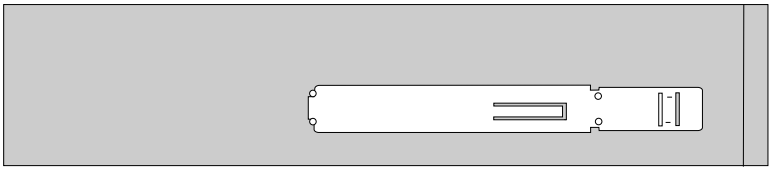


Figure 19. Installing the optical drive retainer

6. Slide the new optical drive into the drive bay from the front of the computer until the optical drive snaps into position.

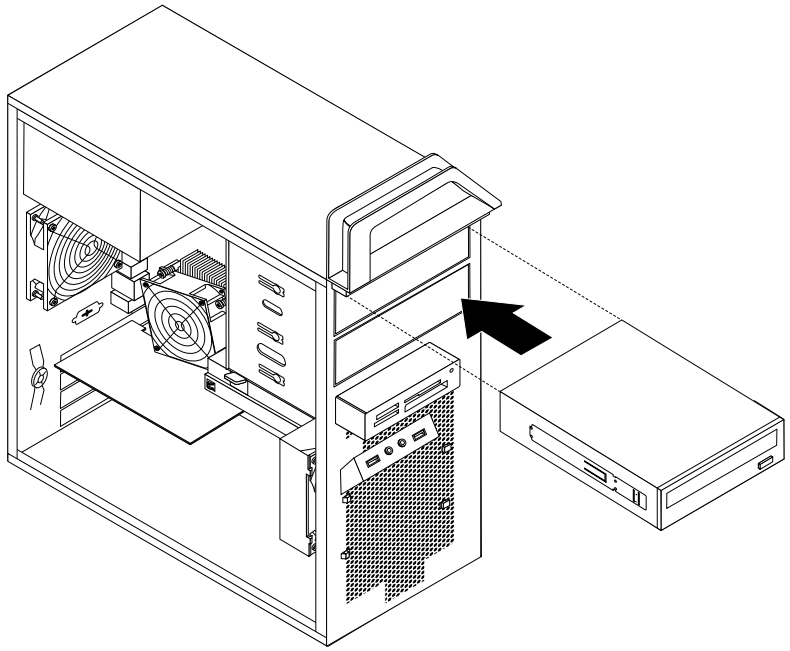


Figure 20. Installing the optical drive

7. Connect the signal cable and the power cable to the new optical drive.

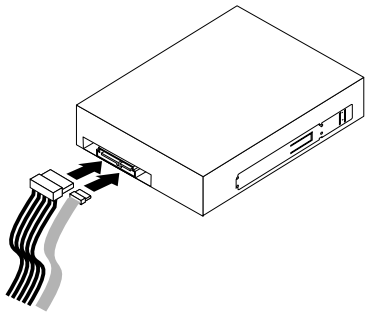


Figure 21. Connecting the optical drive

8. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 23.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 45.

Replacing the card reader

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

This section provides instructions on how to install or replace the card reader.

To replace the card reader, do the following:

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 23.
4. Locate the card reader. See “Locating components” on page 9.
5. Disconnect the card reader cable from the front USB connector on the system board. See “Locating parts on the system board” on page 10.
6. Press the blue retaining clip to remove the card reader out of the chassis.

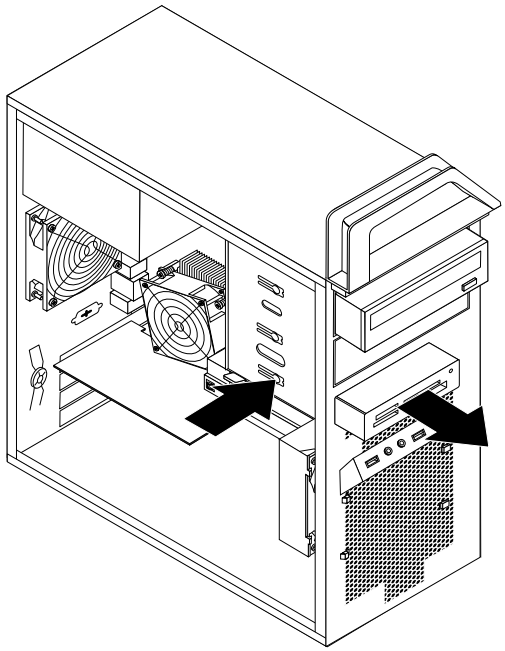


Figure 22. Removing the card reader

7. Install the card reader retainer on the side of the new card reader.

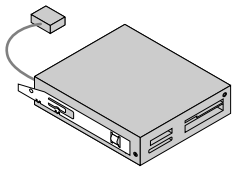
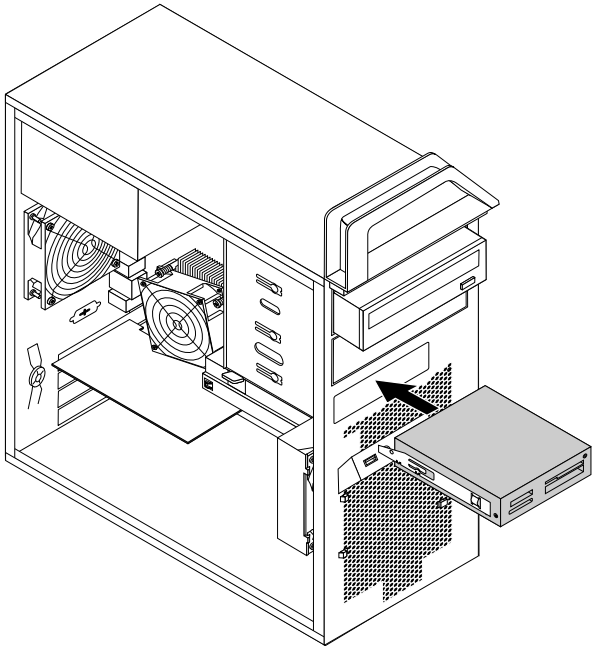


Figure 23. Installing the card reader retainer

8. Slide the new card reader into the drive bay until it snaps into position.



9. Reconnect the card reader cable to one of the available front USB connectors on the system board. See “Locating parts on the system board” on page 10.
10. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 23.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 45.

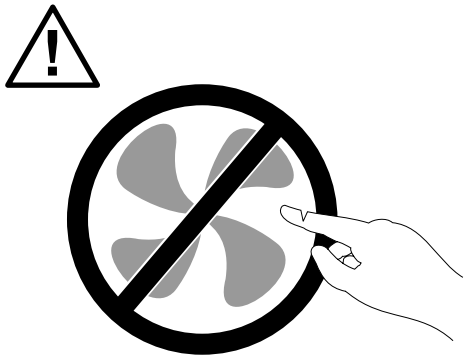
Replacing the power supply assembly

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

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

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

DANGER



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

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

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

To replace the power supply assembly, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. Disconnect the power supply assembly cables from the system board and all drives. See “Locating parts on the system board” on page 10.
4. Release the power supply assembly cables from the cable clips and ties in the chassis.

5. Lay the computer on its side and remove the four screws at the rear of the chassis that secure the power supply assembly.

