Lenovo

ThinkStation®

ThinkStation P910
User Guide

Machine Types: 30B8 and 30B9

Note: Before using this information and the product it supports, be sure to read and understand the "Read this first: Important safety information" on page v and Appendix G "Notices" on page 155.

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Read this first: Important safety information

This chapter contains the safety information that you must be familiar with.

Before using this manual

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

If you no longer have a copy of the *Safety, Warranty, and Setup Guide*, you can obtain a Portable Document Format (PDF) version from the Lenovo® Support Web site at http://www.lenovo.com/support. The Lenovo Support Web site also provides the *Safety, Warranty, and Setup Guide* and this *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 ensure that the power is turned off and that the product is unplugged from any power source. For more information about CRUs, refer to Chapter 7 "Installing or replacing hardware" on page 59. If you have any questions or concerns, contact the Customer Support Center.

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

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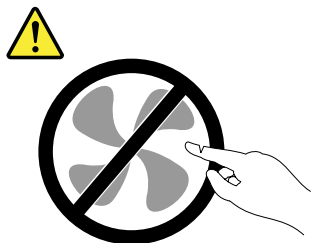
Hazardous moving parts. Keep fingers and other body parts away.

CAUTION:

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

Static electricity prevention

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

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

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

Power cords and power adapters

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

The power cords shall be safety approved. For Germany, it shall be H05VV-F, 3G, 0.75 mm^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.

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 connected 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) cables while the computer power is on; otherwise, you might damage your computer. To avoid possible damage to connected 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 storage drive.

Do not place any beverages on top of or beside the computer or other connected devices. If liquid is spilled on or in the computer or a connected 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.

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.

Chapter 1. Product overview

This chapter provides information about the following topics:

Hardware locations

This section provides information about the locations of your computer hardware.

Note: The computer hardware might look slightly different from the illustrations.

Front view
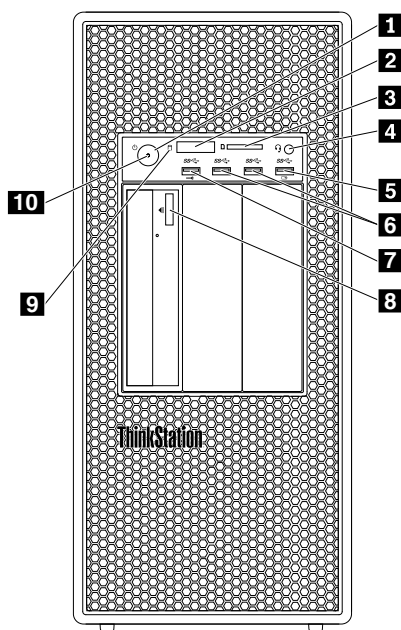
Figure 1. Front connectors, controls, and indicators

1 Power button	**2** Four-digit diagnostic display
3 SD card slot	**4** Headset connector
5 Always On USB 3.0 connector	**6** USB 3.0 connectors (2)
7 Diagnostic USB 3.0 connector	**8** Optical-drive eject/close button (some models)
9 Hard-disk-drive activity indicator	**10** Power indicator

Note: The orientation of the ThinkStation® logo plate on the front of your computer is adjustable. When you lay the computer on its side, you can slightly pull out the logo plate, turn it 90-degree counterclockwise, and then push it back in.

1 **Power button**

Press the power button to turn on your computer. If your computer is unresponsive, you can turn off the computer by pressing and holding the power button for four or more seconds.

2 **Four-digit diagnostic display**

The four-digit diagnostic display on the front of the computer displays text and a numerical error code when the computer detects an issue or error.

3 **SD card slot**

Insert a secure digital (SD) card into the slot so that the data on the card can be accessed and read.

4 **Headset connector**

Connect the headset to your computer through the headset connector.

5 **Always On USB 3.0 connector**

Connect a USB-compatible device, such as a USB keyboard, mouse, storage drive, or printer, to this connector. With the power cord connected, you can charge the connected USB device even when the computer is in hibernation mode or turned off. If the Always On USB connector function is not enabled, open the Power Manager program and enable the function. To open the Power Manager program, see "Accessing a program on your computer" on page 14. To enable the Always On USB connector, refer to the help system of the Power Manager program.

6 **USB 3.0 connector**

Connect a USB-compatible device, such as a USB keyboard, mouse, storage drive, or printer, to this connector.

7 **Diagnostic USB 3.0 connector**

When a system error is detected, the diagnostic indicator blinks. In this case, if you connect an FAT32 format USB flash drive to the connector, the error-related log can be automatically downloaded from the diagnostic USB 3.0 connector to the USB flash drive.

8 **Optical-drive eject/close button**

Press the button to eject or close the tray of the optical drive.

9 **Hard-disk-drive activity indicator**

Indicate the status of the internal storage drives (such as hard disk drives or solid-state drives).

On: The storage drives are ready for use.

Off when computer powered on: The storage drives do not work properly or other problems occur.

10 **Power indicator**

When the power indicator is on, the computer is turned on.

Rear view

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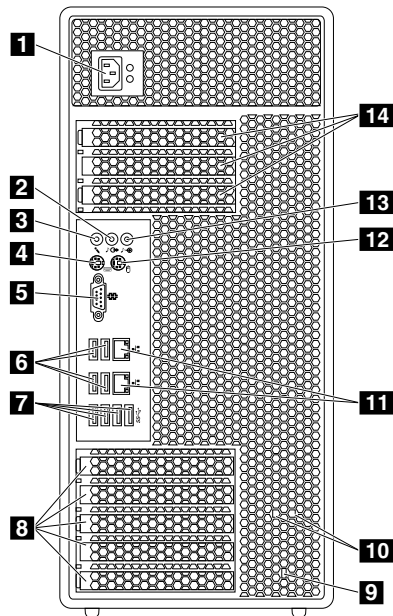
Figure 2. Rear connectors

1 Power cord connector		**2** Audio line-out connector	
3 Microphone connector		**4** PS/2 keyboard connector	
5 Serial connector		**6** USB 2.0 connectors (4)	
7 USB 3.0 connectors (4)		**8** PCI card area (PCI cards available vary by computer model)	
9 Security-lock slot		**10** Key-nest slots	
11 Ethernet connectors (2)		**12** PS/2 mouse connector	
13 Audio line-in connector		**14** PCI card area (PCI cards available vary by computer model)	

Notes:

- A discrete graphics card or a network interface card can be installed in the appropriate Peripheral Component Interconnect (PCI) or PCI Express card slot. If such a card is installed, ensure that you use the connectors on the card instead of the corresponding connectors on the computer.
- Depending on your computer model, one or more graphics cards might be installed to provide the following connectors:
  - DisplayPort® connector
  - Digital Visual Interface (DVI) connector
  - Mini DisplayPort® connector

DisplayPort connector

Attach a high-performance monitor, a direct-drive monitor, or other compatible devices to the DisplayPort connector.

DVI monitor connector

Attach a DVI monitor or other compatible devices to the DVI monitor connector.

Mini DisplayPort connector

Attach a high-performance monitor, a direct-drive monitor, or other compatible devices to the Mini DisplayPort connector. The Mini DisplayPort connector is a miniaturized version of a DisplayPort connector.

1 Power cord connector

Connect the power cord to your computer for power supply.

2 Audio line-out connector

The audio line-out connector is used to send audio signals from the computer to external devices, such as headphones.

3 Microphone connector

Attach a microphone to your computer through the microphone connector when you want to record sound or if you use speech-recognition software.

4 PS/2 keyboard connector

Attach a Personal System/2 (PS/2) keyboard to the PS/2 keyboard connector.

5 Serial connector

Connect an external modem, a serial printer, or other devices that use a 9-pin serial connector to the serial connector.

6 USB 2.0 connectors (4)

Connect a USB-compatible device, such as a USB keyboard, mouse, storage drive, or printer, to this connector.

7 USB 3.0 connectors (4)

Connect a USB-compatible device, such as a USB keyboard, mouse, storage drive, or printer, to this connector.

8 14 PCI card area (PCI cards available vary by model)

To improve the operating performance of your computer, you can install PCI/PCI-Express cards into this area. Depending on your computer model, the cards already installed in this area might vary.

9 Security-lock slot

Attach a Kensington-style cable lock to the security-lock slot to secure your computer. For more information, see "Attaching a Kensington-style cable lock" on page 31.

10 Key-nest slots

Install the key holder that comes with the computer cover lock key to the key-nest slots.

11 Ethernet connectors (2)

Attach an Ethernet cable for a local area network (LAN).

Note: To operate the computer within Federal Communications Commission (FCC) Class B limits, use a Category 5 Ethernet cable.

12 PS/2 mouse connector

Attach a PS/2 mouse, a trackball, or other pointing devices that use a PS/2 mouse connector.

13 Audio line-in connector

The audio line-in connector is used to receive audio signals from an external audio device, such as a stereo system. When you attach an external audio device, a cable connection is established between the audio line-out connector of the device and the audio line-in connector of the computer.

Computer components

Notes:

- Depending on the model, your computer might look slightly different from the illustration.

- To remove the computer cover, see "Preparing your computer and removing the computer cover" on page 59.
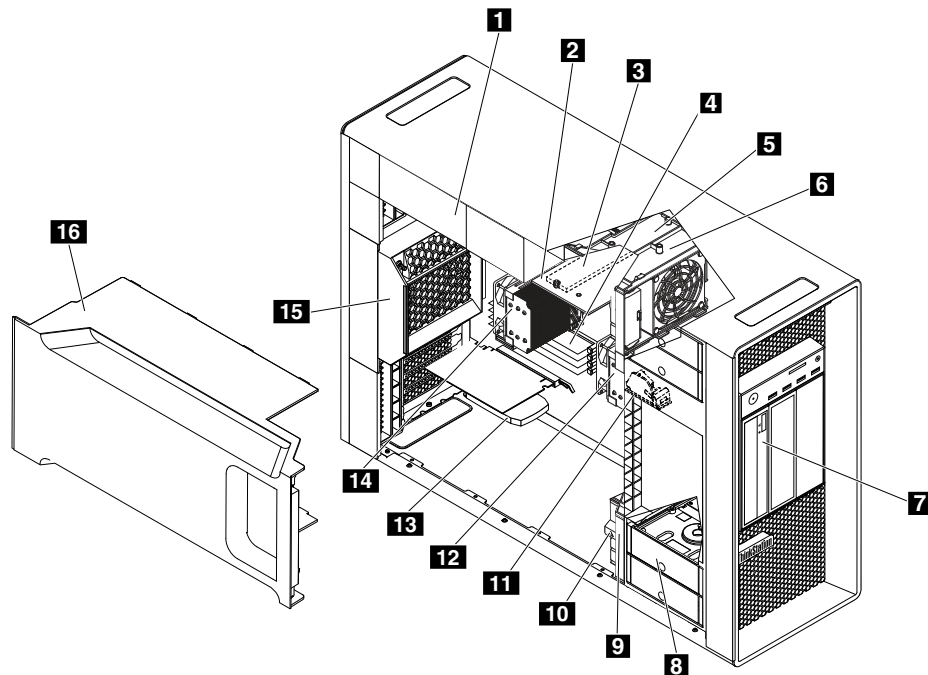
Figure 3. Component locations

1 Power supply assembly	**2** Flex adapter (some models)
3 M.2 solid-state drive (some models)	**4** Memory modules (amount varies by model)
5 Multi-function bracket	**6** Front fan assembly
7 Optical drive, flex module or flex bay storage enclosure (amount and combination vary by model)	**8** Hard disk drive, hybrid drive, or solid-state drive (amount and combination vary by model)
9 Front fan assembly	**10** Multi-function bracket
11 Cover presence switch (intrusion switch)	**12** Heat sink and fan assembly 1
13 PCI card (vary by computer model)	**14** Heat sink and fan assembly 2 (some models)
15 Rear fan assembly	**16** Direct cooling air baffle

Parts on the system board

The following illustration shows the locations of the parts on the system board.
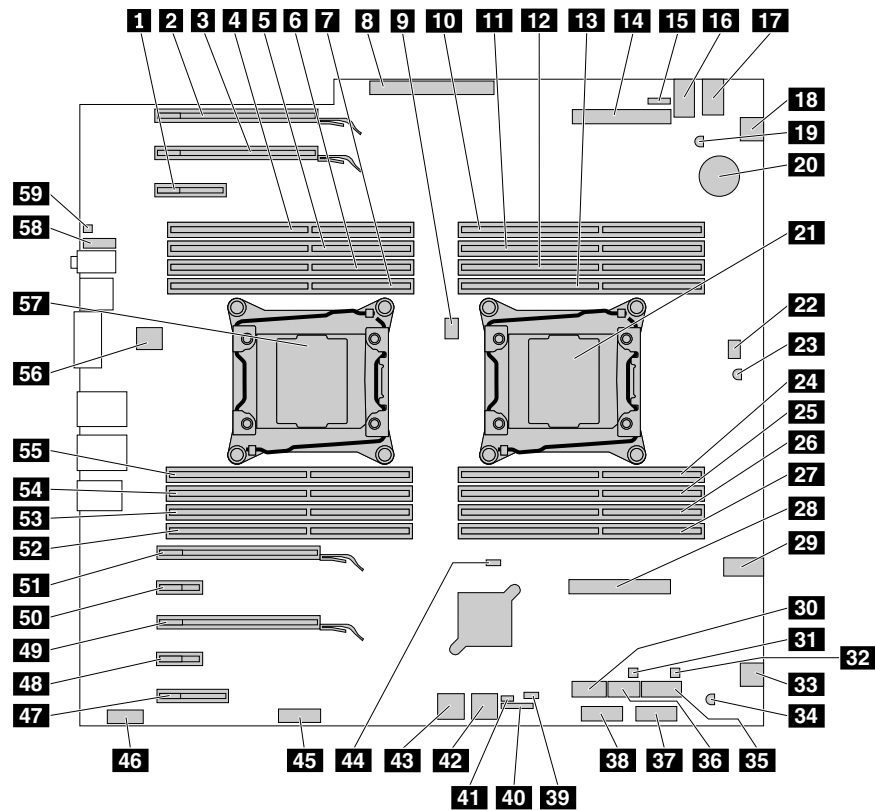
Figure 4. Parts on the system board

1 PCI Express 2.0 x4 card slot	**2** PCI Express 3.0 x16 graphics card slot
3 PCI Express 3.0 x16 graphics card slot	**4** Memory slot
5 Memory slot	**6** Memory slot
7 Memory slot	**8** Power supply connector
9 Microprocessor fan connector 2	**10** Memory slot
11 Memory slot	**12** Memory slot
13 Memory slot	**14** Flex adapter slot 2
15 Optical-drive fan connector	**16** 4-pin power connector
17 4-pin power connector	**18** Front fan assembly connector
19 Thermal sensor	**20** Battery
21 Microprocessor 1	**22** Microprocessor fan connector 1
23 Thermal sensor	**24** Memory slot
25 Memory slot	**26** Memory slot
27 Memory slot	**28** Flex adapter slot 1
29 4-pin power connector	**30** eSATA connector

31 Front-access storage enclosure control connector (for SATA 5 connector)	**32** Front-access storage enclosure control connector (for SATA 6 connector)
33 Front fan assembly connector	**34** Thermal sensor
35 SATA 6 connector	**36** SATA 5 connector
37 29-in-1 card reader connector	**38** Front USB 3.0 connector
39 Cover presence switch connector (intrusion switch connector)	**40** Thunderbolt™ adapter control connector
41 Internal-storage-drive activity indicator connector (used only with a 9364 RAID card)	**42** SATA 1/SATA 2 connector
43 SATA 3/SATA 4 connector	**44** Clear CMOS /Recovery jumper
45 Front panel connector	**46** Seven-segment indicator
47 PCI Express 2.0 x4 card slot	**48** PCI Express 2.0 x1 card slot
49 PCI Express 3.0 x16 graphics card slot	**50** PCI Express 2.0 x1 card slot
51 PCI Express 3.0 x16 graphics card slot	**52** Memory slot
53 Memory slot	**54** Memory slot
55 Memory slot	**56** Rear fan assembly connector
57 Microprocessor 2 (some models)	**58** Front audio connector
59 Internal speaker connector	

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.

When you install or replace an internal drive, note the type and size of the drive that each bay supports and correctly connect the required cables. Refer to the appropriate section inChapter 7 "Installing or replacing hardware" on page 59 for instructions on how to install or replace internal drives for your computer.