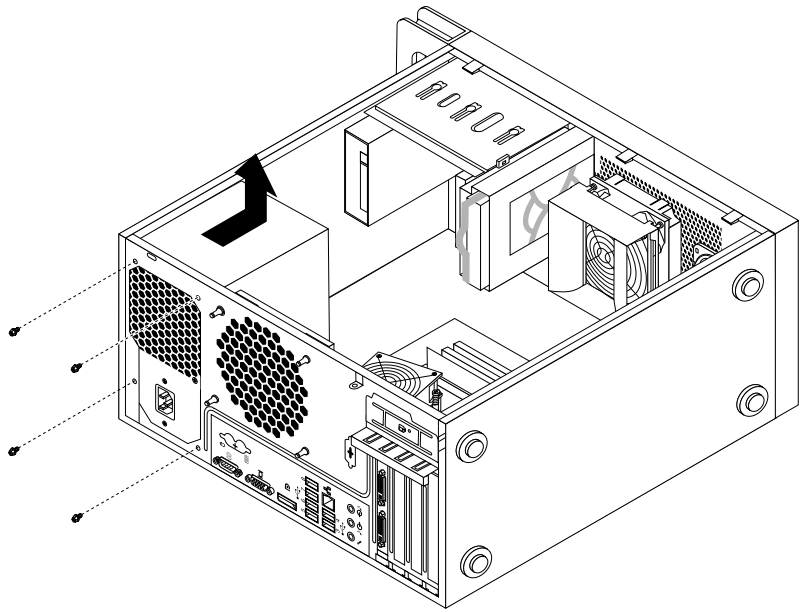


Figure 24. Removing the screws for the power supply assembly

6. Slide the power supply assembly to the front of the computer and then lift it out of the chassis.
7. Ensure that the new power supply assembly is the correct replacement.
8. Install the new power supply assembly into the chassis so that the screw holes in the power supply assembly align with those in the chassis.
9. Install and tighten the four screws to secure the power supply assembly.

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

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 45.

Replacing the heat sink and fan assembly

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

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

CAUTION:

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

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

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. Lay the computer on its side for easier access to the system board.
4. Locate the heat sink and fan assembly. See “Locating parts on the system board” on page 10.
5. Disconnect the heat sink and fan assembly cable from the microprocessor fan connector on the system board. See “Locating parts on the system board” on page 10.
6. Follow this sequence to remove the four screws that secure the heat sink and fan assembly to the system board:
   a. Partially remove screw **1**, then fully remove screw **2**, and then fully remove screw **1**.
   b. Partially remove screw **3**, then fully remove screw **4**, and then fully remove screw **3**.

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

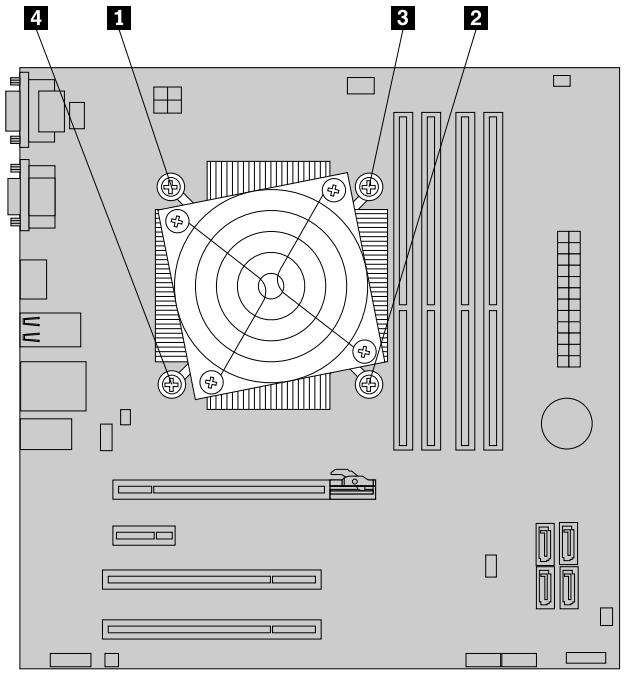


Figure 25. Removing the heat sink and fan assembly

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

   Notes:
   a. You might have to gently twist the heat sink and fan assembly to free it from the microprocessor.
   b. Do not touch the thermal grease while handling the heat sink and fan assembly.
8. Position the new heat sink and fan assembly on the system board so that the four screws are aligned with the holes on the system board.

   Note: Position the new heat sink and fan assembly so that the heat sink and fan assembly cable is toward the microprocessor fan connector on the system board.
9. Follow the following sequence to install the four screws to secure the new heat sink and fan assembly. Do not over-tighten the screws.
   a. Partially tighten screw **1**, then fully tighten screw **2**, and then fully tighten screw **1**.

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

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

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 45.

Replacing the primary hard disk drive

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

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

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

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. Locate the primary hard disk drive. See “Locating internal drives” on page 11.
4. Disconnect the signal cable and the power cable from the hard disk drive.
5. Press the blue release tab 1 down, slide the hard disk drive cage 2 to the rear of the computer, and then pivot it outward.

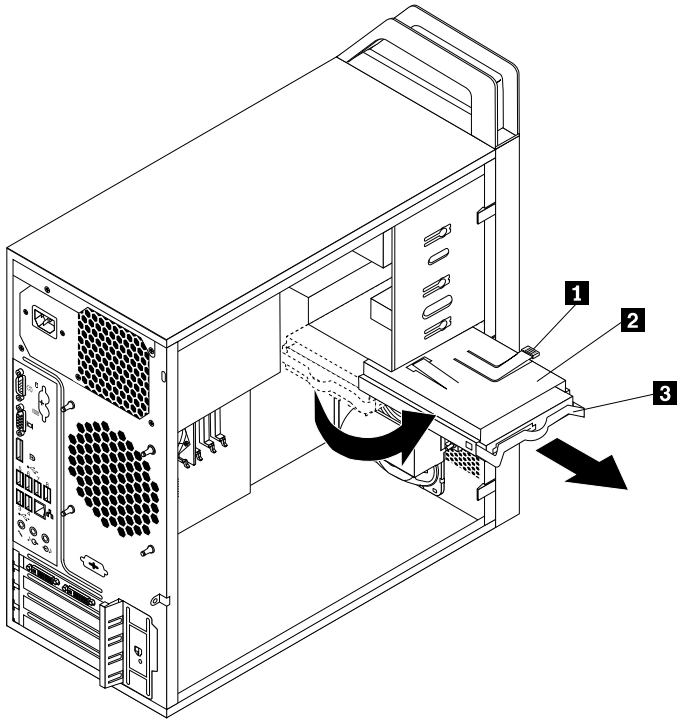


Figure 26. Removing the primary hard disk drive

6. Remove the hard disk drive cage from the chassis by sliding it outward.
7. Pull on the blue handle 3 to release and remove the hard disk drive from the drive cage.
8. Flex the sides of the blue bracket to remove the hard disk drive from the bracket.