The following illustration shows the locations of the drive bays.
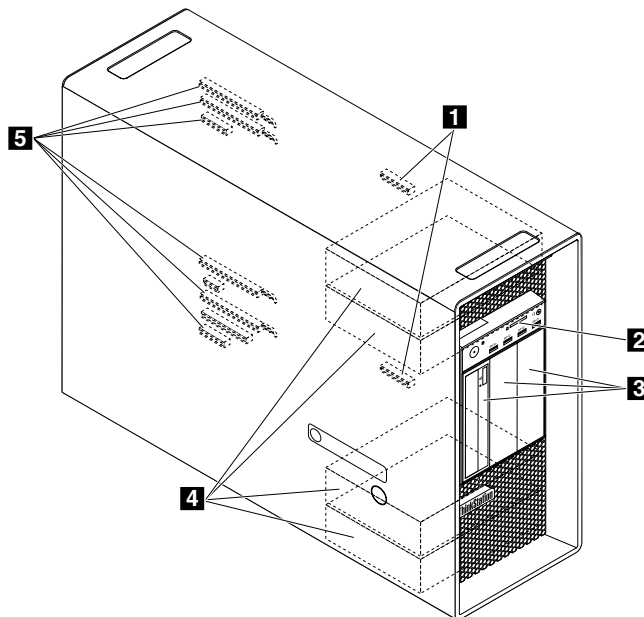
Figure 5. Drive bay locations

1 Flex adapter slots	**2** SD card slot
3 Optical-drive bays	**4** Storage drive bays
5 PCI Express card slots	

1 Flex adapter slots

Depending on your computer model, the following flex adapters might be installed in the flex adapter slots:

- Flex adapter with two mini Serial Attached SCSI (SAS) high-density (HD) connectors
- Flex adapter with one Serial Advanced Technology Attachment (SATA) 3.0 connector, one USB 2.0 connector, and two mini-SAS HD connectors
- Flex adapter with two M.2 slots (with the M.2 solid-state drive installed in some models)

2 SD card slot (with an SD card installed in some models)

3 Optical-drive bays

Depending on your computer model, the following devices might be installed in the optical-drive bays:

- Optical drive
- Flex module

  Note: The flex module might be installed with the following:

  – IEEE 1394 connector
  – eSATA connector
  – 29-in-1 card reader
  – Slim optical drive

- Flex bay storage enclosure

4 Storage drive bays (with hard disk drives, solid-state drives or hybrid drives installed in some bays)

5 PCI Express x16 graphics card slots and PCI Express x4 card slots (with PCI Express solid-state drives or other PCI cards installed in some models)

Machine type and model label

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

The machine type and model label is attached on the front of your computer as shown.

Machine Type: XXXX
Model Number: XXX

Figure 6. Machine type and model label

Computer features

For your specific computer model, some features might vary or not apply.

Information about your computer

- To view basic information (such as microprocessor and memory information) about your computer, do the following:

    1. Click the Start button to open the Start menu.

    2. Depending on your Microsoft® Windows® operating system version, do one of the following:

        – For Windows 7: Right-click **Computer**, and then click **Properties**.

        – For Windows 10: Click **Settings** ➙ **System** ➙ **About**.

- To view detailed information about the devices (such as the optical drive and network adapters) on your computer, do the following:

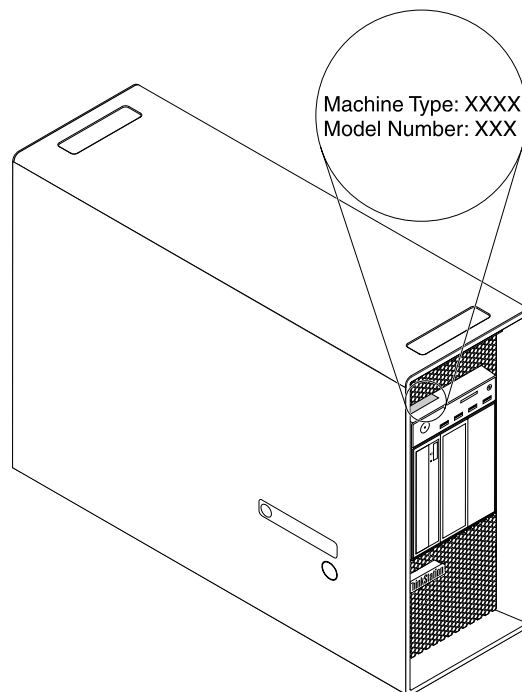   1. Depending on your Windows version, do one of the following:

        – For Windows 7: Click the Start button to open the Start menu. Right-click **Computer**, and then click **Properties**.

        – For Windows 10: Right-click the Start button to open the Start context menu.

    2. Locate and double-click your device in **Device Manager** to view device properties. Type the administrator password or provide confirmation if prompted.

Memory

Your computer supports up to 16 double data rate 4 (DDR4) error correction code (ECC) registered DIMMs (RDIMMs) or DDR4 ECC load reduced DIMMs (LRDIMMs).

For more information, see "Memory module" on page 120.

Internal drives

Your computer supports the following storage drives:

- SD card

- Hard disk drive

- Hybrid drive (available on some models)

- Optical drive (available on some models)

- Solid-state drive (available on some models)

To view the amount of storage drive space, do the following:

    1. Depending on your Windows version, do one of the following:

        - For Windows 7: Click the Start button to open the Start menu. Right-click **Computer**, and then click **Manage**.

        - For Windows 10: Right-click the Start button to open the Start context menu.

    2. Click **Disk Management** and follow the instructions on the screen.

Video features

Discrete graphics card installed in one of the PCI Express x16 graphics card slots (available on some models) (the connectors vary by graphics card)

Note: Your computer is installed with one or more graphics cards that vary by computer model. Depending on your computer model, the graphics cards might provide the following connectors:

- DisplayPort connector

- DVI connector

- Mini DisplayPort connector

Audio features

Integrated audio controller supports the following connectors and devices on your computer:

- Audio line-in connector
- Audio line-out connector
- Headset connector
- Internal speaker
- Microphone connectors

Input/Output (I/O) features

- 100/1000 Mbps Ethernet connector
- 9-pin serial connectors
- Audio connectors (audio line-in connector, audio line-out connector, headset connector, and microphone connector)
- Display connectors (DisplayPort connector, DVI connector, and Mini DisplayPort connector) (vary by graphics card)
- PS/2 keyboard connector
- PS/2 mouse connector
- USB connectors

For more information, see "Front view" on page 1 and "Rear view" on page 3.

Expansion

- Hard-disk-drive bays
- Flex adapter slots
- Optical-drive bays
- PCI Express x1 card slots
- PCI Express x4 card slots
- PCI Express x16 graphics card slots
- SD card slot

For more information, see "Internal drives" on page 9 and "Parts on the system board" on page 7.

Power supply

1300-watt automatic voltage-sensing power supply

Wireless features

Depending on your computer model, the following wireless features are supported:

- Wireless LAN
- Bluetooth

System management features

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

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

- ErP LPS compliance mode

  The energy-related products directive (ErP) lowest power state (LPS) compliance mode reduces the consumption of electricity when your computer is in sleep or off mode. For more information, see "Enabling or disabling the ErP LPS compliance mode" on page 36.

- Intel Standard Manageability (ISM)

  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 Active Management Technology (AMT)

  Intel Active Management Technology is hardware- and firmware-based technology that makes computers easier and less expensive for businesses to monitor, maintain, update, upgrade, and repair.

- Intel Rapid Storage Technology enterprise (RSTe)

  Intel RSTe is a device driver that provides support for SATA or SAS Redundant Array of Independent Disks (RAID) 0, 1, 5, and 10 arrays on specific Intel chipset system boards to enhance hard disk drive performance.

- Preboot Execution Environment (PXE)

  The Preboot Execution Environment is an environment to start computers using a network interface independent of data storage drives (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 (WOL)

  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.

- 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.

Security features

- Ability to enable and disable a device
- Ability to enable and disable USB connectors individually
- Antivirsus program
- BIOS guard
- BIOS passwords and Windows accounts to deter unauthorized use of your computer
- Computrace Agent software embedded in firmware
- Cover presence switch (also called intrusion switch)
- Finger authentication (available on some models)
- Firewalls
- Startup sequence control
- Startup without keyboard or mouse
- Support for a Kensington-style cable lock
- Support for a keylock
- Trusted Platform Module (TPM)

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

Preinstalled operating system

Your computer is preinstalled with Windows 7 or Windows 10 operating system. Additional operating systems might be identified by Lenovo as compatible with your computer. To determine if an operating system has been certified or tested for compatibility, check the Web site of the operating system provider.

Computer specifications

This section lists the physical specifications for your computer.

Dimensions

    Width: 200 mm (7.87 inches)

    Height: 446 mm (17.56 inches)

    Depth: 620 mm (24.41 inches)

Weight

    Maximum configuration as shipped: 32.3 kg (71.3 lb)

Environment

- Air temperature:

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

    Storage in original shipping package: From -40°C (-40°F) to 60°C (140°F)

    Storage without package: From -10°C (14°F) to 60°C (140°F)

- Humidity:

    Operating: 10%–80% (non-condensing)

    Storage: 10%–90% (non-condensing)

- Altitude:

    Operating: From -15.2 m (-50 ft) to 3048 m (10 000 ft)

    Storage: From -15.2 m (-50 ft) to 10 668 m (35 000 ft)

Electrical input

    Input voltage: From 100 V ac to 240 V ac

    Input frequency: 50/60 Hz

Programs

This section provides information about the programs on your computer.

Accessing a program on your computer

Note: For Windows 7, depending on your computer model, some of the Lenovo programs might be ready to be installed, so you must install them manually. Then, you can access and use these programs.

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

- From Windows Search:

    1. Depending on your Windows version, do one of the following:

        – For Windows 7: Click the Start button to open the Start menu, and then type the program name into the search box.

– For Windows 10: Type the program name into the search box next to the Start button.

2. In the search results, click the name of the desired program to launch the program.

- From the Start menu or Control Panel:

    1. Depending on your Windows version, do one of the following:

        – For Windows 7: Click the Start button to open the Start menu. If the program name is not displayed, click **All Programs** to display the program list. Then, click the name of the desired program to launch the program.

        – For Windows 10: Click the Start button to open the Start menu. Then, click the name of the desired program to launch the program.

    2. If the program name is not displayed on the Start menu, access the program from Control Panel.

        a. Depending on your Windows version, do one of the following:

            – For Windows 7: Click **Control Panel** on the Start menu.

            – For Windows 10: Right-click the Start button to open the Start context menu, and then click **Control Panel**.

        b. View Control Panel by Large icons or Small icons, and then click the name of the desired program to launch the program.

Installing a program that is ready to be installed (Windows 7 only)

On the Windows 7 operating system, to install a program that is ready to be installed, do the following:

1. Open the Lenovo ThinkVantage® Tools program. See "Accessing a program on your computer" on page 14.

2. Click **View ➙ Tiles** to view the program icons.

3. Follow the instructions under grayed-out icons to locate the icon for the desired program. Then, double-click the icon to install the program.

An introduction to Lenovo programs

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

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

Fingerprint Manager Pro or ThinkVantage Fingerprint Software (Windows 7)	The Fingerprint Manager Pro or ThinkVantage Fingerprint Software program enables you to use a fingerprint reader. The integrated fingerprint reader provided on some keyboards enables you to enroll your fingerprint and associate it with your power-on password, hard disk password, and Windows password. As a result, fingerprint authentication can replace passwords and enable simple and secure user access.
Lenovo Companion (Windows 10)	Your computer's best features and capabilities should be easy to access and understand. With Lenovo Companion, they are. Use Lenovo Companion to do the following: • Optimize your computer's performance, monitor your computer's health, and manage updates. • Access your user guide, check warranty status, and view accessories customized for your computer. • Read how-to articles, explore Lenovo forums, and stay up-to-date on technology news with articles and blogs from trusted sources. Lenovo Companion is filled with exclusive Lenovo content to help you learn more about what you can do with your computer.

Lenovo Device Experience or Lenovo PC Experience (Windows 7 and Windows 10)	The Lenovo Device Experience or Lenovo PC Experience program helps you work more easily and securely. The program provides easy access to Lenovo ThinkVantage Tools or Lenovo Tools, important settings and information about your computer, the Lenovo Support Web site, and so on.
Lenovo ID (Windows 10)	The Lenovo ID program enables you to create and manage your Lenovo ID. With a Lenovo ID, you can connect to everything Lenovo through a single account. Use your Lenovo ID for quick and simple authentication and then enjoy the various services provided by Lenovo. Such services include online shopping, app download, personalized device support, special promotional offers, Lenovo forums, and so on.
Lenovo PowerENGAGE (Windows 7)	The Lenovo PowerENGAGE program provides power management function.
Lenovo Solution Center (Windows 7 and Windows 10)	The Lenovo Solution Center program enables you to troubleshoot and resolve computer problems. It combines diagnostic tests, system information collection, security status, and support information, along with hints and tips for maximum system performance.
Lenovo ThinkVantage Tools (Windows 7)	The Lenovo ThinkVantage Tools program provides easy access to various tools to help your work more easily and securely.
Recovery Media (Windows 7)	The Recovery Media program enables you to restore the contents of the hard disk drive to the factory-default settings.
Rescue and Recovery® (Windows 7)	The Rescue and Recovery program is a one-button recovery and restore solution. It includes a set of self-recovery tools to help you diagnose computer problems, get help, and recover from system crashes, even if you cannot start the Windows operating system.
System Update (Windows 7)	The System Update program provides regular access to the system updates for your computer, such as device driver updates, software updates, and BIOS updates. The program gathers information from the Lenovo Help Center about new updates for your computer, and then sorts and displays the updates for download and installation. You have complete control of which updates to download and install.

Chapter 2. Using your computer

This chapter contains the following topics:

- "Registering your computer" on page 17
- "Setting the computer volume" on page 17
- "Using a disc" on page 17
- "Connecting to a network" on page 19

Registering your computer

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

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

Setting the computer volume

To set the computer volume, do the following:

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

   Note: If the volume icon is not displayed in the Windows notification area, add the icon to the notification area. See the Windows help system.

2. Follow the instructions on the screen and the hover text to adjust the volume, mute the speaker, or unmute the speaker.

Using a disc

This section provides information about using a disc and the optical drive.

Guidelines about using the optical drive

When using the optical drive, follow these guidelines:

- Do not place the computer in a location where the drive is exposed to any of the following conditions:
  - High temperature
  - High humidity
  - Excessive dust
  - Excessive vibration or sudden shock
  - An inclined surface
  - Direct sunlight
- Do not insert any object other than a disc into the drive.
- Do not insert damaged discs into the drive. Warped, scratched, or dirty discs can damage the drive.
- Before moving the computer, remove the disc from the drive.

Handling and storing a disc

When handling and storing a disc, follow these guidelines:

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

Playing and removing a disc

To play a disc, do the following:

1. With the computer on, press the eject/close button on the front of the optical drive. The tray slides out of the drive.
2. Insert a disc into the tray. Some optical drive has a snap hub in the center of the tray. If your drive has a snap hub, support the tray with one hand and then push the center of the disc until it snaps into place.
3. Press the eject/close button again or gently push the tray forward to close the tray. The disc player program starts automatically. For more information, refer to the help system of the disc player program.

To remove a disc from the optical drive, do the following:

1. With the computer on, press the eject/close button on the front of the optical drive. The tray slides out of the drive.
2. Carefully remove the disc from the tray.
3. Press the eject/close button again or gently push the tray forward to close the tray.

Note: If the tray does not slide out of the drive when you press the eject/close button, turn off your computer. Then, insert a straightened paper clip into the emergency-eject hole adjacent to the eject/close button. Use the emergency eject only in an emergency.

Recording a disc

If your optical drive supports recording, you can record a disc.

Recording a disc using Windows tools

To record a disc using Windows tools, do one of the following:

- Burn a disc using the AutoPlay window.
    1. Ensure that the disc is played automatically.
        a. Click the Start button to open the Start menu.
        b. Depending on your Windows version, do one of the following:
            – For Windows 7: Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **AutoPlay**.
            – For Windows 10: Click **Settings** ➙ **Devices** ➙ **AutoPlay**.
        c. Select or turn on **Use AutoPlay for all media and devices**.
    2. Insert a recordable disc into the optical drive that supports recording. The AutoPlay window opens.
    3. Follow the instructions on the screen.

- Burn a disc using Windows Media® Player.

    1. Insert a recordable disc into the optical drive that supports recording.

    2. Open Windows Media Player. See "Accessing a program on your computer" on page 14.

    3. Follow the instructions on the screen.

- Burn a disc from an ISO file.

    1. Insert a recordable disc into the optical drive that supports recording.

    2. Double-click the ISO file.

    3. Follow the instructions on the screen.

Recording a disc using preinstalled programs

To record a disc using preinstalled programs, do the following:

1. Insert a recordable disc into the optical drive that supports recording.

2. Open the PowerDVD Create, PowerProducer, or Power2Go program. See "Accessing a program on your computer" on page 14.

3. Follow the instructions on the screen.

Connecting to a network

This section provides information about connecting to a network. If you cannot connect your computer to a network, see "Ethernet LAN problems" on page 50.

Connecting to an Ethernet LAN

You can connect your computer to an Ethernet LAN by connecting an Ethernet cable to the Ethernet connector.

⚠️**DANGER**

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

Connecting to a wireless LAN

You can connect your computer to a wireless LAN without the use of an Ethernet cable but by means of radio waves only.

Note: The wireless LAN feature is available only on some models.

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

1. Ensure that a wireless LAN is available and the wireless LAN feature on your computer is working.

2. Click the wireless-network-connection-status icon in the Windows notification area to display available wireless networks.

    Note: If the wireless-network-connection-status icon is not displayed in the Windows notification area, add the icon to the notification area. See the Windows help system.

3. Click a wireless LAN, and then click **Connect** to connect your computer to it. Provide required information if needed.

Connecting to a Bluetooth-enabled device

Bluetooth is a short-range wireless communications technology. Use Bluetooth to establish a wireless connection between your computer and another Bluetooth-enabled device within a distance of about 10 m (32.8 ft).

Note: The Bluetooth feature is available only on some models.

To connect to a Bluetooth-enabled device, do the following:

1. Ensure that the Bluetooth feature on your computer is working and the Bluetooth-enabled device is located within a distance of about 10 m (32.8 ft) from your computer.
2. Click the Bluetooth icon in the Windows notification area on the taskbar. Then, click **Add a Device** and follow the instructions on the screen.

   Note: If the Bluetooth icon is not displayed in the Windows notification area, add the icon to the notification area. See the Windows help system.

Chapter 3. You and your computer

This chapter contains the following topics:

- "Arranging your workspace" on page 21
- "Accessibility information" on page 22
- "Cleaning your computer" on page 25
- "Maintenance" on page 25
- "Moving your computer" on page 27

Arranging your workspace

Arrange your workspace to suit your needs and the kind of work you do. This section provides information about the factors that affect the way you arrange your workspace.

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 screen. When possible, place the monitor at right angles to windows and other light sources. If necessary, reduce overhead lighting 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.

Air circulation

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

### Electrical outlet locations and cable lengths

The following factors might determine the final placement of your computer:

- Locations of electrical outlets
- Length of power cords or power adapters
- Length of the cables that are connected to other devices

For more information about power cords or power adapters, see "Power cords and power adapters" on page vi.

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. The following figure sets an example for your reference.
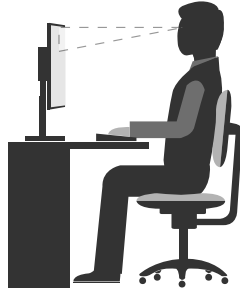
- Screen position: Keep the screen at a comfortable viewing distance, usually 51–61 cm (20–24 inches). Then, adjust the screen so that the top of the screen is at or slightly below eye level and you can view it without twisting your body.
- Chair position: Use a chair that gives you good back support and seat height adjustment. Use chair adjustments to best suit your desired posture.
- Head position: Keep your head and neck in a comfortable and neutral (vertical or upright) position.
- Arm and hand positions: Keep your forearms, wrists, and hands in a relaxed and neutral (horizontal) position. Type with a soft touch without pounding the keys.
- Leg position: Keep your thighs parallel to the floor and your feet flat on the floor or on a footrest.

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

Accessibility information

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

Keyboard shortcuts

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

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

Keyboard shortcut	Function
Windows logo key + U	Open Ease of Access Center
Right Shift for eight seconds	Turn on or turn off Filter Keys
Shift five times	Turn on or turn off Sticky Keys
Num Lock for five seconds	Turn on or turn off Toggle Keys
Left Alt+Left Shift+Num Lock	Turn on or turn off Mouse Keys
Left Alt+Left Shift+PrtScn (or PrtSc)	Turn on or turn off High Contrast

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

Ease of Access Center

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

To use Ease of Access Center, do the following:

1. Click the Start button to open the Start menu.
2. Depending on your Windows version, do one of the following:
   - For Windows 7: Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **Ease of Access Center**.
   - For Windows 10: Click **Settings** ➙ **Ease of Access**.
3. Choose the appropriate tool by following the instructions on the screen.

Ease of Access Center mainly includes the following tools:

- Magnifier

  Magnifier is a useful utility that enlarges the entire screen or part of the screen so that you can see the items better.

- Narrator

  Narrator is a screen reader that reads aloud what is displayed on the screen and describes events such as error messages.

- On-Screen Keyboard

  If you prefer to type or enter data into your computer using a mouse, joystick, or other pointing device instead of a physical keyboard, you can use On-Screen Keyboard. On-Screen Keyboard displays a visual keyboard with all the standard keys.

- High Contrast

  High Contrast is a feature that heightens the color contrast of some text and images on your screen. As a result, those items are more distinct and easier to identify.

- Personalized keyboard

  Adjust keyboard settings to make your keyboard easier to use. For example, you can use your keyboard to control the pointer and type certain key combinations easier.

- Personalized mouse

  Adjust mouse settings to make your mouse easier to use. For example, you can change the pointer appearance and make it easier to manage windows with the mouse.

Speech Recognition

Speech Recognition enables you to control your computer by voice.

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

To use Speech Recognition, do the following:

1. Depending on your Windows version, do one of the following:
   - For Windows 7: Click the Start button to open the Start menu.
   - For Windows 10: Right-click the Start button to open the Start context menu.
2. Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **Speech Recognition**.

3. Follow the instructions on the screen.

Screen-reader technologies

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

• Using PDFs with screen readers:
  http://www.adobe.com/accessibility.html?promoid=DJGVE

• Using the JAWS screen reader:
  http://www.freedomscientific.com/jaws-hq.asp

• Using the NVDA screen reader:
  http://www.nvaccess.org/

Screen resolution

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

To adjust the screen resolution, do the following:

1. Right-click a blank area on the desktop.

2. Depending on your Windows version, do one of the following:

   • For Windows 7: Click **Screen resolution**.

   • For Windows 10: Click **Display settings**. On the **Display** tab, click **Advanced display settings**.

3. Follow the instructions on the screen.

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

Customizable item size

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

• To change the item size temporarily, use the Magnifier tool in Ease of Access Center. See "Ease of Access Center" on page 23.

• To change the item size permanently, do the following:

  – Change the size of all the items on your screen.

    1. Right-click a blank area on the desktop.

    2. Depending on your Windows version, do one of the following:

       – For Windows 7: Click **Screen resolution** ➜ **Make text and other items larger or smaller**.

       – For Windows 10: Click **Display settings**.

    3. Change the item size by following the instructions on the screen.

    4. Click **Apply**. This change will take effect the next time you log in to the operating system.

  – Change the size of the items on a Web page.

    Press and hold Ctrl, and then press the plus-sign key (+) to enlarge or the minus-sign key (-) to reduce the text size.

  – Change the size of the items on the desktop or a window.

    Note: This function might not work on some windows.

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

Industry-standard connectors

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

For more information about the location and function of each connector, see "Hardware locations" on page 1.

TTY/TDD conversion modem

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

Documentation in accessible formats

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

Cleaning your computer

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

It is a good practice to clean your computer periodically to protect the surfaces and ensure trouble-free operation. Use only mild cleaning solutions and a damp cloth to clean the painted surfaces of the computer.

Dust buildup compounds problems associated with glare, so remember to clean the screen periodically. Wipe the screen surface gently with a soft, dry cloth, or blow on the screen to remove grit and other loose particles. Depending on the type of the screen, moisten a soft, lint-free cloth with an LCD cleaner or liquid glass cleaner and then wipe the screen surface.

Maintenance

With appropriate care and maintenance, your computer will serve you reliably. This section provides information about maintaining your computer so that it can keep working in better condition.

Basic maintenance tips

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

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

Good maintenance practices

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

- Empty your recycle bin on a regular basis.

- Use the disk defragmentation or disk optimization feature of your operating system occasionally to prevent performance problems caused by an excessive number of fragmented files.

- Clean out your Inbox, Sent Items, and Deleted Items folders in your e-mail application on a regular basis.

- Back up critical data regularly on removable media memory, such as discs and USB storage devices, and store the removable media in a safe location. The frequency of making backup copies depends on how critical the data is to you or your business.

- Back up your data on the storage drive regularly. See "Recovery information" on page 56.

- Keep your computer software, device drivers, and operating system up-to-date. See "Keeping your computer current" on page 26.

- Keep a log book. Entries might include major software or hardware changes, device-driver updates, intermittent problems and what you did to resolve them, and other issues you might have experienced. The cause of a problem might be change in hardware, change in software, or any other actions that might have taken place. A log book can help you or a Lenovo technician determines the cause of a problem.

- Create Product Recovery discs. See "Recovery information" on page 56 for more information about using Product Recovery discs to restore the hard disk drive to the factory-default settings.

- Create rescue media using discs or USB storage devices as early as possible. You can use a rescue medium to recover from failures that prevent you from gaining access to the Windows environment or the Rescue and Recovery workspace on your hard disk drive.

Keeping your computer current

In most cases, it is a good practice to have the most up-to-date operating system update patches, software programs, and device drivers. This section provides information about how to get the latest updates for your computer.

Getting the latest system updates

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

- Use the corresponding Lenovo program to get the system updates, such as device driver updates, software updates, and BIOS updates:

  – For Windows 7: Use the System Update program.

  – For Windows 10: Use the Lenovo Companion program.

  To open the System Update or Lenovo Companion program, see "Accessing a program on your computer" on page 14. For more information about using the program, refer to the help system of the program.

- Use Windows Update to get the system updates, such as security fixes, new versions of Windows components, and device driver updates.

  1. Click the Start button to open the Start menu.

  2. Depending on your Windows version, do one of the following:

     – For Windows 7: Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **Windows Update**.

     – For Windows 10: Click **Settings** ➙ **Update & security** ➙ **Windows Update**.

  3. Follow the instructions on the screen.

Note: The device drivers provided by Windows Update might not be tested by Lenovo. It is recommended that you get device drivers by using Lenovo programs or from the Lenovo Web site at http://www.lenovo.com/support.

Moving your computer

Before moving your computer, take the following precautions:

1. Back up your data on the storage drive. See "Good maintenance practices" on page 25.

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

3. If you saved the original shipping cartons and packing materials, use them to pack the units. If you are using different cartons, cushion the units to avoid damage.

Moving your computer to another country or region

When you move your computer to another country or region, you must take local electrical standards into consideration. If the local electrical outlet style is different from the type you are currently using, contact the Lenovo Customer Support Center to purchase either an electrical plug adapter or a new power cord. For a list of Lenovo Support phone numbers, go to http://www.lenovo.com/support/phone. If you cannot find the support telephone number for your country or region, contact your Lenovo reseller.

Chapter 4. Security

This chapter contains the following topics:

Locking your computer

This section provides information about locking your computer with the locking devices to keep your computer safe.

Locking the computer cover

Locking the computer cover helps prevent unauthorized people from gaining access to the inside of your computer. Your computer might come with a key lock **1** that is built into the computer cover. The keys for the key lock are attached to the rear of the machine. For security, store the keys in a secure place when you are not using them.

Note: The key lock and keys are available only on some models.
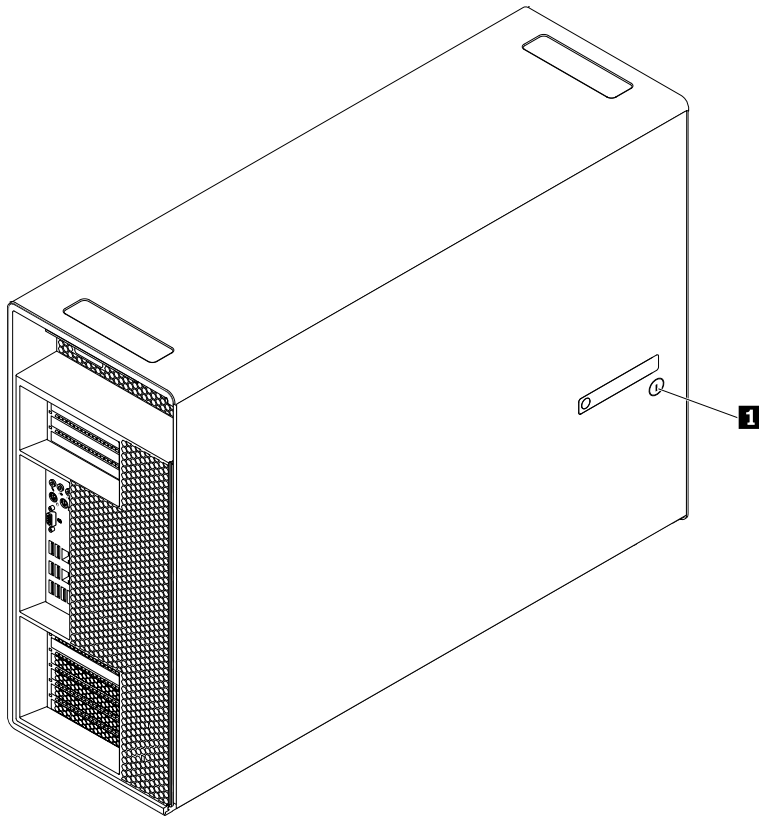
Figure 7. Locking the computer cover

Attaching a Kensington-style cable lock

You can use a Kensington-style cable lock to secure your computer to a desk, table, or other non-permanent fixture. The cable lock attaches to the security-lock slot at the rear of your computer. Depending on the type selected, the cable lock can be operated with a key or combination. The cable lock also locks the buttons used to open the computer cover. This is the same type of lock used with many notebook computers. You can order such a cable lock directly from Lenovo by searching for *Kensington* at:
http://www.lenovo.com/support
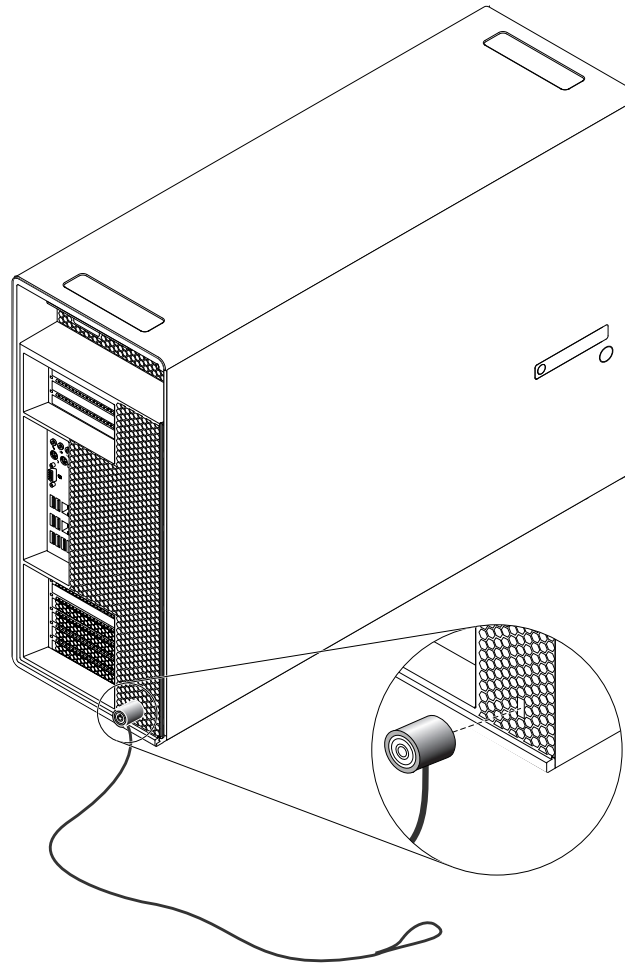
Figure 8. Kensington-style cable lock

Viewing and changing security settings in the Setup Utility program

To view and change security settings in the Setup Utility program, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Security**.
3. Follow the instructions on the right side of the screen to view and change security settings. You can refer to "Using the Setup Utility program" on page 35 to get basic information about some major security settings.

4. To save settings and exit the Setup Utility program, press F10, select **Yes** in the window displayed, and press Enter.