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

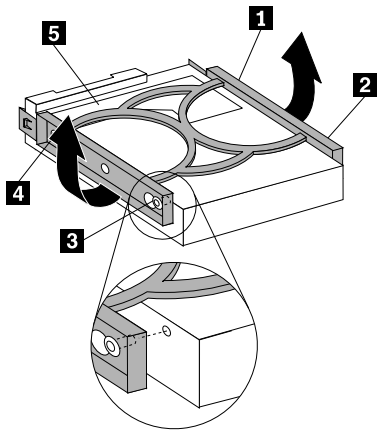


Figure 27. Installing the hard disk drive into the bracket

10. Slide the new hard disk drive into the drive cage until it snaps into position.
11. Align the drive cage pivot pin with the slot 1 in the upper drive cage and slide the hard disk drive cage into the chassis.
12. Connect the signal cable and the power cable to the new hard disk drive.

13. Press down on the metal latch **2** and pivot the drive cage into place, and then slide it to the front of the computer until it snaps into position.

    Note: There are two arrows, one on the upper drive cage and one on the hard disk drive cage. The arrows are aligned when the hard disk drive is in the proper position.

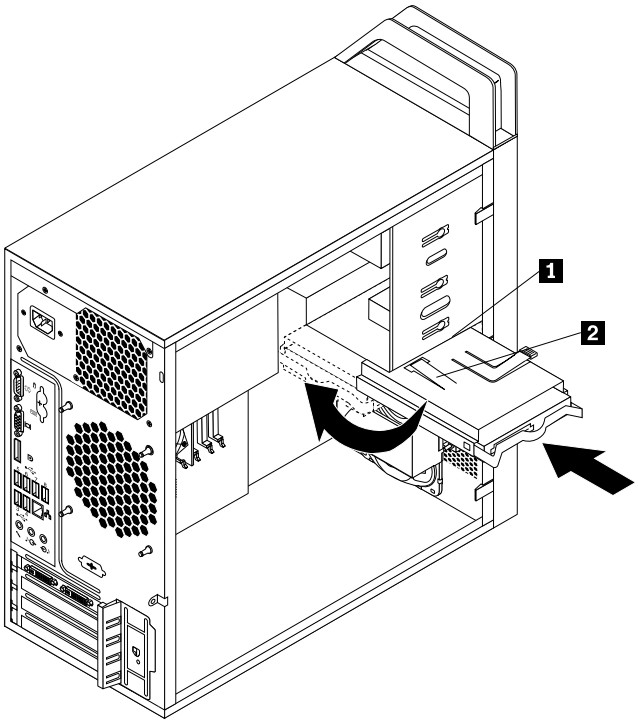


Figure 28. Installing the primary hard disk drive

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 45.

Replacing the secondary hard disk drive

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

Note: Depending on your model type, your computer might come with a secondary hard disk drive bay for installing or replacing a secondary hard disk drive.

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

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

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. Locate the secondary hard disk drive. See “Locating internal drives” on page 11.
4. Disconnect the signal cable and the power cable from the hard disk drive.

5. Press the blue release button to release the hard disk drive cage from the chassis.

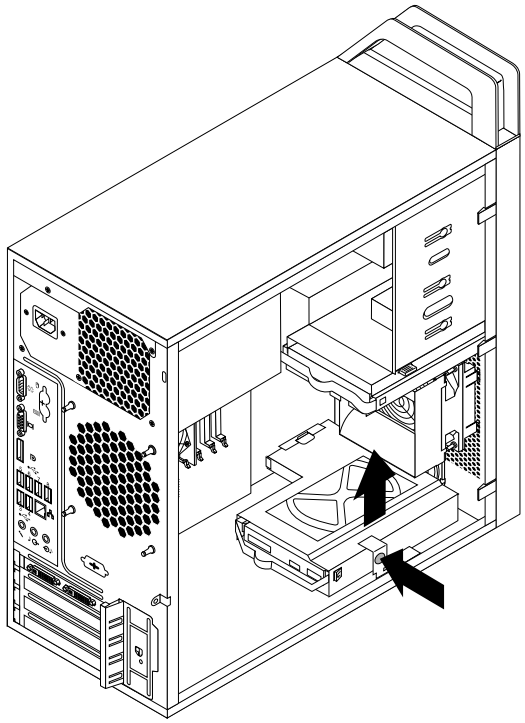


Figure 29. Removing the secondary hard disk drive

6. Remove the hard disk drive cage from the chassis by simply sliding it outward.
7. Pull on the blue handle to release and remove the hard disk drive from the hard disk drive cage.
8. Flex the sides of the blue bracket to remove the hard disk drive from the bracket.
9. To install a new hard disk drive into the blue bracket, flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the hard disk drive. Do not touch the circuit board **5** on the bottom of the hard disk drive.

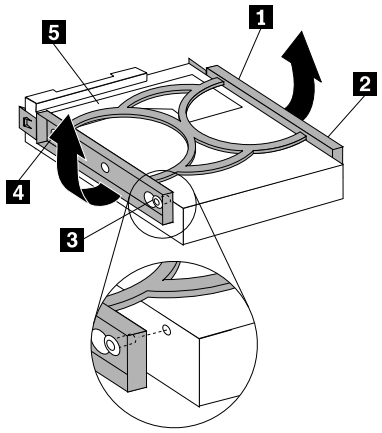


Figure 30. Installing the hard disk drive into the bracket

10. Slide the new hard disk drive into the hard disk drive cage until it snaps into position.

11. Install the hard disk drive cage into the chassis until it snaps into position underneath the metal tab. Make sure that the hard disk drive cage release button is secured in the chassis.

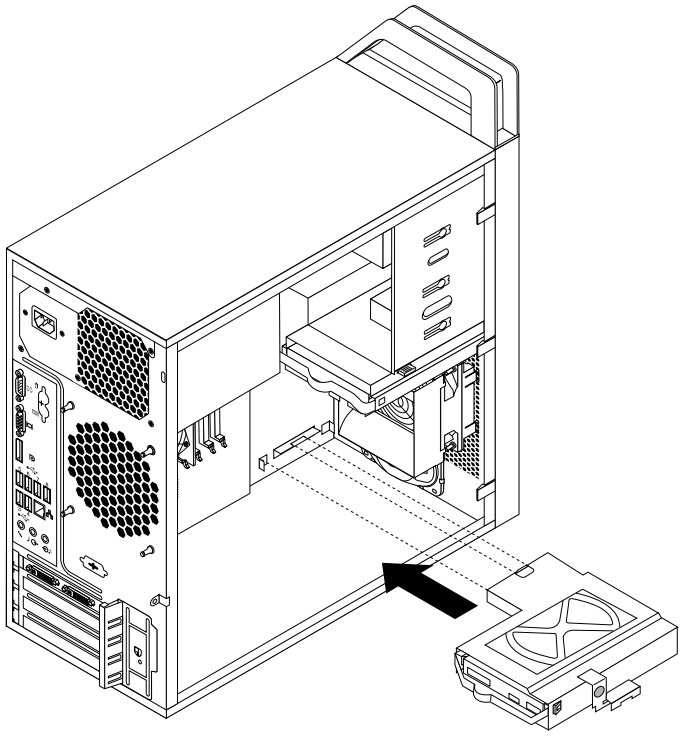


Figure 31. Installing the secondary hard disk drive

12. Connect the signal cable and the power cable to the new hard disk drive.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 45.

Replacing the front fan assembly

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

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

Note: The front fan assembly is only available in some models.

To replace the front fan assembly, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 23.
4. Disconnect the front fan assembly cable from the front fan connector on the system board. See “Locating parts on the system board” on page 10.

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

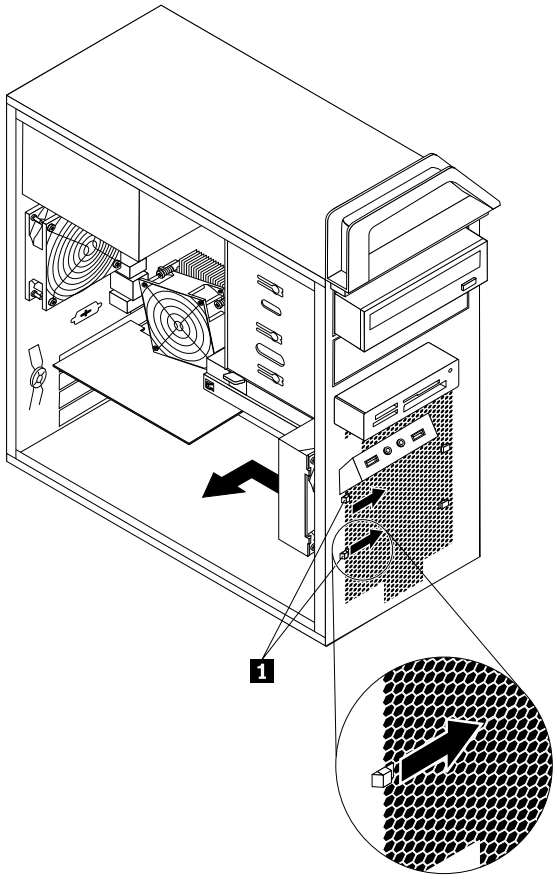


Figure 32. Removing the front fan assembly

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

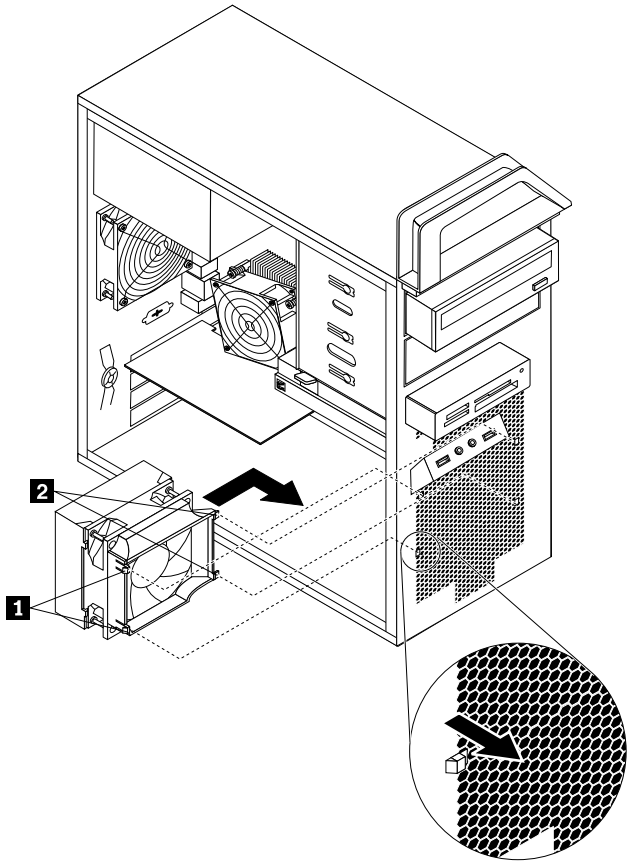


Figure 33. Installing the front fan assembly

7. Connect the front fan assembly cable to the front fan connector on the system board. See “Locating parts on the system board” on page 10.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 45.

Replacing the rear fan assembly

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

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

To replace the rear fan assembly, do the following:

1. Turn off the computer and disconnect all power cords from electrical outlets.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. Locate the rear fan assembly. See “Locating components” on page 9.

4. Disconnect the rear fan assembly cable from the rear fan connector on the system board. See “Locating parts on the system board” on page 10.
5. The rear fan assembly is attached to the chassis by four rubber mounts. Remove the rear fan assembly by breaking or cutting the rubber mounts and gently pulling the rear fan assembly out of the chassis.

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

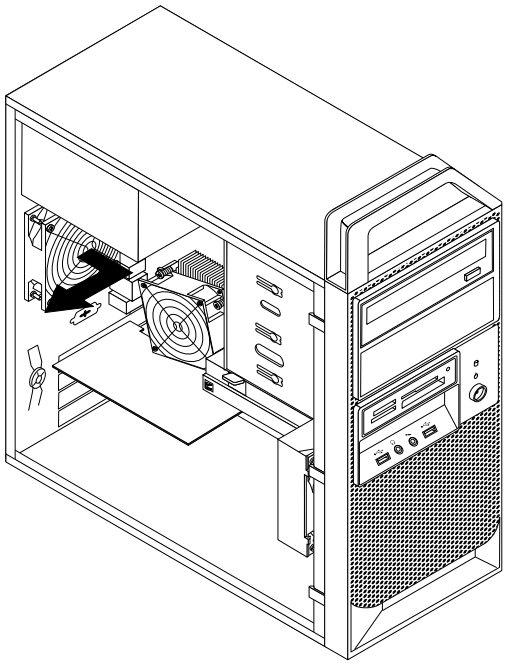


Figure 34. Removing the rear fan assembly

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

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

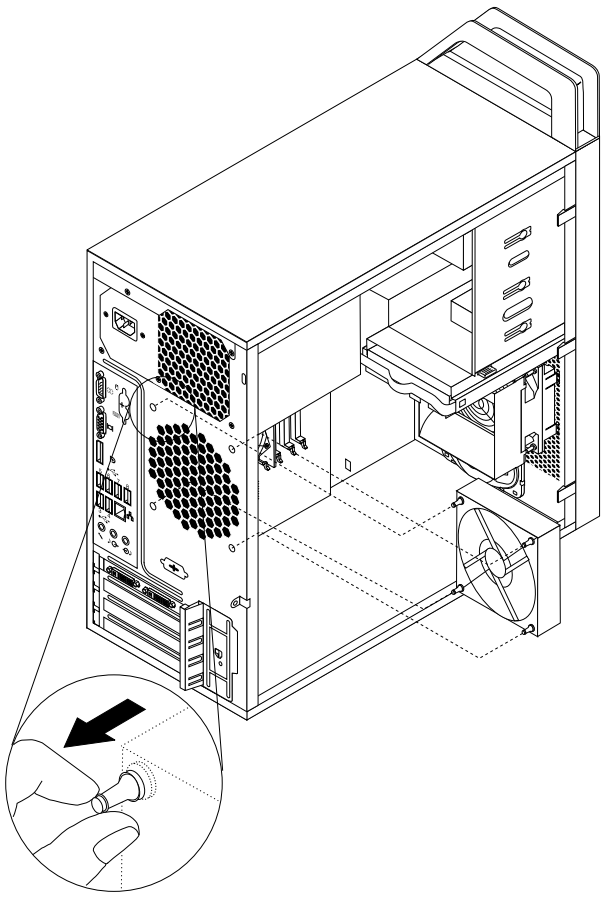


Figure 35. Installing the rear fan assembly

8. Connect the rear fan assembly cable to the rear fan connector on the system board. See “Locating parts on the system board” on page 10.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 45.