   Note: For some keyboards, you might need to press Fn+F10 to exit the Setup Utility program.

Using passwords and Windows accounts

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

- To use BIOS passwords, see "Using BIOS passwords" on page 38.
- To use Windows accounts, do the following:
    1. Click the Start button to open the Start menu.
    2. Depending on your Windows version, do one of the following:
        – For Windows 7: Click **Control Panel → User Accounts**.
        – For Windows 10: Click **Settings → Accounts**.
    3. Follow the instructions on the screen.

Using fingerprint authentication

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

To use fingerprint authentication, do one of the following:

- For Windows 7: Use the Fingerprint Manager Pro or ThinkVantage Fingerprint Software program provided by Lenovo. To open the program, see "Accessing a program on your computer" on page 14. For more information about using the program, refer to the help system of the program.
- For Windows 10: Use the fingerprint tool provided by the Windows operating system. Click the Start button to open the Start menu, and then click **Settings → Accounts → Sign-in options**. Follow the instructions on the screen.

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

Using the cover presence switch

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 use the cover presence switch, enable the cover-presence-switch connector on the system board first. To achieve this, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Security → Chassis Intrusion Detection** and press Enter.
3. Select **Enabled** and press Enter.
4. To save settings and exit the Setup Utility program, press F10, select **Yes** in the window displayed, and press Enter. The cover-presence-switch connector on the system board is enabled.

   Note: For some keyboards, you might need to press Fn+F10 to exit the Setup Utility program.

The cover presence switch starts functioning. If the switch detects that the computer cover is not correctly installed or closed, an error message will be displayed when you turn on the computer. To fix the error and log in to the operating system, do the following:

1. Properly install or close your computer cover. See Chapter 7 "Installing or replacing hardware" on page 59.

2. Start and then exit the Setup Utility program. See "Starting the Setup Utility program" on page 35 and "Exiting the Setup Utility program" on page 40.

Using firewalls

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

To use Windows Firewall, do the following

1. Depending on your Windows version, do one of the following:

   • For Windows 7: Click the Start button to open the Start menu.

   • For Windows 10: Right-click the Start button to open the Start context menu.

2. Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **Windows Firewall**.

3. Follow the instructions on the screen.

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.

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

BIOS guard

The BIOS guard module cryptographically verifies all the BIOS updates to the system BIOS flash. Therefore, the malware is blocked from attacking the BIOS.

Trusted Platform Module (TPM)

TPM is a secure cryptoprocessor that stores cryptographic keys, which in turn protects information stored in your computer.

Chapter 5. Advanced configuration

This chapter contains the following topics:

- "Using the Setup Utility program" on page 35
- "Configuring RAID" on page 41
- "Updating and recovering the BIOS" on page 40

Using the Setup Utility program

The Setup Utility program is used to view and change the configuration settings of your computer. This section provides information about only the major configuration settings available in the program.

Note: 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. Turn on or restart your computer.
2. Before the operating system starts up, repeatedly press and release F1 or Fn+F1 (depending on the keyboard). Based on the Setup Utility display mode setting, one of the following situations occurs:
   - Text mode: The Setup Utility program opens.
   - Graphic mode: The start screen is displayed. Then, select **Setup** to open the Setup Utility program.

   Note: If a BIOS password has been set, the Setup Utility program will not open until you enter the correct password. For more information, see "Using BIOS passwords" on page 38.

To view and change the configuration settings, follow the instructions on the screen.

Changing the display mode of the Setup Utility program

You can use the Setup Utility program in the graphic mode or the text mode according to your needs.

- Text mode: You can use only the keyboard to make selections. The keys used to perform various tasks are displayed at the bottom of the screen.
- Graphic mode: In addition to the keyboard, you also can use the mouse to make selections.

Note: The Serial Port Console Redirection item is available only in the text mode.

To change the display mode of the Setup Utility program, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. From the main interface, locate **Setup mode select**, and select **Graphic** or **Text**.
3. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard), select **Yes** in the window displayed, and press Enter.

Changing the display language of the Setup Utility program

The Setup Utility program supports three display languages: English, French, and simplified Chinese.

To change the display language of the Setup Utility program, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.

2. From the main interface, locate **System Language**, and select the display language according to your needs.

Enabling or disabling a device

This section provides information about how to enable or disable user access to hardware devices (such as USB connectors or storage drives).

To enable or disable a device, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.

2. Select **Devices**.

3. Select the device you want to enable or disable and press Enter.

4. Select the desired setting and press Enter.

5. To save settings and exit the Setup Utility program, press F10, select **Yes** in the window displayed, and press Enter.

   Note: For some keyboards, you might need to press Fn+F10 to exit the Setup Utility program.

Enabling or disabling the automatic power-on of your computer

The Automatic Power On item in the Setup Utility program provides various options for you to make your computer start up automatically.

To enable or disable the Automatic Power On features, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.

2. Select **Power** ➙ **Automatic Power On** and press Enter.

3. Select the feature you want to enable or disable and press Enter.

4. Select the desired setting and press Enter.

5. To save settings and exit the Setup Utility program, press F10, select **Yes** in the window displayed, and press Enter.

   Note: For some keyboards, you might need to press Fn+F10 to exit the Setup Utility program.

Enabling or disabling the ErP LPS compliance mode

Lenovo computers meet the eco-design requirements of the ErP Lot 3 regulation. For more information, go to:
http://www.lenovo.com/ecodeclaration

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

To enable or disable the ErP LPS compliance mode, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.

2. Select **Power** ➙ **Enhanced Power Saving Mode** and press Enter.

3. Select **Enabled** or **Disabled** depending on your needs, and then press Enter. If you select **Enabled**, you also need to disable the Wake on LAN feature. See "Enabling or disabling the automatic power-on of your computer" on page 36.

4. To save settings and exit the Setup Utility program, press F10, select **Yes** in the window displayed, and press Enter.

Note: For some keyboards, you might need to press Fn+F10 to exit the Setup Utility program.

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

- Press the power button.
- Enable the Wake Up on Alarm feature to make your computer wake up at a set time. See "Enabling or disabling the automatic power-on of your computer" on page 36.
- Enable the After Power Loss feature to make your computer wake up when the power supply resumes after a sudden loss of electricity.

  To enable the After Power Loss feature, do the following:

  1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
  2. Select **Power** ➙ **After Power Loss** and press Enter.
  3. Select **Power On** and press Enter.
  4. To save settings and exit the Setup Utility program, press F10, select **Yes** in the window displayed, and press Enter.

     Note: For some keyboards, you might need to press Fn+F10 to exit the Setup Utility program.

Enabling or disabling the configuration change detection

When the configuration change detection is enabled, if the POST detects configuration changes of some hardware devices (such as storage drives or memory modules), an error message is displayed.

To enable or disable the configuration change detection, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Security** ➙ **Configuration Change Detection** and press Enter.
3. Select the desired setting and press Enter.
4. To save settings and exit the Setup Utility program, press F10, select **Yes** in the window displayed, and press Enter.

   Note: For some keyboards, you might need to press Fn+F10 to exit the Setup Utility program.

To bypass the error message and log in to the operating system, do one of the following:

- Press the F2 key.

  Note: For some keyboards, you might need to press Fn+F2 to bypass the error message.

- Start and then exit the Setup Utility program. See "Starting the Setup Utility program" on page 35 and "Exiting the Setup Utility program" on page 40.

Changing the BIOS settings before installing a new operating system

BIOS settings vary by operating system. Change the BIOS settings before installing a new operating system.

To change the BIOS settings, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. From the Setup Utility program main menu, select **Exit** ➙ **OS Optimized Default**.
3. Depending on the operating system to be installed, do one of the following:

   - To install the Windows 10 (64-bit) operating system, select **Enabled**.
   - To install an operating system other than Windows 10 (64-bit), select **Disabled**.

4. Select **Yes** in the window displayed and press Enter to confirm your selection.

5. To save setting and exit the Setup Utility program, press F10, select **Yes** in the window displayed, and press Enter.

   Note: For some keyboards, you might need to press Fn+F10 to exit the Setup Utility program.

Using BIOS passwords

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

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

Password types

The following types of passwords are available in the Setup Utility program:

- Power-on password
  When a power-on password is set, you are prompted to enter a valid password each time the computer is turned on. The computer cannot be used until the valid password is entered.

- 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 enter 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 entered.

  If both the power-on password and administrator password are set, you can enter 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 internal storage drive (such as a hard disk drive). When a hard disk password is set, you are prompted to enter a valid password each time you try to access the storage drive.

  Notes:

  – After you set a hard disk password, your data on the storage drive is protected even if the storage 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 storage drive.

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.

Note: The Setup Utility program passwords are not case sensitive.

To set a strong password, consider the following guidelines:

- Have at least eight characters in length
- Contain at least one alphabetic character and one numeric character
- Not be your name or your user name
- Not be a common word or a common name

- Be significantly different from your previous passwords

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 35.

2. Select **Security**.

3. Depending on the password type, select **Set Power-On Password**, **Set Administrator Password**, or **Hard Disk Password** and press Enter.

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 38.

5. To save settings and exit the Setup Utility program, press F10, select **Yes** in the window displayed, and press Enter.

   Note: For some keyboards, you might need to press Fn+F10 to exit the Setup Utility program.

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 any media from the drives and turn off all connected 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 Chapter 7 "Installing or replacing hardware" on page 59.

3. Locate the Clear Complementary Metal Oxide Semiconductor (CMOS)/Recovery jumper on the system board. See "Parts on the system board" on page 7.

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 Chapter 7 "Installing or replacing hardware" on page 59.

6. Turn on the computer and leave it on for approximately 10 seconds. Then, turn off the computer by holding the power button for approximately five seconds.

7. Repeat step 1 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.

Selecting a startup device

If your computer does not start up from a device as expected, you can choose to change the startup device sequence permanently or select a temporary startup device.

Changing the startup device sequence permanently

To change the startup device sequence permanently, do the following:

1. Depending on the type of the storage device, do one of the following:

   - If the storage device is internal, go to step 2.

   - If the storage device is a disc, ensure that your computer is turned on. Then, insert the disc into the optical drive.

- If the storage device is an external device other than a disc, connect the storage device to the computer.
2. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
3. Select **Startup**.
4. Follow the instructions on the right side of the screen to change the startup device sequence.
5. To save settings and exit the Setup Utility program, press F10, select **Yes** in the window displayed, and press Enter.

   Note: For some keyboards, you might need to press Fn+F10 to exit the Setup Utility program.

Selecting a temporary startup device
Note: Not all discs and storage drives are bootable.

To select a temporary startup device, do the following:
1. Depending on the type of the storage device, do one of the following:
   - If the storage device is internal, go to step 2.
   - If the storage device is a disc, ensure that your computer is turned on. Then, insert the disc into the optical drive.
   - If the storage device is an external device other than a disc, connect the storage device to the computer.
2. Turn on or restart the computer. Before Windows starts up, repeatedly press and release the F12 key until Boot Menu is displayed.

   Note: For some keyboards, you might need to press Fn+F12 to display Boot Menu.
3. Select the desired storage device and press Enter. The computer then starts up from the device you select.

If you want to select a permanent startup device, select **Enter Setup** on Boot Menu and press Enter to start the Setup Utility program. For more information about how to select a permanent startup device, see "Changing the startup device sequence permanently" on page 39.

Exiting the Setup Utility program

To exit the Setup Utility program, do one of the following:

- If you want to save the new settings, press the F10 key. Then, select **Yes** in the window displayed and press Enter.

   Note: For some keyboards, you might need to press Fn+F10 to exit the Setup Utility program.

- If you do not want to save the new settings, select **Exit ➔ Discard Changes and Exit** and press Enter. Then, select **Yes** in the window displayed and press Enter.

Updating and recovering the BIOS

The BIOS is the first program that the computer runs when you turn on the computer. The BIOS initializes the hardware components and loads the operating system and other programs.

Updating the BIOS

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

To update the BIOS, do the following:

1. Go to http://www.lenovo.com/support.
2. To update the BIOS from your operating system, download the flash BIOS update driver according to your operating system version. To update the BIOS from a flash update disc, download the ISO image version (used to create a flash update disc). Then, download the installation instructions for the flash BIOS update driver.
3. Print the installation instructions you download and follow the instructions to update the BIOS.

Note: If you want to update the BIOS from a flash update disc, the installation instructions might not provide the information about how to record the update disc. See "Recording a disc" on page 18.

Recovering from a BIOS update failure

To recover from a BIOS update failure, do the following:

1. Remove any media from the drives and turn off all connected 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 Chapter 7 "Installing or replacing hardware" on page 59.
3. Locate the Clear CMOS /Recovery jumper on the system board. See "Hardware locations" on page 1.
4. Remove any parts and cables that impede your 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. Reinstall the parts and cables that were removed.
7. Reinstall the computer cover and reconnect any cables that were disconnected. See Chapter 7 "Installing or replacing hardware" on page 59.
8. Turn on the computer and insert the BIOS update disc into the optical drive. Wait a few minutes. The recovery process begins. After the recovery process is completed, your computer will shut down automatically.

   Note: If the computer does not start up from the disc, select the disc as the startup device. See "Selecting a temporary startup device" on page 40.
9. Repeat steps 1–4.
10. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
11. Repeat step 6 and step 7. Then, turn on your computer.

Configuring RAID

This chapter provides instructions on how to install hard disk drives and configure Redundant Array of Independent Disks (RAID) for your computer. Depending on your computer model, RAID can be enabled by Intel Rapid Storage Technology enterprise (RSTe) or the LSI MegaRAID BIOS.

Note: The RAID configuration information described in this chapter is only applicable in the Windows environment. For information about configuring RAID in the Linux®environment, contact your Linux software provider.

This chapter provides information about the following topics:

- "Configuring RAID with Intel RSTe" on page 41
- "Quick RAID setup using the LSI MegaRAID BIOS configuration utility " on page 44

Configuring RAID with Intel RSTe

If your computer comes with Intel RSTe, you can follow the sections below to configure RAID with Intel RSTe.

This section provides information about the following topics:

- "Installing SATA or SAS hard disk drives" on page 42
- "Configuring SATA or SAS RAID functionality with the Intel RSTe configuration utility" on page 42

Installing SATA or SAS hard disk drives

Ensure that your computer has the minimum number of SATA or SAS hard disk drives installed for the following supported levels of RAID:

- RAID Level 0 - Striped disk array
    - A RAID Level 0 hard disk drive group consisting of at least two hard disk drives
    - Supported strip size: 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB
    - Better performance without fault tolerance
- RAID Level 1 - Mirrored disk array
    - A RAID Level 1 hard disk drive group consisting of two hard disk drives
    - Improved reading performance and 100% redundancy
- RAID Level 10 - Striped and mirrored disk array (a combination of RAID Level 0 and RAID Level 1)
    - A RAID Level 10 hard disk drive group consisting of four hard disk drives
    - Supported strip size: 4 KB, 8 KB, 16 KB, 32 KB, or 64 KB
- RAID Level 5 - Block-level striped disk array with distributed parity
    - A RAID Level 5 hard disk drive group consisting of at least three hard disk drives
    - Supported strip size: 4 KB, 8 KB, 16 KB, 32 KB, or 64 KB
    - Better performance and fault tolerance

Configuring SATA or SAS RAID functionality with the Intel RSTe configuration utility

This section describes the information about configuring SATA or SAS RAID functionality with the Intel RSTe configuration utility.

Note: The Intel RSTe configuration utility assumes that your computer is installed with more than one hard disk drive. Therefore, if only one hard disk drive is installed in your computer, the following information does not apply.

This section provides information about the following topics:

- "Entering the Intel RSTe configuration utility" on page 42
- "Creating RAID volumes using the Intel RSTe configuration utility" on page 43
- "Deleting RAID volumes using the Intel RSTe configuration utility" on page 43
- "Resetting hard disk drives to non-RAID" on page 43

Entering the Intel RSTe configuration utility

This section provides instructions on how to enter the Intel RSTe configuration utility.

During the computer startup, follow the instructions on the screen. Press Ctrl+I to enter the Intel RSTe configuration utility.

The following four options are displayed after you enter the Intel RSTe configuration utility:

1. **Create RAID Volume**
2. **Delete RAID Volume**
3. **Reset Disks to Non - RAID**

4. **Exit**

Press the up and down arrow keys to select an option. Press Enter to enter the menu for the selected option. Press Esc to exit the Intel RSTe configuration utility, or select **Exit**, and then press Enter to exit the Intel RSTe configuration utility.

Creating RAID volumes using the Intel RSTe configuration utility

This section provides instructions on how to use the Intel RSTe configuration utility to create RAID volumes.

To create a RAID volume, do the following:

1. Enter the Intel RSTe configuration utility. See "Entering the Intel RSTe configuration utility" on page 42.
2. Press the up and down arrow keys to select **Create RAID Volume**, and then press Enter to view the CREATE VOLUME MENU window.
3. The following five options are displayed. Press the up and down arrow keys to select an option. After you configure an option, press Tab or Enter to go to the next option.
   a. **Name**: Volume name. You can use the default name or type a preferred name.
   b. **RAID Level**: You can change the RAID Level to one of the following:
      - **RAID Level 0**
      - **RAID Level 1**
      - **RAID Level 10**
      - **RAID Level 5**
   c. **Disks**: Press Enter to enter the SELECT DISKS MENU window. Follow the instructions at the bottom of the menu to select hard disk drives, and then press Enter to complete the configuration.
   d. **Strip Size**: Press the up and down arrow keys to select a strip size.
   e. **Capacity**: Customize the capacity of the RAID volume. The default RAID volume is the largest value.
4. Press Enter to finish configuring all the five options. When prompted, press Y to confirm the creation of the new RAID volume.
5. After the new RAID volume is created, the information about the RAID volume will be displayed under **DISK/VOLUME INFORMATION**, such as ID number, name, RAID level, strip size, volume size, status, and whether it is a bootable volume.

Deleting RAID volumes using the Intel RSTe configuration utility

This section provides instructions on how to use the Intel RSTe configuration utility to delete RAID volumes.

To delete a RAID volume, do the following:

1. Enter the Intel RSTe configuration utility. See "Entering the Intel RSTe configuration utility" on page 42.
2. Press the up and down arrow keys to select **Delete RAID Volume**. Press Enter to enter the DELETE VOLUME MENU window.
3. Press the up and down arrow keys to select the RAID volume that is not needed. Press Del to delete it from the **RAID Volumes** list.
4. When prompted, press Y to confirm the deletion of the selected RAID volume.

Resetting hard disk drives to non-RAID

This section provides instructions on how to reset hard disk drives to non-RAID.

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

1. Enter the Intel RSTe configuration utility. See "Entering the Intel RSTe configuration utility" on page 42.
2. Press the up and down arrow keys to select **Reset Disks to Non-RAID**. Press Enter to enter the RESET RAID DATA window.

3. Use the up and down arrow keys and the space key to mark individual hard disk drive to be reset, and then press Enter to complete the selection.

4. When prompted, press Y to confirm the reset action.

5. If the hard disk drive you reset is part of a RAID volume, the computer might detect that the RAID volume is degraded. In this case, you are prompted to select a hard disk drive to initiate a rebuild process.

6. Select an available hard disk drive, and then press Enter to initiate the rebuild process.

   Note: Press Esc to cancel a rebuild process and keep the RAID volume in the degraded status. In the Main Menu window under **DISK/VOLUME INFORMATION**, you will see the status of the RAID volume is changed to **Degraded**.

Quick RAID setup using the LSI MegaRAID BIOS configuration utility

Notes:

- The LSI MegaRAID SAS adapter and the LSI MegaRAID BIOS configuration utility are only available on some models.

- The following steps in this section are intended to guide you through a quick setup of basic RAID functions with the LSI MegaRAID SAS adapter. For advanced setup and configuration using this adapter, refer to the complete *MegaRAID SAS Software User Guide* that is available at http://support.lenovo.com/en_US/guides-and-manuals/detail.page?DocID=UM007543.

This section provides information about the following topics:

- "Installing SATA or SAS hard disk drives" on page 44
- "Entering the LSI MegaRAID BIOS configuration utility" on page 45
- "Creating RAID volumes using the LSI MegaRAID BIOS configuration utility" on page 45
- "Deleting RAID volumes using the LSI MegaRAID BIOS configuration utility" on page 46
- "Setting the hot spare hard disk drive" on page 46

Installing SATA or SAS hard disk drives

Ensure that your computer has the minimum number of SATA or SAS hard disk drives installed for the following supported levels of RAID:

- RAID Level 0 - Striped disk array

  – A RAID Level 0 hard disk drive group consisting of at least one hard disk drive

  – Supported strip size: 8 KB to 1 MB

  – Better performance without fault tolerance

- RAID Level 00 - Spanned hard disk drive group with a series of RAID 0 hard disk drive groups

  – A RAID Level 00 hard disk drive group consisting of two or four hard disk drives

  – Supported strip size: 8 KB to 1 MB

  – Better performance without fault tolerance

- RAID Level 1 - Mirrored disk array

  – A RAID Level 1 hard disk drive group consisting of two or four hard disk drives

  – Improved read performance and 100% redundancy

- RAID Level 10 - A combination of RAID Level 0 and RAID Level 1

  – A RAID Level 10 hard disk drive group consisting of four hard disk drives

  – Data being striped across hard disk drive groups

  – Provides both high data transfer rates and complete data redundancy

- RAID Level 5 - Block-level striped disk array with distributed parity
  - A RAID Level 5 hard disk drive group consisting of at least three hard disk drives
  - Supported strip size: 8 KB to 1 MB
  - Better performance and fault tolerance
  - RAID Level 5 might not be available on all models of LSI MegaRAID adapter
- RAID Level 6 - Block-level striped disk array with dual distributed parity
  - A RAID Level 6 hard disk drive group consisting of at least four hard disk drives
  - Supported strip size: 8 KB to 1 MB
  - Better performance and fault tolerance that can stand up to loss of two hard disk drives
  - RAID Level 6 might not be available on all models of LSI MegaRAID adapter

Ensure that the LSI MegaRAID SAS adapter card is installed in your computer, and that the hard disk drives are connected to this adapter card and not to the connectors on the system board.

Entering the LSI MegaRAID BIOS configuration utility

This section provides instructions on how to enter the LSI MegeRAID BIOS configuration utility.

To enter the LSI MegaRAID BIOS configuration utility, do the following:
1. During the computer startup, follow the instructions on the screen.
2. Press Ctrl+H to enter the CONTROLLER SELECTION window.
3. Select the controller you want to configure, and then click **Start** to enter the LSI MegaRAID BIOS configuration utility.

Creating RAID volumes using the LSI MegaRAID BIOS configuration utility

This section provides instructions on how to create RAID volumes using the LSI MegaRAID BIOS configuration utility.

To create RAID volumes using the LSI MegaRAID BIOS configuration utility, do the following:
1. Click **Configuration Wizard** on the WebBIOS main screen to enter the Choosing the Configuration Type window.
2. Press the up and down arrow keys to select one of the three configuration types:
   - **Clear Configuration**: Clear the existing configuration.
   - **New Configuration**: Clear the existing configuration and create new configuration.
   - **Add Configuration**: Retain the existing storage configuration and add new hard disk drives. The new configuration will not cause any data loss.
3. Select **Add Configuration**, and then click **Next**. The following two options are displayed in the Configuration Method window.
   - **Manual Configuration**: Manually create hard disk drive groups and virtual hard disk drives, and set parameters.
   - **Automatic Configuration**: Automatically create an optimal RAID configuration.
4. Select **Manual Configuration**, and then click **Next**. The Drive Group Definition window is displayed. To create hard disk drive groups, do the following:
   a. Select one or more hard disk drives for the group (keep pressing Ctrl while selecting more than one hard disk drive).
   b. Click **Add To Array** to move the selected hard disk drives to **Drive Groups**.

c. Click **Accept DG** to create the hard disk drive group.

d. Repeat the above steps if you want to create more than one hard disk drive group.

5. Click **Next**. The Span Definition window is displayed. Select the hard disk drive group that you want to add to a span, and then click **Add to SPAN**. Repeat this step until you have selected all the hard disk drive groups you want.

6. Click **Next**. The Virtual Drive Definition window is displayed. Change the virtual hard disk drive options from the default settings listed on the screen to the settings you want. Click **Accept** , and then follow the instructions on the screen to customize your settings.

7. Click **Next**, and the Preview window is displayed.

8. Verify your settings, and then click **Accept**.

9. Click **Yes** to save the configuration.

Deleting RAID volumes using the LSI MegaRAID BIOS configuration utility

This section provides instructions on how to delete RAID volumes using the LSI MegaRAID BIOS configuration utility.

To delete RAID volumes using the LSI MegaRAID BIOS configuration utility, do the following:

1. Enter the LSI MegaRAID BIOS configuration utility. Refer to "Entering the LSI MegaRAID BIOS configuration utility" on page 45.

2. Click the virtual hard disk drives you want to delete, and then the Virtual Drive window is displayed.

3. Click **Delete**, and then click **Go**.

4. Click **Yes** to save your changes.

Setting the hot spare hard disk drive

This section provides instructions on how to set the hot spare hard disk drive.

To set the hot space hard disk drive, do the following:

1. Enter the LSI MegaRAID BIOS configuration utility. Refer to "Entering the LSI MegaRAID BIOS configuration utility" on page 45.

2. Click the hard disk drive you want to set as the hot spare hard disk drive. The Drive window is displayed.

3. Select **Make Global HSP** or **Make Dedicated HSP**, and then click **Go**.

4. The main screen of the LSI MegaRAID BIOS configuration utility is displayed, and the hard disk drive you selected is listed as a hot spare hard disk drive in the right pane.

Chapter 6. Troubleshooting, diagnostics, and recovery

This chapter provides solutions to resolve your computer problems. Follow the steps in the basic procedure for resolving computer problems, which helps you make good use of the troubleshooting, diagnostics, and recovery information.

- "Basic procedure for resolving computer problems" on page 47
- "Troubleshooting" on page 47
- "Diagnostics" on page 55
- "Recovery information" on page 56

Basic procedure for resolving computer problems

It is recommended that you use the following procedure to resolve computer problems you are experiencing:

1. Ensure that:

    a. The cables for all connected devices are connected correctly and securely.

    b. All connected devices that require ac power are connected to properly grounded, functioning electrical outlets.

    c. All connected devices are enabled in the BIOS settings of your computer. Refer to "Enabling or disabling a device" on page 36.

    If these actions do not resolve your problem, continue with the next step.

2. Use an antivirus program to see if your computer has been infected by a virus. If the program detects a virus, remove the virus. If the antivirus program does not resolve your problem, continue with the next step.

3. Go to "Troubleshooting" on page 47 and follow the instructions for the type of problem you are experiencing. If these troubleshooting instructions do not resolve your problem, continue with the next step.

4. Run the diagnostic program. Refer to "Diagnostics" on page 55. If the diagnostic program does not resolve your problem, continue with the next step.

5. Recover your operating system. Refer to "Recovery information" on page 56.

6. If none of these actions solve your problem, contact the Lenovo Customer Support Center. For a list of Lenovo Support phone numbers, go to http://www.lenovo.com/support/phone. For more information about help, service, and technical assistance, refer to Chapter 8 "Getting information, help, and service" on page 135.

Troubleshooting

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

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

Startup problems

The computer does not start up when you press the power button.

Solutions:

Ensure 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, ensure 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 operating system fails to start up.

Solution:

Ensure that the startup device sequence set in the Setup Utility program includes the device where the operating system resides. Usually, the operating system is on the internal storage drive. For more information, refer to "Changing the startup device sequence permanently" on page 39.

The computer beeps multiple times before the operating system starts up.

Solution:

Ensure that no keys are stuck.

Audio problems

The audio cannot be heard on the Windows operating system.

Solutions:

- If you are using powered external speakers that have an On/Off control, ensure that:
  - The On/Off control is set to the **On** position.
  - The speaker power cable is connected to a properly grounded, functional ac electrical outlet.
- If your external speakers have a volume control, ensure that the volume is not set too low.
- Click the volume icon in the Windows notification area on the taskbar. Ensure that the mute speakers settings are not selected and none of the volume settings is set too low.

  Note: If the volume icon is not displayed in the Windows notification area, add the icon to the notification area. Refer to the Windows help system.
- For some computers that have a front audio panel, ensure that the volume is not set too low.
- Ensure that your external speakers (and headphones, if used) are connected to the correct audio connectors on the computer. Most speaker cables are color-coded to match the connectors.

  Note: When external-speaker or headphone cables are connected to the audio connectors, the internal speaker, if present, is disabled. In most cases, if an audio adapter is installed in one of the expansion slots, the audio function built into the system board is disabled. Therefore, you must use the audio connectors on the audio adapter.
- Ensure that the program you are running is designed for use on the Windows operating system. If the program is designed to run in DOS, the program does not use the Windows sound feature. The program must be configured to use SoundBlaster Pro or SoundBlaster emulation.
- Ensure that the audio device drivers are correctly installed.

The sound comes from one of the external speakers.

Solutions:

- Ensure that the speaker cable is inserted completely into the connector on the computer.
- Click the volume icon in the Windows notification area on the taskbar. Then, click the speaker icon on top of the volume control. Click the **Levels** tab and ensure that the Balance settings are set correctly.

Note: If the volume icon is not displayed in the Windows notification area, add the icon to the notification area. Refer to the Windows help system.

CD or DVD problems

A CD or DVD does not work.

Solutions:

- Ensure that the power cable and signal cable are securely connected to the drive.
- Ensure that the disc is inserted correctly, with its label up.
- Ensure that the disc you are using is clean. To remove dust or fingerprints, wipe the disc clean with a soft cloth from the center to the outside. Wiping a disc in a circular motion might cause loss of data.
- Ensure that the disc you are using is not scratched or damaged. Try inserting another disc that you know is good. If you cannot read from a known-good disc, you might have a problem with your optical drive or the cabling to your optical drive.
- If you have multiple CD or DVD drives installed (or a combination of CD and DVD drives), try inserting the disc into the other drive. In some cases, only one of the drives is connected to the audio subsystem.

A bootable recovery medium, such as the Product Recovery CD, cannot be used to start your computer.

Solution:

Ensure that the CD or DVD drive is set as the top priority of the Boot Priority Order in the Setup Utility program. Refer to "Selecting a temporary startup device" on page 40 for information about viewing and changing the startup sequence.

Note: On some computer models, the startup sequence is permanently set and cannot be changed.

A black screen is displayed instead of the DVD video.

Solutions:

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

A DVD movie does not play.

Solutions:

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

No audio or only an intermittent audio comes out while a DVD movie is playing.

Solutions:

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

The playback is slow or choppy.

Solutions:

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

A message indicating invalid disc or no disc found is displayed.

Solutions:

- Ensure that the disc is in the drive with the shiny side of the disc facing down.
- Ensure that video resolution is lower than 1152 x 864 pixels.
- Ensure that the DVD or CD is inserted into an appropriate optical drive. For example, do not insert a DVD into a CD-only drive.

Intermittent problems

Intermittent problems refer to the problems occur only occasionally and are difficult to repeat.

Solutions:

- Ensure that all cables and cords are securely connected to the computer and attached devices.
- Ensure that when the computer is on, the fan grill is not blocked (there is air flow around the grill), and the fans are working. If airflow is blocked or the fans are not working, the computer might overheat.
- If Small Computer System Interface (SCSI) devices are installed, ensure that the last external device in each SCSI chain is terminated correctly. For more information, refer to your SCSI documentation.

Storage drive problems

Some or all storage drives are missing from the Setup Utility program.

Solutions:

- Ensure that the signal cables and power cables for all the storage drives are connected correctly.
- If the computer is installed with SAS storage drives, ensure that the LSI MegaRAID SAS adapter is correctly connected.

The computer cannot start up from the correct storage drive or the message "No Operating System Found" is displayed.

Solutions:

- Ensure that the signal cables and power cables for all the storage drives are connected correctly.
- Ensure that the computer starts up from the correct storage drive. Set the storage drive, on which the operating system resides, as the first startup device in the Setup Utility program. Refer to "Changing the startup device sequence permanently" on page 39.

Note: In rare cases, the storage drive with the operating system might get corrupted or damaged. If this problem occurs, replace the storage drive. Refer to Chapter 7 "Installing or replacing hardware" on page 59.

Ethernet LAN problems

The computer cannot connect to an Ethernet LAN.