Replacing the keyboard or mouse

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

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

To replace the keyboard or mouse, do the following:

1. Remove any media from the drives. Then, turn off all attached devices and the computer.
2. Disconnect all power cords from electrical outlets.
3. Disconnect the old keyboard cable or mouse cable from the computer.

4. Connect a new keyboard or mouse to one of the USB connectors on the computer. Depending on where you want to connect the new keyboard or mouse, see “Locating connectors, controls, and indicators on the front of your computer” on page 6 or “Locating connectors on the rear of your computer” on page 7.

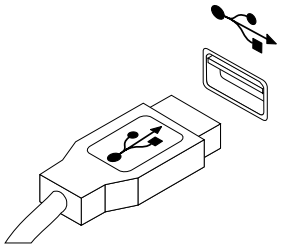


Figure 36. Connecting the USB keyboard or mouse

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 45.

Completing the parts replacement

After completing the installation or replacement for all parts, you need to reinstall the computer cover and reconnect cables. Depending on the parts you installed or replaced, you might need to confirm the updated information in the Setup Utility program. Refer to Chapter 6 “Using the Setup Utility program” on page 55.

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

1. Make sure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer. See “Locating components” on page 9 for the locations of various components in your computer.
2. If you have removed the front bezel, reinstall it. See “Removing and reinstalling the front bezel” on page 23.
3. Make sure that the cables are routed correctly before reinstalling the computer cover. Keep cables clear of the hinges and sides of the computer chassis to avoid interference with reinstalling the computer cover.

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

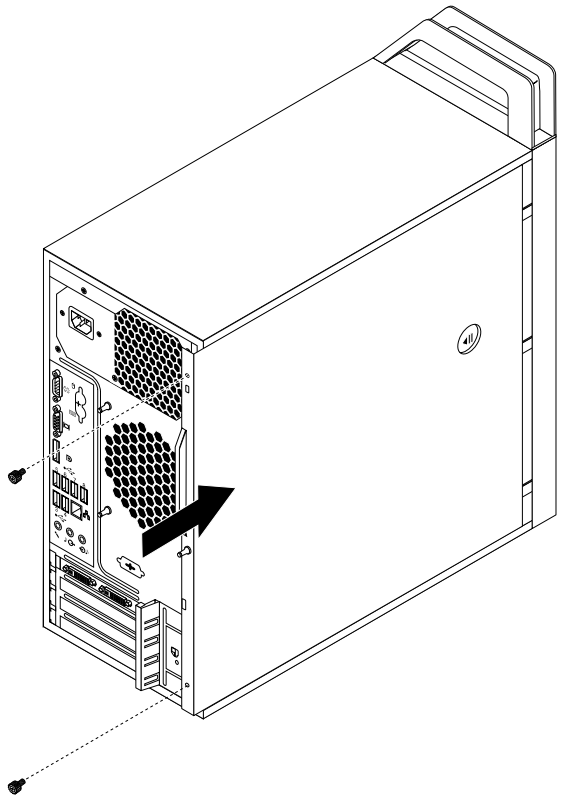


Figure 37. Reinstalling the computer cover

5. Install the screws to secure the computer cover.
6. If there is a padlock available, lock the computer cover. See “Locking the computer cover” on page 18.
7. If there is an integrated cable lock available, lock the computer. See “Attaching an integrated cable lock” on page 19.
8. Reconnect the external cables and power cords to the computer. See “Locating connectors on the rear of your computer” on page 7.
9. To update your configuration, refer to Chapter 6 “Using the Setup Utility program” on page 55.

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

Obtaining device drivers

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

Chapter 5. Recovery information

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

This chapter contains the following topics:

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

Notes:

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

Creating and using recovery media

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

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

Creating recovery media

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

Note: On the Windows 7 operating system, you can create recovery media using discs or external USB storage devices.

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

Using recovery media

This section provides instructions on how to use recovery media on the Windows 7 operating system.

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

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

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

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

Note: After restoring your computer hard disk drive to the factory default state, you might have to reinstall device drivers for some devices. See “Reinstalling device drivers” on page 52.

Performing backup and recovery operations

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

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

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

Performing a backup operation

This section provides instructions on how to perform a backup operation using the Rescue and Recovery program on the Windows 7 operating system.

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

1. From the Windows desktop, click **Start → All Programs → Lenovo ThinkVantage Tools → Enhanced Backup and Restore**. The Rescue and Recovery program opens.
2. In the Rescue and Recovery main window, click the **Launch advanced Rescue and Recovery** arrow.

3. Click **Back up your hard drive** and select backup operation options. Then, follow the instructions on the screen to complete the backup operation.

Performing a recovery operation

This section provides instructions on how to perform a recovery operation using the Rescue and Recovery program on the Windows 7 operating system.

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

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

For more information about performing a recovery operation from the Rescue and Recovery workspace, see "Using the Rescue and Recovery workspace" on page 49.

Using the Rescue and Recovery workspace

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

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

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

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

1. Make sure the computer is turned off.
2. Repeatedly press and release the F11 key when turning on the computer. When you hear beeps or see a logo screen, release the F11 key.
3. If you have set a Rescue and Recovery password, type your password when prompted. The Rescue and Recovery workspace opens after a short delay.

Note: If the Rescue and Recovery workspace fails to open, see “Solving recovery problems” on page 52.

4. Do one of the following:
   - To rescue files from your hard disk drive or from a backup, click **Rescue files** and follow the instructions on the screen.
   - To restore your hard disk drive from a Rescue and Recovery backup or to restore your hard disk drive to the factory default settings, click **Restore your system** and follow the instructions on the screen.

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

Note: After restoring your hard disk drive to the factory default state, you might have to reinstall device drivers for some devices. See “Reinstalling device drivers” on page 52.

Creating and using a rescue medium

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

Notes:

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

Creating a rescue medium

This section provides instructions on how to create a rescue medium on the Windows 7 operating system.

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

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

Using a rescue medium

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

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

3. In the Please select boot device window, select the USB hard disk drive as the first boot device and press Enter. The rescue medium starts.

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

Reinstalling preinstalled applications and device drivers

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

Reinstalling preinstalled applications

This section provides instructions on how to reinstall preinstalled applications.

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

1. Turn on the computer.
2. Use Windows Explorer or My Computer to display the directory structure of your hard disk drive.
3. Go to the C:\SWTOOLS directory.
4. Open the apps folder. Within the apps folder, there are several subfolders named for various applications installed in your computer.
5. Open the appropriate application subfolder.
6. In the application subfolder, look for a SETUP.EXE file or other appropriate EXE files for setup. Double-click the file and follow the instructions on the screen to complete the installation.

Reinstalling preinstalled device drivers

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

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

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

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

Reinstalling software programs

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

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

To reinstall the program, do one of the following:

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

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

Reinstalling device drivers

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

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

For more information about reinstalling device drivers that came with your computer, see “Reinstalling preinstalled applications and device drivers” on page 51.

Solving recovery problems

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

- Use a rescue medium to start the Rescue and Recovery workspace. See “Creating and using a rescue medium” on page 50.
- Use recovery media if all other methods of recovery have failed and you need to restore the hard disk drive to the factory default settings. See “Creating and using recovery media” on page 47.