Solutions:

- Connect the cable from the Ethernet connector to the RJ45 connector of the hub.
- Enable the Ethernet LAN feature in the Setup Utility program. Refer to "Using the Setup Utility program" on page 35.
- Enable the Ethernet LAN adapter.
    1. Depending on your Windows version, do one of the following:
        – For Windows 7: Click the Start button to open the Start menu.
        – For Windows 10: Right-click the Start button to open the Start context menu.
    2. Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **Network and Sharing Center** ➔ **Change adapter settings**.
    3. Right-click the Ethernet LAN adapter icon and click **Enable**.
- Update or reinstall the Ethernet LAN driver. Refer to "Keeping your computer current" on page 26.
- Install all networking software that is necessary for your network environment. Check with your LAN administrator for the necessary networking software.
- Set the same duplex for the switch port and the adapter. If you configured the adapter for full duplex, ensure that the switch port is also configured for full duplex. Setting the wrong duplex mode might degrade performance, cause data loss, or result in lost connections.

When a Gigabit Ethernet model computer is used at a speed of 1000 Mbps, the Ethernet LAN connection fails or errors occur.

Solution:

Connect the network cable to the Ethernet connector using Category 5 wiring and a 100 BASE-T hub/switch (not 100 BASE-X).

A Gigabit Ethernet model computer should connect to the network at a speed of 1000 Mbps but at only a speed of 100 Mbps.

Solutions:

- Try another cable.
- Set the link partner to auto-negotiate.
- Set the switch to be 802.3ab-compliant (gigabit over copper).

The Wake On LAN feature does not work.

Solution:

Enable the Wake On LAN feature in the Setup Utility program. Refer to "Using the Setup Utility program" on page 35.

Wireless LAN problem

Note: The wireless LAN feature is available only on some models.

The wireless LAN feature does not work.

Solutions:

- Enable the wireless LAN feature in the Setup Utility program. Refer to "Using the Setup Utility program" on page 35.
- For Windows 10, enable the wireless LAN feature in Windows Settings. Click the Start button to open the Start menu, and then click **Settings** ➔ **Network & Internet** ➔ **Wi-Fi**. Turn on the Wi-Fi feature.
- Enable the wireless LAN adapter.

1. Depending on your Windows version, do one of the following:

   – For Windows 7: Click the Start button to open the Start menu.

   – For Windows 10: Right-click the Start button to open the Start context menu.

2. Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **Network and Sharing Center ➙ Change adapter settings**.

3. Right-click the wireless LAN adapter icon and click **Enable**.

- Update or reinstall the wireless LAN driver. Refer to "Keeping your computer current" on page 26.

Bluetooth problems

Note: The Bluetooth feature is available only on some models.

The Bluetooth feature does not work.

Solutions:

- Enable the Bluetooth feature in the Setup Utility program. Refer to "Using the Setup Utility program" on page 35.
- Turn on the Bluetooth radios.

   1. Depending on your Windows version, do one of the following:

      – For Windows 7: Click the Start button to open the Start menu. Right-click **Computer**, and then click **Properties**.

      – For Windows 10: Right-click the Start button to open the Start context menu.

   2. Click **Device Manager**. Type the administrator password or provide confirmation if prompted.

   3. Right-click the Bluetooth radios under **Bluetooth Radios** and click **Enable**.

- Enable the Bluetooth adapter.

   1. Depending on your Windows version, do one of the following:

      – For Windows 7: Click the Start button to open the Start menu.

      – For Windows 10: Right-click the Start button to open the Start context menu.

   2. Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **Network and Sharing Center ➙ Change adapter settings**.

   3. Right-click the Bluetooth adapter icon and click **Enable**.

- Update or reinstall the Bluetooth driver. See "Keeping your computer current" on page 26.

No sound comes from the Bluetooth headset or headphones.

Solution:

Set the Bluetooth headset or headphones as the default device.

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

2. Right-click the volume icon in the Windows notification area on the taskbar.

   Note: If the volume icon is not displayed in the Windows notification area, add the icon to the notification area. Refer to Window help system.

3. Click **Playback devices**.

4. If you are using the Headset profile, select **Bluetooth Hands-free Audio**, and then click **Set Default**. If you are using the AV profile, select **Stereo Audio**, and then click **Set Default**.

5. Click **OK**.

Performance problems

Excessive fragmented files exist on the storage drives.

Solution:

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

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

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

The free storage drive space is insufficient.

Solutions:

Free up the storage drive space.

- Clean out your Inbox, Sent Items, and Deleted Items folders from your e-mail application.
- Clean up your C drive.
   1. Click the Start button to open the Start menu.
   2. Depending on your Windows version, do one of the following:
      - For Windows 7: Click **Computer**.
      - For Windows 10: Click **File Explorer** ➙ **This PC**.
   3. Right-click your C drive and then click **Properties**.
   4. Check the amount of free space, and then click **Disk Cleanup**.
   5. A list of unnecessary file categories is displayed. Select each file category you want to delete, and then click **OK**.
- Turn some Windows features off or remove some unnecessary programs.
   1. Depending on your Windows version, do one of the following:
      - For Windows 7: Click the Start button to open the Start menu.
      - For Windows 10: Right-click the Start button to open the Start context menu.
   2. Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **Programs and Features**.
   3. Do one of the following:

– To turn some Windows features off, click **Turn Windows features on or off**. Follow the instructions on the screen.

– To remove some unnecessary programs, select the program you want to remove, and then click **Uninstall/Change** or **Uninstall**.

The free memory space is insufficient.

Solutions:

• Right-click a blank area on the taskbar and open Task Manager. Then, end some tasks you are not performing.

• Install additional memory modules. Refer to Chapter 7 "Installing or replacing hardware" on page 59. To purchase memory modules, go to:
http://www.lenovo.com

Serial connector problem

The serial connector cannot be accessed.

Solutions:

• Connect the serial cable from the serial connector on the computer to the serial device. If the serial device has its own power cord, connect the power cord to a grounded electrical outlet.

• Turn on the serial device and keep the device online.

• Install any application programs supplied with the serial device. Refer to the documentation that comes with the serial device for more information.

• If you added one serial-connector adapter, ensure that the adapter is installed correctly.

USB device problem

A USB device cannot be accessed.

Solutions:

• Connect the USB cable from the USB connector to the USB device. If the USB device has its own power cord, connect the power cord to a grounded electrical outlet.

• Turn on the USB device and keep the device online.

• Install any device drivers or application programs supplied with the USB device. Refer to the documentation that comes with the USB device for more information.

• Disconnect and reconnect the USB connector to reset the USB device.

Software and driver problems

For some programs, dates cannot be sorted in correct order.

Solution:

Some programs developed before the year 2000 use only the last two digits of a year to sort dates, assuming the first two digits are 19. Consequently, dates cannot be sorted in correct order nowadays. Check with your software manufacturer to refer to if any updates are available. Many software manufacturers make updates available from the World Wide Web.

Some application programs do not work as expected.

Solutions:

1. Check whether the problem is caused by an application program.

   a. Ensure that the software is compatible with your computer. Refer to the information supplied with the software for more information.

   b. Verify that other software works properly on your computer.

   c. Verify that the software you are using works on another computer.

2. If the problem is caused by an application program:

   • Refer to the printed documentation that comes with the program or the help system of the program for troubleshooting information.

   • Update the program. Refer to "Keeping your computer current" on page 26.

   • Uninstall the program and then reinstall it. To download a program that is preinstalled on your computer, go to http://www.lenovo.com/support and follow the instructions on the screen.

A device does not work properly due to device driver problems.

Solution:

Update the device driver. Refer to "Keeping your computer current" on page 26.

Diagnostics

Note: If you are using a Windows operating system other than Windows 7 or Windows 10, go to http://www.lenovo.com/diags for the diagnostics information for your computer.

The diagnostic program is used to test hardware components of your computer. The diagnostic program also can report operating-system-controlled settings that interfere with the correct operation of your computer.

Lenovo Solution Center

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

To open the Lenovo Solution Center program, refer to "Accessing a program on your computer" on page 14. For more information about using the program, refer to the help system of the program.

If you are unable to isolate and repair the problem yourself after running Lenovo Solution Center, save and print the log files created by the program. You might need the log files when you speak to a Lenovo technical support representative.

Hardware diagnostics

Your computer supports the hardware diagnostics function. This function enables your computer to monitor some hardware components in real time for potential issues that might not be easily detectable during normal use. When the computer detects an issue or error, the four-digit diagnostic display on the front of the computer displays text and a numerical error code. Refer to "Front view" on page 1.

For information about the issue or error, do the following:

1. Connect either of the following devices to the diagnostic USB connector on the front of the computer:

   • A USB key

- An Android™ device with the Lenovo Workstation Diagnostics app installed

   Refer to "Front view" on page 1.

2. Wait about 10 to 15 seconds for the diagnostic data to transfer from the computer to the USB device. During the data transfer, the four-digit diagnostic display displays "File Copy". When the data transfer finishes, the four-digit diagnostic display displays "File Copy Done".

   Note: Diagnostic data is available for transfer through the diagnostic USB connector only when text and a numerical error code is displayed on the four-digit diagnostic display. In normal conditions, the diagnostic USB connector functions as a standard USB 3.0 connector.

3. Depending on whether you are using a USB key or an Android device (such as a smartphone), do one of the following:

   - If you are using a USB key, go to http://support.lenovo.com/workstation_diagnostics for information about how to read the error data on the USB key.

   - If you are using an Android device with the Lenovo Workstation Diagnostics app installed, open the application for details about the error. For more information about the Lenovo Workstation Diagnostics app, go to:
   http://www.thinkworkstationsoftware.com/diags

For more information about how to use the diagnostic USB connector on your computer, decipher the error codes, or use the Lenovo Workstation Diagnostics app, go to:
http://www.thinkworkstationsoftware.com/diags

The hardware diagnostic function is enabled on your computer by default. To disable the function, do the following:

1. Start the Setup Utility program. Refer to "Starting the Setup Utility program" on page 35.

2. From the Setup Utility program main menu, select **Advanced ➙ Diagnostics**, and then press Enter.

3. Select **Real-time Diagnostics Monitoring** and press Enter. Then select **Disabled** and press Enter.

4. Press F10 to save changes and exit the Setup Utility program.

Recovery information

This section provides instructions on how to recover your operating system.

Note: If a device does not work normally after recovering the operating system, update the device driver. Refer to "Keeping your computer current" on page 26.

Recovery information for Windows 7

To recover your Windows 7 operating system, use the following solutions:

- Use Windows recovery solutions.

   - Use System Restore to restore system files and settings to an earlier point.

      1. Click the Start button to open the Start menu.

      2. Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **Recovery ➙ Open System Restore**.

      3. Follow the instructions on the screen.

   - Use the Windows recovery environment by doing one of the following:

      - After several consecutive failed boot attempts, the Windows recovery environment might start automatically. Follow the instructions on the screen to choose the appropriate recovery solution.

– Turn on or restart your computer. Then, repeatedly press and release the F8 key until the Advanced Boot Options window opens. Select **Repair Your Computer**, press Enter, and follow the instructions on the screen to choose the appropriate recovery solution.

Note: For some keyboards, you might need to press Fn+F8 to open the Advanced Boot Options window.

- Use the Rescue and Recovery program to restore the storage drive from a backup, or restore the C drive to the factory-default settings.

Notes:

– Depending on your computer model, the Rescue and Recovery program might not be available unless you installed it manually earlier.

– If you use the Rescue and Recovery program to restore the storage drive from a backup, ensure that you backed up your data earlier with the program.

To use the Rescue and Recovery program, do one of the following:

– Open the Rescue and Recovery program. Refer to "Accessing a program on your computer" on page 14. For more information about using the program, refer to the help system of the program.

– Open the Rescue and Recovery workspace.

1. Turn off your computer. Press and hold the Enter key and then turn on the computer. Release the Enter key when Startup Interrupt Menu is displayed. Then, press F11 to open the Rescue and Recovery workspace.

2. If the Rescue and Recovery workspace fails to open, use the rescue medium you created earlier to resolve the problem. Select the rescue medium as the startup device. Refer to "Selecting a temporary startup device" on page 40. When the rescue medium starts, the Rescue and Recovery workspace opens. Follow the instructions on the screen.

- Use the recovery medium you created earlier with the Create Recovery Media program to restore only the C drive or the entire storage drive to the factory-default settings.

Note: To create a recovery medium, refer to "Good maintenance practices" on page 25.

1. Select the recovery medium as the startup device. Refer to "Selecting a temporary startup device" on page 40.

2. Follow the instructions on the screen to choose the appropriate recovery solution.

- Use the recovery disc set provided by Lenovo to restore the entire storage drive to the factory-default settings.

– If your computer comes with the recovery disc set, follow the instructions shipped with the disc set.

– If your computer does not come with the recovery disc set, contact the Lenovo Customer Support Center to order a recovery disc set. Refer to "Calling for service" on page 136.

Recovery information for Windows 10

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

- Use Windows recovery solutions.

– Use recovery solutions in Windows Settings.

1. Click the Start button to open the Start menu.

2. Click **Settings** ➙ **Update & security** ➙ **Recovery**.

3. Choose the appropriate recovery solution by following the instructions on the screen.

– Use System Restore to restore system files and settings to an earlier point.

1. Right-click the Start button to open the Start context menu.

2. Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **Recovery** ➙ **Open System Restore**.

3. Follow the instructions on the screen.

– Use the File History tool to restore your files from a backup.

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

1. Right-click the Start button to open the Start context menu.

2. Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **File History** ➙ **Restore personal files**.

3. Follow the instructions on the screen.

– Use the Windows recovery environment by doing one of the following:

– After several consecutive failed boot attempts, the Windows recovery environment might start automatically. Follow the instructions on the screen to choose the appropriate recovery solution.

– Select the recovery medium you created earlier with the Windows tool as the startup device. Refer to "Selecting a temporary startup device" on page 40. Then, follow the instructions on the screen to choose the appropriate recovery solution.

Note: To create a recovery medium, refer to "Good maintenance practices" on page 25.

• Use the recovery USB key provided by Lenovo to restore the entire storage drive to the factory-default settings.

– If your computer comes with the recovery USB key, follow the instructions shipped with the USB key.

– If your computer does not come with the recovery USB key, contact the Lenovo Customer Support Center to order a recovery USB key. Refer to "Calling for service" on page 136.

Chapter 7. Installing or replacing hardware

This chapter contains the following topics:

- "Handling static-sensitive devices" on page 59
- "Preparing your computer and removing the computer cover" on page 59
- "Installing or replacing hardware" on page 60
- "Completing the parts replacement" on page 132

Handling static-sensitive devices

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

When you handle options 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 options and other computer components carefully. Handle PCI/PCI-Express cards, memory modules, system boards, and microprocessors by the edges. Never touch any exposed circuitry.
- Prevent others from touching the options and other computer components.
- Touch the static-protective package containing the part to a metal expansion-slot cover or other unpainted metal surface on the computer for at least two seconds. This reduces static electricity from the package and your body before you install or replace a new part.
- When possible, remove the new part from the static-protective package, and install it directly in the computer without setting the part down. When this is not possible, place the static-protective package on a smooth, level surface and place the part on the package.
- Do not place the part on the computer cover or other metal surface.

Preparing your computer and removing the computer cover

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

CAUTION:

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

Before installing or removing any hardware component in your computer, do the following to prepare your computer and remove the computer cover:

1. Remove any media from the drives and turn off all connected devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Unlock any locking device that secures the computer cover. See "Locking your computer" on page 29.

3. Press the pit **1** so that the handle **2** is lifted. Then, pivot the handle to the left as shown and pull the handle to remove the cover from the chassis.
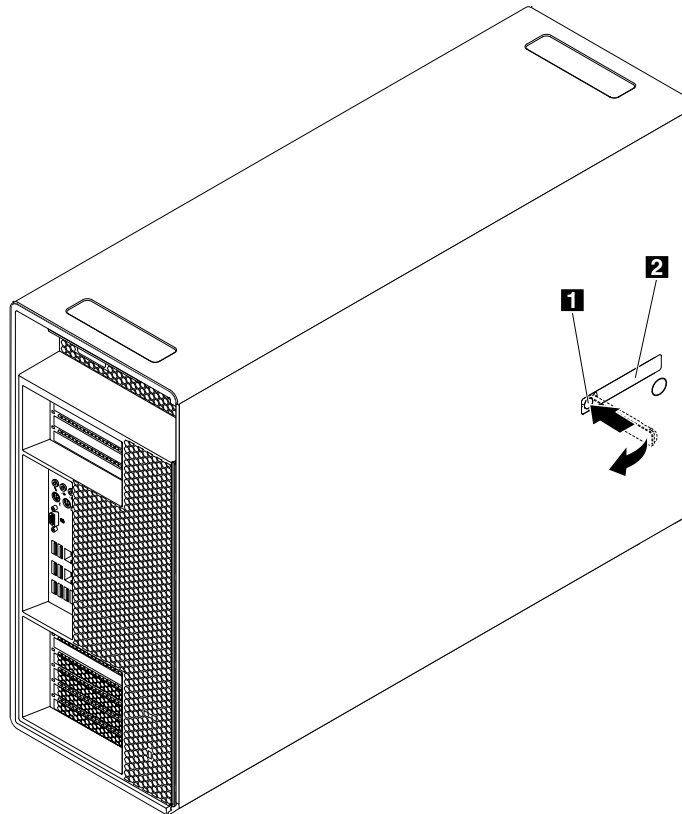
Figure 9. Removing the computer cover

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 "Read this first: Important safety information" on page v.

Notes:

- Depending on your computer model, some of the hardware parts in this section might not be available.
- Use computer parts provided only by Lenovo.
- When installing or replacing an option, use the appropriate instructions in this section along with the instructions that come with the option.
- In most areas of the world, Lenovo requires the return of the defective CRU. Information about this will come with the CRU or will come a few days after the CRU arrives.

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 "Front view" on page 1 and "Rear view" on page 3 to identify the

required connector. Then, use the instructions that come with the option to help you make the connection and install any required software or device drivers.

Cover presence switch (intrusion switch)

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

To replace the cover presence switch (also known as intrusion switch), do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. Lay the computer on its side for easier access to the cover presence switch bracket.

3. Locate the cover presence switch bracket. See "Computer components" on page 6.

4. Note the routing of the cover presence switch cable, and then disconnect the cover presence switch cable from the system board. See "Parts on the system board" on page 7.

5. Pivot the tab **1** on the cover presence switch bracket to the left as shown. Then, remove the bracket together with the cover presence switch from the chassis.
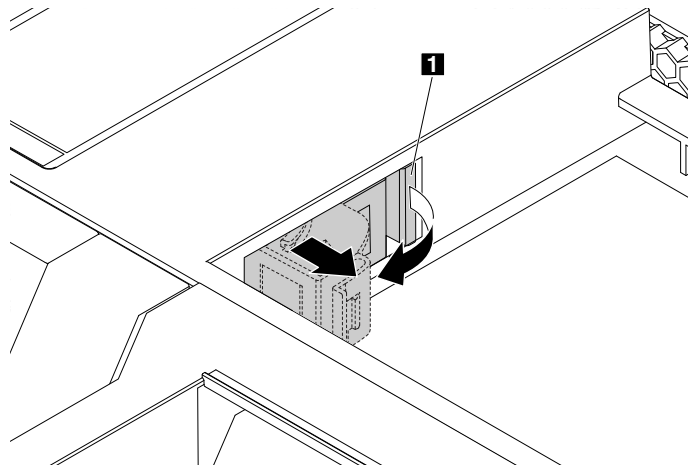
Figure 10. Removing the cover presence switch bracket

6. Pivot the clip **1** on the bracket outward, and then disengage the failing cover presence switch from the circle clip **2** to remove it from the bracket.
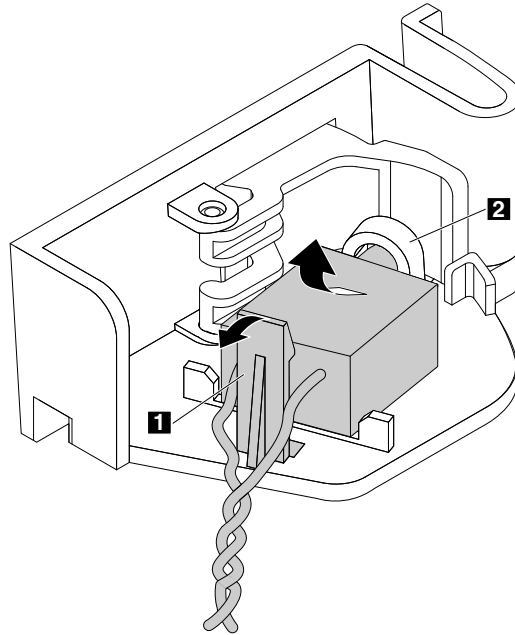
Figure 11. Removing the cover presence switch from the bracket

7. Insert the end of the new cover presence switch with the post into the circle clip **2**. Ensure that the clip **1** is placed between the two branched cables of the new cover presence switch. Then, press the cover presence switch downward until it snaps into position.
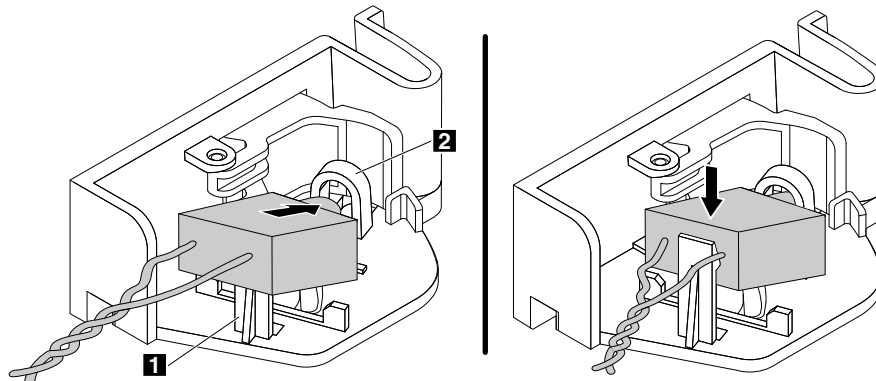
Figure 12. Installing the cover presence switch into the bracket

8. Route the cable of the new cover presence switch, and align the notch **2** on the cover presence switch with the tab **1** in the chassis. Then pivot the cover presence switch bracket to the right as shown until it snaps into position.
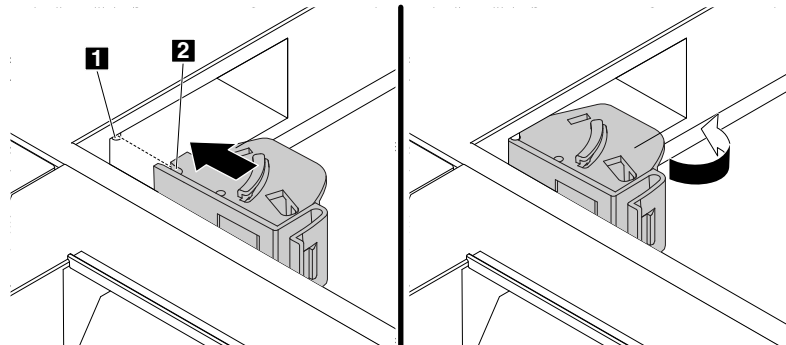
Figure 13. Installing the cover presence switch bracket

9. Connect the cable of the new cover presence switch to the system board. See "Parts on the system board" on page 7.

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 132.

Direct cooling air baffle

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

To remove the direct cooling air baffle, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. Pull the direct cooling air baffle outward by its handle **1** to remove it from the chassis.
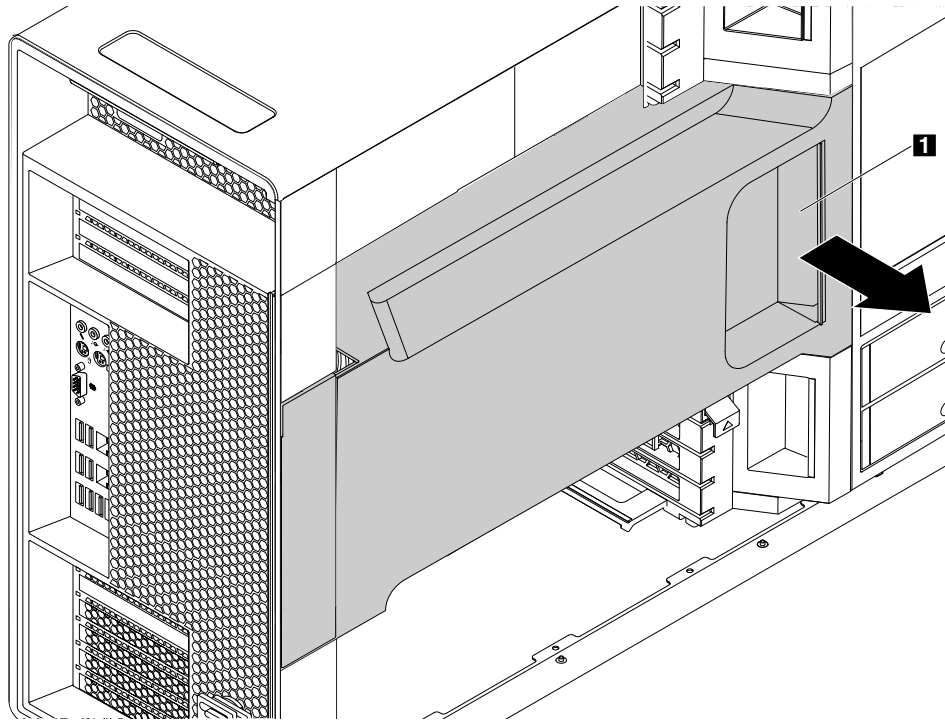
Figure 14. Removing the direct cooling air baffle

To reinstall the direct cooling air baffle, do the following:

1. Align the plastic boards on the top and bottom sides of the direct cooling air baffle with the small gaps ▮1 in the chassis. Ensure that the handle of the direct cooling air baffle faces towards the front of the chassis.
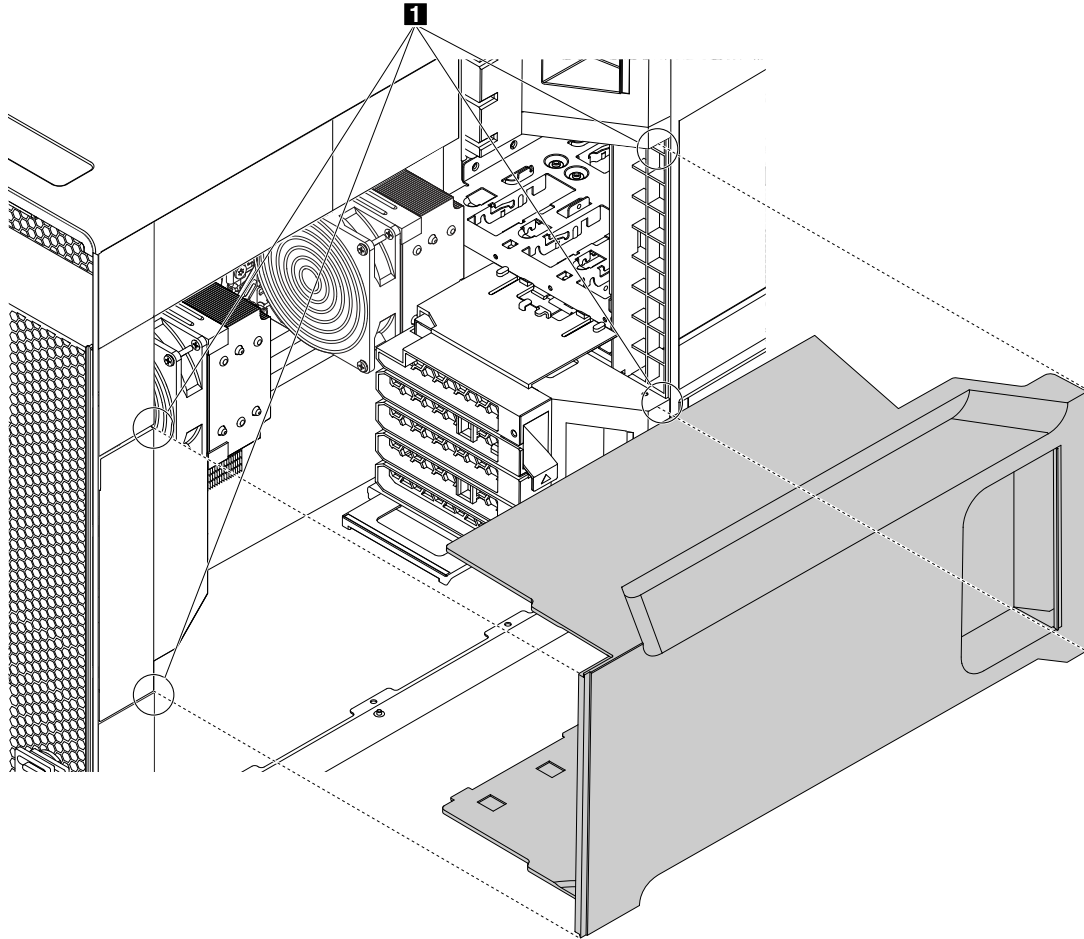
Figure 15. Aligning the plastic boards with the small gaps

2. Slide the direct cooling air baffle into the chassis until it is secured firmly.

   Note: If necessary, adjust the position of the direct cooling air baffle slightly to avoid any interference with other components 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 132.

Device in an optical-drive bay

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

Depending on your computer model, the following devices might be installed in the optical-drive bays:

- Optical drive
- Flex module

  Note: The flex module might be installed with the following:

  – IEEE 1394 connector
  – eSATA connector
  – 29-in-1 card reader
  – Slim optical drive
- Fex bay storage enclosure

To remove and install a flex module or a flex bay storage enclosure, follow the steps of removing and installing an optical drive.

To remove an optical drive, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Remove the direct cooling air baffle. See "Direct cooling air baffle" on page 63.
3. Locate the optical-drive bay from which you want to remove an optical drive. See "Internal drives" on page 9.
4. Disconnect the cables from the optical drive.

   Note: If you remove a flex module or a flex bay storage enclosure, you might need to disconnect the cables from the device, a PCI card, or the system board. See "Parts on the system board" on page 7.
5. Press the tab **1** downward and push the optical drive to the front of the chassis. Then, remove the optical drive from the front of the chassis.
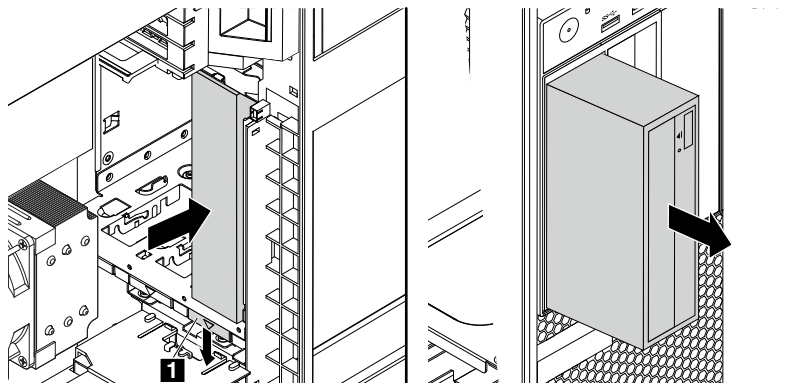
Figure 16. Removing the optical drive

To install an optical drive, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Remove the direct cooling air baffle. See "Direct cooling air baffle" on page 63.
3. Locate the optical-drive bay into which you want to install an optical drive. See "Internal drives" on page 9.
4. Press the clip underneath the plastic cover of the optical-drive bay so that the cover is ejected out of the bay. Then, remove the metal shield in the bay.

5. Note the orientation of the new optical drive. Then, slide the optical drive into the optical-drive bay from the front of the chassis until it snaps into position.
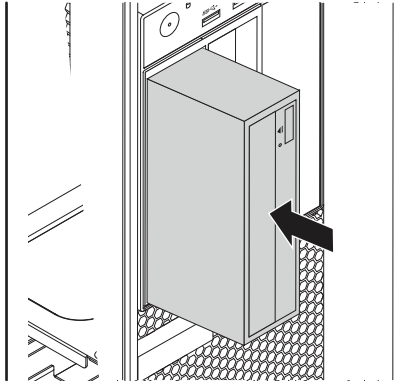
Figure 17. Installing the optical drive

6. Connect the cables to the optical drive.

   Note: If you install a flex module or a flex bay storage enclosure, you might need to connect the cables to the device, a PCI card, or the system board. See "Parts on the system board" on page 7.

7. Reinstall the direct cooling air baffle. See "Direct cooling air baffle" on page 63.

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 132.

Hard disk drive in the front-access storage enclosure

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

You can install or replace a hard disk drive in the front-access storage enclosure. The hard disk drive also can be hot-swappable, which means that you can install or replace the drive without even turning off your computer.

The hard disk drive in the front-access storage enclosure is hot-swappable only when the following requirements are met:

• The SATA cable of the front-access storage enclosure is connected to the eSATA connector on the system board. To verify the cable connection, see "Preparing your computer and removing the computer cover" on page 59 and "Parts on the system board" on page 7 for more information.