Note: If you are unable to access the Rescue and Recovery workspace or the Windows environment from a rescue medium or recovery media, you might not have the rescue device (an internal hard disk drive, a disc, a USB hard disk drive, or other external devices) set as the first boot device in the startup device sequence. You must first make sure that your rescue device is set as the first boot device in the startup device sequence in the Setup Utility program. See “Selecting a startup device” on page 57 for detailed information about temporarily or permanently changing the startup device sequence. For more information about the Setup Utility program, see Chapter 6 “Using the Setup Utility program” on page 55.

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

Chapter 6. Using the Setup Utility program

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

Starting the Setup Utility program

To start the Setup Utility program, do the following:

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

   Note: If a Power-On Password or an Administrator Password has been set, the Setup Utility program menu will not be displayed until you type the correct password. For more information, see “Using passwords” on page 55.

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

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

Viewing and changing settings

The Setup Utility program menu lists various items about the system configuration. To view or change settings, start the Setup Utility program. See “Starting the Setup Utility program” on page 55. Then, follow the instructions on the screen.

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

Using passwords

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

- Power-On Password
- Administrator Password
- Hard Disk Password

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

Password considerations

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

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

Power-On Password

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

Administrator Password

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

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

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

Hard Disk Password

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

Notes:

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

Setting, changing, and deleting a password

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

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 55.
2. From the Setup Utility program main menu, select **Security**.
3. Depending on the password type, select **Set Power-On Password**, **Set Administrator Password**, or **Hard Disk Password**.
4. Follow the instructions on the right side of the screen to set, change, or delete a password.

   Note: A password can be any combination of up to 64 alphabetic and numeric characters. For more information, see “Password considerations” on page 55.

Erasing lost or forgotten passwords (clearing CMOS)

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

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

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. Locate the Clear CMOS /Recovery jumper on the system board. See “Locating parts on the system board” on page 10.
4. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
5. Reinstall the computer cover and connect the power cord. See “Completing the parts replacement” on page 45.
6. Turn on the computer and leave it on for approximately 10 seconds. Then, turn off the computer by holding the power switch for approximately five seconds.
7. Repeat step 1 and step 2.
8. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
9. Reinstall the computer cover and connect the power cord. See “Completing the parts replacement” on page 45.

Enabling or disabling a device

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

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

To enable or disable a device, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 55.
2. From the Setup Utility program main menu, select **Devices**.
3. Depending on the device you want to enable or disable, do one of the following:
   - Select **USB Setup** to enable or disable a USB device.
   - Select **ATA Drive Setup** to enable or disable an internal or external SATA device.
4. Select the desired settings and press Enter.
5. Press F10 to save and exit the Setup Utility program. See “Exiting from the Setup Utility program” on page 58.

Selecting a startup device

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

Selecting a temporary startup device

Use this procedure to select a temporary startup device.

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

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

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

Selecting or changing the startup device sequence

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

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 55.
2. From the Setup Utility program main menu, select **Startup**.
3. Select the devices for the Primary Startup Sequence, the Automatic Startup Sequence, and the Error Startup Sequence. Read the information displayed on the right side of the screen.
4. Press F10 to save and exit the Setup Utility program. See “Exiting from the Setup Utility program” on page 58.

Exiting from the Setup Utility program

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

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

Chapter 7. Configuring RAID

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

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

RAID Level

Your computer must have the minimum number of SATA hard disk drives installed for the supported level of RAID below:

- RAID Level 0 – Striped disk array
  - Two hard disk drives minimum
  - Better performance without fault tolerance
- RAID Level 1 – Mirrored disk array
  - Two hard disk drives minimum
  - Improved read performance and 100% redundancy

To install a secondary hard disk drive, refer to “Replacing the secondary hard disk drive” on page 38.

Configuring the system BIOS to enable SATA RAID functionality

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

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

To enable SATA RAID functionality, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 55.
2. Select **Devices → ATA Drive Setup**.
3. Select **Configure SATA as** and press Enter.
4. Select **RAID Mode** and press Enter.
5. Press F10 to save the new settings and exit the Setup Utility program.

Creating RAID volumes

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

To create RAID volumes, do the following:

1. Press Ctrl+I when prompted to enter the Intel Matrix Storage Manager option ROM configuration utility during the computer startup.
2. Use the up and down arrow keys to select **Create RAID Volume** and press Enter.
3. Type a proper RAID Volume name in the **Name** field and press Tab.
4. Use the arrow keys to select a RAID level in the **RAID Level** field and press Tab.
5. If appropriate, use the arrow keys to select a Stripe Size in the **Stripe Size** field and press Tab.
6. Type a volume size in the **Capacity** field and press Tab.

7. Press Enter to initiate volume creation.
8. When prompted, press Y to accept the warning message and create the volume.
9. Return to step 2 to create additional RAID volumes, or select **Exit** and press Enter.
10. Press Y when prompted to confirm the exit.

Deleting RAID volumes

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

To delete RAID volumes, do the following:

1. Press Ctrl+I when prompted to enter the Intel Matrix Storage Manager option ROM configuration utility during the computer startup.
2. Use the up and down arrow keys to select **Delete RAID Volume** and press Enter.
3. Use the arrow keys to select the RAID volume to be deleted and press Delete.
4. When prompted, press Y to confirm the deletion of the selected RAID volume. Deleting a RAID volume will reset the hard disk drives to non-RAID.
5. After deleting a RAID volume, you can:
   - Return to step 2 to delete additional RAID volumes.
   - See “Creating RAID volumes” on page 59 for RAID volume creation.
   - Use the up and down arrow keys to select **Exit** and press Enter.

Resetting disks to non-RAID

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

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

1. Press Ctrl+I when prompted to enter the Intel Matrix Storage Manager option ROM configuration utility during the computer startup.
2. Use the up and down arrow keys to select **Reset Disks to Non-RAID** and press Enter.
3. Use the arrow keys and the space key to mark individual physical hard disk drives to be reset, and then press Enter to complete the selection.
4. When prompted, press Y to confirm the reset action.
5. After completing the Reset Disks to Non-RAID function, you can:
   - See “Deleting RAID volumes” on page 60 for RAID volume deletion.
   - See “Creating RAID volumes” on page 59 for RAID volume creation.
   - Use the up and down arrow keys to select **Exit** and press Enter.

Chapter 8. Updating system programs

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

Using system programs

System programs are the basic layer of software built into your computer. System programs include the POST, the BIOS, and the Setup Utility program. The POST is a set of tests and procedures that are performed each time you turn on your computer. The BIOS is a layer of software that translates instructions from other layers of software into electrical signals that the computer hardware can execute. You can use the Setup Utility program to view or change the configuration settings of your computer. See Chapter 6 “Using the Setup Utility program” on page 55 for detailed information.

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

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

Updating (flashing) the BIOS from a disc

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

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

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

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

Updating (flashing) the BIOS from your operating system

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

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

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

Recovering from a POST/BIOS update failure

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

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the computer cover” on page 22.
3. Locate the Clear CMOS /Recovery jumper on the system board. See “Locating parts on the system board” on page 10.
4. Remove any cables that impede access to the Clear CMOS /Recovery jumper.
5. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
6. Reconnect any cables that were disconnected and reinstall the PCI card if removed.
7. Reinstall the computer cover and reconnect the power cords for the computer and monitor to electrical outlets. See “Completing the parts replacement” on page 45.
8. Turn on the computer and then insert the POST and BIOS update (flash update) disc into the optical drive. The recovery session begins. The recovery session will take two to three minutes. During this time, you will hear a series of beeps.
9. After the recovery session is completed, the series of beeps will end, and the system will automatically turn off. Remove the disc from the optical drive before the system completely turns off.
10. Repeat step 1 through step 4.
11. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
12. Reconnect any cables that were disconnected and reinstall the PCI card if removed.
13. Reinstall the computer cover and reconnect any cables that were disconnected.
14. Turn on the computer to restart the operating system.

Chapter 9. Troubleshooting and diagnostics

This chapter describes some basic troubleshooting and diagnostic programs. If your computer problem is not described here, see Chapter 10 “Getting information, help, and service” on page 67 for additional troubleshooting resources.

Basic troubleshooting

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

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

Symptom	Action
The computer does not start when you press the power switch.	Verify that: • The power cord is correctly connected to the rear of the computer and to a working electrical outlet. • If your computer has a secondary power switch on the rear of the computer, make sure that it is switched on. • The power indicator on the front of the computer is on. • The computer voltage matches the voltage available at the electrical outlet for your country or region.
The monitor screen is blank.	Verify that: • The monitor signal cable is correctly connected to the monitor and to the appropriate monitor connector on the computer. • The monitor power cord is correctly connected to the monitor and to a working electrical outlet. • The monitor is turned on and the brightness and contrast controls are set correctly. • The computer voltage matches the voltage available at the electrical outlet for your country or region. • If your computer has two monitor connectors, be sure to use the connector on the graphics card.
The keyboard does not work.	Verify that: • The computer is turned on. • The keyboard is securely connected to a USB connector on the computer. • No keys are stuck.
The mouse does not work.	Verify that: • The computer is turned on. • The mouse is securely connected to a USB connector on the computer. • The mouse is clean. Refer to “Cleaning an optical mouse” on page 65 for further information.

Symptom	Action
The operating system does not start.	Verify that: • The startup sequence includes the device where the operating system resides. Usually, the operating system is on the hard disk drive. For more information, see “Selecting a startup device” on page 57.
The computer beeps multiple times before the operating system starts.	Verify that no keys are stuck.

Diagnostic programs

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

Notes:

1. You can also download the PC-Doctor for DOS diagnostic program from http://www.lenovo.com/support. See “PC-Doctor for DOS” on page 64 for detailed information.
2. If you are unable to isolate and repair the problem yourself after running the programs, save and print the log files created by the programs. You will need the log files when you speak to a Lenovo technical support representative.

Lenovo ThinkVantage Toolbox

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

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

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

PC-Doctor for DOS

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

Creating a diagnostic disc

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

To create a diagnostic disc, do the following:

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

Running the diagnostic program from a diagnostic disc

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

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

1. Make sure the optical drive you want to use is set as the first boot device in the startup device sequence. See “Selecting or changing the startup device sequence” on page 58.
2. Make sure the computer is turned on and then insert the disc into the optical drive. The diagnostic program opens.

   Note: You can insert the disc into the optical drive when you are setting the startup device sequence. However, if you insert the disc into the optical drive when you have already entered the operating system, you need to restart the computer to access the diagnostic program.
3. Follow the instructions on the screen to select the diagnostic test you want to run.

   Note: For additional help, press the F1 key.
4. Remove the diagnostic disc from the optical drive when you complete the diagnostic process.

Cleaning an optical mouse

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

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

To clean an optical mouse, do the following:

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

b. If there is debris in the lens, gently blow the debris away from the area.

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

Chapter 10. Getting information, help, and service

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

Information resources

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

Lenovo ThinkVantage Tools

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

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

Lenovo Welcome

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

Help and Support

The Windows Help and Support information system guides you to various help and support information from Lenovo and Microsoft, such as updating drivers, accessing ThinkVantage Technologies, and accessing user manuals.

To access the Windows Help and Support information system, click **Start → Help and Support**.

Safety and Warranty

The *ThinkStation Safety and Warranty Guide* that is provided with your computer contains information on safety, setup, warranty, and notices. Read and understand all safety information before using this product.

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

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

- Shop for desktop, workstation, and notebook computers, monitors, projectors, upgrades and accessories for your computer, and special offers.
- Purchase additional services, such as support for hardware, operating systems, application programs, network setup and configuration, and custom installations.
- Purchase upgrades and extended hardware repair services.
- Download the latest device drivers and software updates for your computer model.
- Access the online manuals for your products.
- Access the Lenovo Limited Warranty.
- Access troubleshooting and support information for your computer model and other supported products.
- Find the service and support phone numbers for your country or region.
- Find a Service Provider located near you.

Lenovo Support Web site

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

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

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

Help and service

This section contains information about obtaining help and service.

Using the documentation and diagnostic programs

If you experience a problem with your computer, see Chapter 9 “Troubleshooting and diagnostics” on page 63. For information on additional resources to help you troubleshoot your computer problem, see “Information resources” on page 67.

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

Most computers come with a set of diagnostic programs that help you identify hardware problems. For instructions on using the diagnostic programs, see “Diagnostic programs” on page 64.

You can also get the latest technical information and download device drivers and updates from Lenovo Support Web site at:
http://www.lenovo.com/support

Calling for service

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

The following services are available during the warranty period:

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

These items are not covered by the warranty:
- Replacement or use of parts not manufactured for or by Lenovo or non-warranted Lenovo parts

- Identification of software problem sources
- Configuration of BIOS as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

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

For a list of the Lenovo Support phone numbers for your country or region, go to http://www.lenovo.com/support/phone or refer to the *ThinkStation Safety and Warranty Guide* that comes with your computer.

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

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

Using other services

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

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

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

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

Purchasing additional services

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

Appendix A. Notices

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

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1009 Think Place - Building One
Morrisville, NC 27560
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Attention: Lenovo Director of Licensing

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

Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

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Lenovo
The Lenovo logo
Rescue and Recovery
ThinkStation
ThinkVantage

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

Intel, Intel Core, Pentium, and Xeon are trademarks of Intel Corporation in the United States, other countries, or both.

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

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

Appendix B. Regulatory information

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.

Television output notice

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

This product incorporates copyright protection technology that is protected by method claims of certain U.S. patents and other intellectual property rights owned by Macrovision Corporation and other rights owners. Use of this copyright protection technology must be authorized by Macrovision Corporation, and is intended for home and other limited viewing uses only unless otherwise authorized by Macrovision Corporation. Reverse engineering or disassembly is prohibited.

EU-EMC Directive (2004/108/EC) EN 55022 class B Statement of Compliance

CE

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.

Japanese VCCI Class B 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

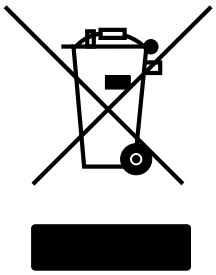
Japanese compliance for products less than or equal to 20 A per phase

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

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

Important information for the European Directive 2002/96/EC



EU Only

The Waste Electrical and Electronic Equipment (WEEE) mark applies only to countries within the European Union (EU) and Norway. Appliances are labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive. Users of electrical and electronic equipment (EEE) with the WEEE marking per Annex IV of the WEEE Directive must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, recovery of WEEE and minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. For additional WEEE information go to: http://www.lenovo.com/lenovo/environment.

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

Die WEEE-Kennzeichnung gilt nur in Ländern der Europäischen Union und in Norwegen. Geräte werden gemäß der Richtlinie 2002/96/EC der Europäischen Union über Elektro- und Elektronikaltgeräte (WEEE) gekennzeichnet. Die Richtlinie regelt die Rückgabe und Wiederverwertung von Altgeräten innerhalb der Europäischen Union. Mit dieser Kennzeichnung versehene Altgeräte dürfen gemäß dieser Richtlinie nicht weggeworfen werden, sondern müssen zurückgegeben werden. Anwender von Elektro- und Elektronikgeräten mit der WEEE-Kennzeichnung dürfen diese gemäß Annex IV der WEEE-Richtlinie nach ihrem Gebrauch nicht als allgemeinen Hausmüll entsorgen. Stattdessen müssen diese Geräte im verfügbaren

Sammelsystem zurückgegeben werden und damit einem Recycling- oder Wiederherstellungsprozess zugeführt werden, bei dem mögliche Auswirkungen der Geräte auf die Umwelt und den menschlichen Organismus aufgrund gefährlicher Substanzen minimiert werden. Weitere Informationen zur Entsorgung von Elektro- und Elektronikaltgeräten finden Sie unter der Adresse: http://www.lenovo.com/lenovo/environment.

La marca de Residuos de equipos eléctricos y electrónicos (WEEE) se aplica sólo a los países pertenecientes a la Unión Europea (UE) y a Noruega. Los aparatos se etiquetan conforme a la Directiva Europea 2002/96/EC relativa a los residuos de equipos eléctricos y electrónicos (WEEE). La directiva determina el marco para devolver y reciclar los aparatos usados según sea aplicable en toda la Unión Europea. Esta etiqueta se aplica a varios productos para indicar que el producto no se va a desechar, sino que va ser reclamado por esta Directiva, una vez termine su ciclo de vida. Los usuarios de los equipos eléctricos y electrónicos (EEE) con la marca WEEE por el Anexo IV de la Directiva WEEE no deben tratar los EEE como desperdicios municipales no clasificados, una vez terminado su ciclo de vida, sino que deben utilizar el marco de recogida disponible para devolver, reciclar y recuperar los WEEE y minimizar los posibles efectos de los EEE en el medio ambiente y en la salud debidos a la presencia de substancias peligrosas. Para obtener información adicional acerca de WEEE consulte el sitio: http://www.lenovo.com/lenovo/environment.

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

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

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

schadelijke stoffen kunnen hebben op het milieu en de volksgezondheid, tot een minimum te beperken. Voor meer informatie over WEEE gaat u naar: http://www.lenovo.com/lenovo/environment.

WEEE-mærkningen (Waste Electrical and Electronic Equipment) gælder kun for lande i EU samt Norge. Udstyr mærkes i henhold til EU's direktiv 2002/96/EF om affald af elektrisk og elektronisk udstyr (WEEE). Direktivet fastlægger de rammer, der gælder for returnering og genbrug af brugt udstyr i EU. Mærkaten påsættes forskellige produkter for at angive, at produktet ikke må smides væk, når det er udtjent, men skal genvindes i henhold til dette direktiv. Brugere af elektrisk og elektronisk udstyr (EEE), der er mærket med WEEE-mærket som angivet i Bilag IV til WEEE-direktivet, må ikke bortskaffe brugt EEE som usorteret husholdningsaffald, men skal bruge den indsamlingsordning, der er etableret, så WEEE kan returneres, genbruges eller genvindes. Formålet er at minimere den eventuelle påvirkning af miljøet og menneskers sundhed som følge af tilstedeværelsen af skadelige stoffer. Der er flere oplysninger om affald af elektrisk og elektronisk udstyr på adressen http://www.lenovo.com/lenovo/environment.

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

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

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

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

廃電気電子機器指令（WEEE）マークは EU 諸国とノルウェーにのみ適用されます。この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC（WEEE）のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。WEEE 指令の付則（Annex）IV 規則によりマークされた電気/電子機器（EEE）の使用者は、使用済みの電気・電子機器を地方自治体の無分別ゴミとして廃棄することは許されず、機器に含まれる有害物質が環境や人体へ与える悪影響を最小に抑えるためにお客様が利用可能な廃電気・電子機器の返却、リサイクル、あるいは再生のための回収方法を利用しなければなりません。WEEE の詳細については、次のWebサイトを参照してください。
Http://www.lenovo.com/lenovo/environment

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

Recycling information

Lenovo encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. Lenovo offers a variety of programs and services to assist equipment owners in recycling their IT products. For information on recycling Lenovo products, go to:
http://www.lenovo.com/lenovo/environment/recycling

環境配慮に関して

本機器またはモニターの回収リサイクルについて

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

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

重金属を含む内部部品の廃棄処理について

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

Collecting and recycling a disused Lenovo computer or monitor

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

Disposing of Lenovo computer components

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

Disposing of disused lithium batteries from Lenovo computers

A button-shaped lithium battery is installed on the system board of your Lenovo computer to provide power to the computer clock while the computer is off or disconnected from the main power source. If you want to replace it with a new one, contact your place of purchase or ask for a repair service provided by Lenovo. If you have replaced it by yourself and want to dispose of the disused lithium battery, insulate it with vinyl tape, contact your place of purchase, and follow their instructions. If you use a Lenovo computer at home and need to dispose of a lithium battery, you must comply with local ordinances and regulations.

Appendix D. Power cord notice

For your safety, Lenovo provides a power cord with a grounded attachment plug to use with this product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

Power cords provided by Lenovo in the United States and Canada are listed by Underwriters Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

Power cords provided by Lenovo for a specific country or region are usually available only in that country or region.

For units intended to be operated in Germany: The power cords shall be safety approved. For Germany, it shall be H05VV-F, 3G, 0.75 mm^2, or better. For other countries, the suitable types shall be used accordingly.

Power cord part number	Used in these countries and regions
41R3176 or 41R3177	Argentina, Paraguay, Uruguay
41R3184, 41R3185, or 54Y8257	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Canada, Cayman Islands, Costa Rica, Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Montserrat, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, (Thailand), Turks and Caicos Islands, United States, Venezuela, Virgin Islands
41R3196 or 41R3197	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea
41R3208, 41R3209, or 54Y8259	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Côte d'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Gabon, Georgia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Montenegro, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Zaire

Power cord part number	Used in these countries and regions
41R3212 or 41R3213	Denmark
41R3220 or 41R3221	Bangladesh, Lesotho, Macao S.A.R. of China, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda
41R3224 or 41R3225	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, Cyprus, Dominica, Gambia, Ghana, Grenada, Guyana, Hong Kong S.A.R. of China, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Saudi Arabia, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe
41R3228 or 41R3229	Liechtenstein, Switzerland
41R3232 or 41R3233	Chile, Italy, Libya Arab Jamahiriya
41R3236 or 41R3237	Israel
43N9057 or 43N9058	Japan
41R3256 or 41R3257	China
41R3260 or 41R3261	Korea (Democratic People's Republic of), Korea (Republic of)
41R3271 or 45J9595	Brazil
41R3278 or 41R3279	Taiwan
41R3175 or 41R3341	India
43N9029 or 43N9030	Thailand

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