• The operating system of your computer does not reside on the hard disk drive installed in the front-access storage enclosure.

Attention: If any of the above requirements are not met, do not install or replace the hard disk drive when the computer is turned on. Otherwise, data on the hard disk drive might get damaged.

To install or replace a hard disk drive in the front-access storage enclosure, do the following:

1. Before replacing an old hard disk drive, safely eject the old hard disk drive from the operating system first. For more information, see the Windows help system.

2. Unlock the enclosure cover with the provided key as shown. Press the notch **a** to open the enclosure cover.
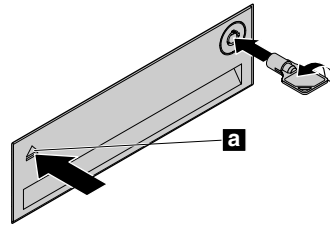
Figure 18. Opening the front-access storage enclosure cover

3. Press the pit on the bracket cover, and then grasp the tilted cover to pull the bracket out of the front-access storage enclosure.
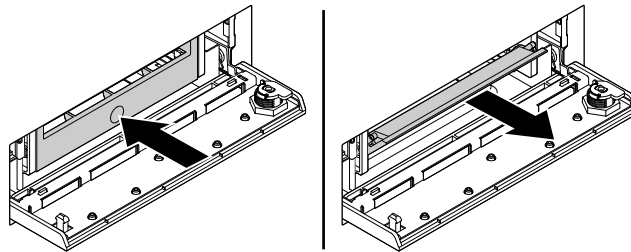
Figure 19. Removing the hard disk drive from the front-access storage enclosure

4. Flex both sides of the bracket to remove the hard disk drive from the bracket.
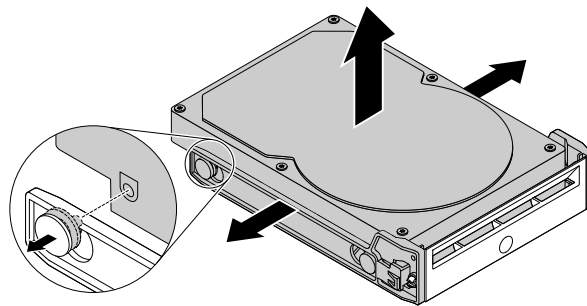
Figure 20. Removing the hard disk drive from the bracket

5. Flex both sides of the bracket and align pins **1** on the bracket with the corresponding holes in the new hard disk drive. Do not touch the circuit board on the hard disk drive.

   Note: Ensure that the circuit board faces downward and the connectors face toward the rear of the bracket.
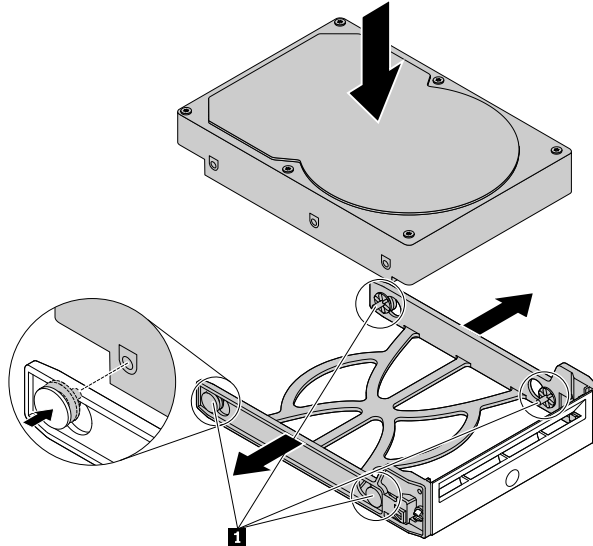
Figure 21. Installing the hard disk drive into the bracket

6. Slide the bracket with the new hard disk drive into the front-access storage enclosure until it snaps into position. Press the notch to secure the enclosure cover and lock the enclosure cover with the key.
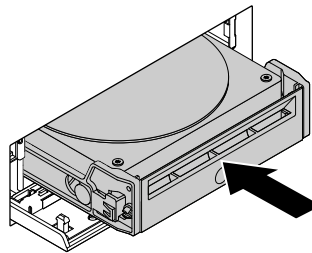
Figure 22. Installing the hard-disk-drive bracket

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 132.

Storage drive in the flex bay storage enclosure

Attention: Do not open your computer or attempt any repair before reading and understanding "Read this first: Important safety information" on page v.

You can install a 3.5-inch hard disk drive, a 2.5-inch hard disk drive, or a 2.5-inch solid-state drive into the flex bay storage enclosure.

To install or replace a storage drive in the flex bay storage enclosure, refer to the following:

- "3.5-inch storage drive" on page 70
- "2.5-inch storage drive" on page 71

3.5-inch storage drive

To install or replace a 3.5-inch storage drive, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. If the flex bay storage enclosure is installed in the computer, disconnect the signal cable and the power cable from the 3.5-inch storage drive first. Then, remove the flex bay storage enclosure from the front of the computer. See "Device in an optical-drive bay" on page 65.

3. If you are replacing a 3.5-inch storage drive, remove the four screws that secure the drive. Then take the old drive out of the flex bay storage enclosure.

   Note: When installing or removing the storage drive, do not touch the circuit board on the storage drive and make sure that the circuit board faces downward.
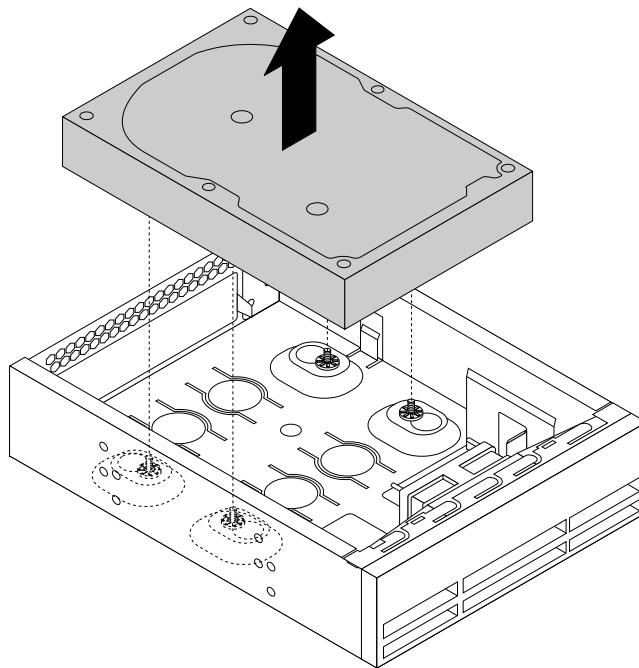
Figure 23. Removing the 3.5-inch storage drive from the flex bay storage enclosure

4. Install the 3.5-inch storage drive into the flex bay storage enclosure. Then, install the four screws to secure the drive to the flex bay storage enclosure.
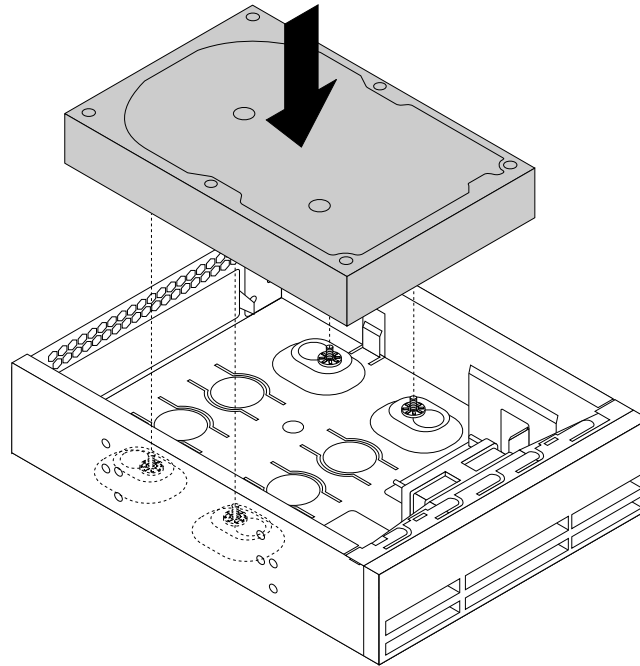
Figure 24. Installing the 3.5-inch storage drive to the flex bay storage enclosure

5. Slide the flex bay storage enclosure into the optical drive bay. See "Device in an optical-drive bay" on page 65.
6. Connect the signal cable and the power cable to the new storage drive.
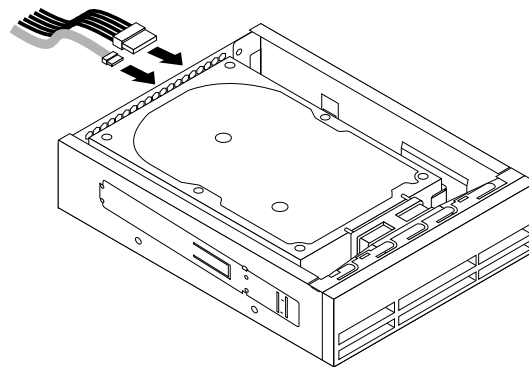
Figure 25. Connecting the cables to the storage drive

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 132.

2.5-inch storage drive

To install or replace a 2.5-inch storage drive, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. If the flex bay storage enclosure is installed in the computer, disconnect the signal cable and the power cable from the 2.5-inch storage drive first. Then, remove the flex bay storage enclosure from the front of the computer. See "Device in an optical-drive bay" on page 65.

3. If you are replacing a 2.5-inch storage drive, do the following:

   a. Remove the four screws that secure the storage converter. Take the storage converter together with the drive out of the flex bay storage enclosure.
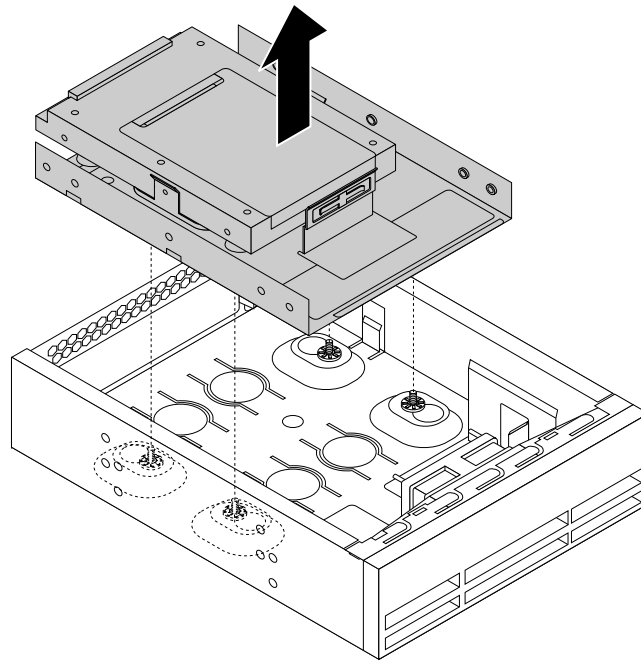
Figure 26. Removing the 2.5-inch storage drive and the storage converter from the flex bay storage enclosure

b. Remove the five screws that secure the 2.5-inch storage drive to the storage converter. Take the drive out of the storage converter.

Note: When installing or removing the storage drive, do not touch the circuit board on the storage drive and make sure that the circuit board faces downward.
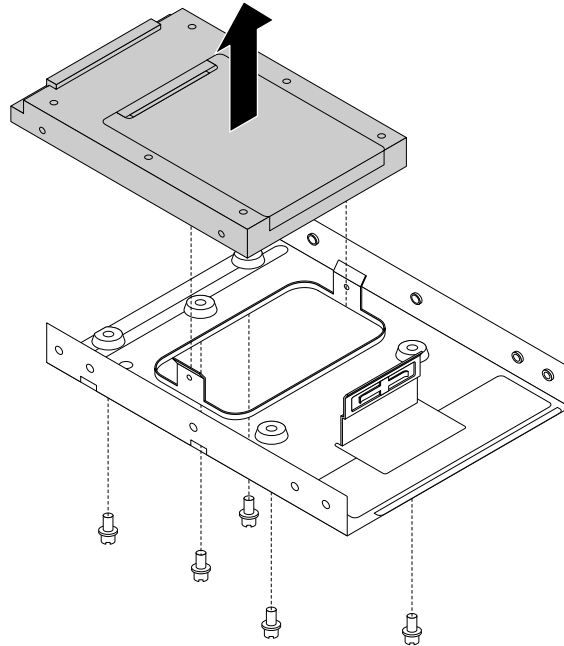
Figure 27. Removing the 2.5-inch storage drive from the storage converter

4. Install the 2.5-inch storage drive into the storage converter. Then, install the five screws to secure the drive to the storage converter.
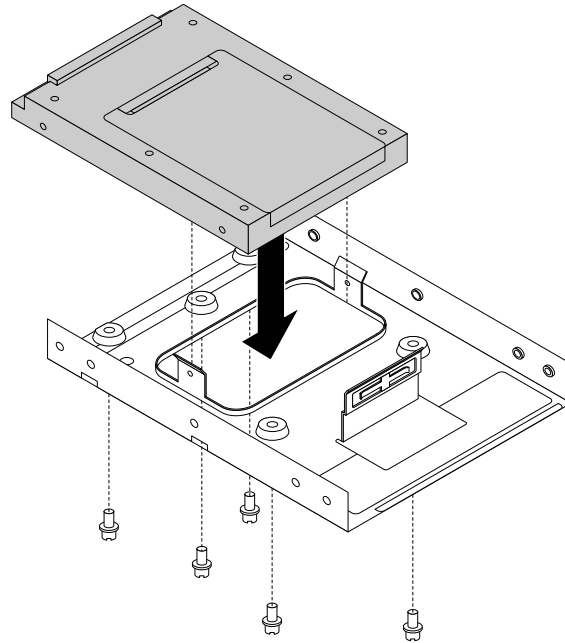
Figure 28. Installing the 2.5-inch storage drive into the storage converter

5. Install the 2.5-inch storage drive and the storage converter into the flex bay storage enclosure. Then, install the four screws to secure the storage converter to the flex bay storage enclosure.
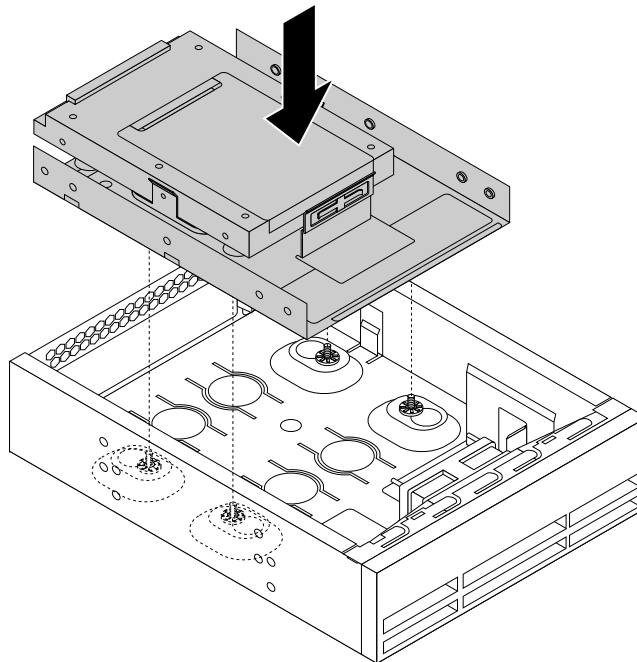
Figure 29. Installing the 2.5-inch storage drive and the storage converter into the flex bay storage enclosure

6. Slide the flex bay storage enclosure into the optical drive bay. See "Device in an optical-drive bay" on page 65.

7. Connect the signal cable and the power cable to the new storage drive.
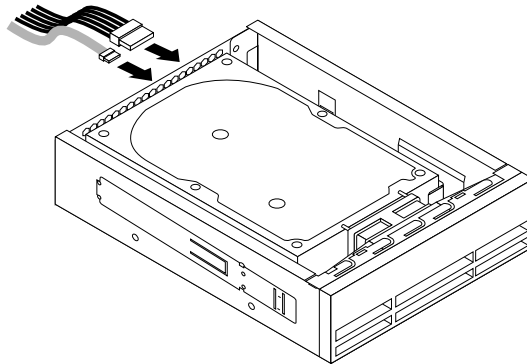
Figure 30. Connecting the cables to the storage drive

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 132.

Device in the 5.25-inch flex module

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

This section provides instructions on how to install or replace a device in the 5.25-inch flex module. Installing and replacing a device in the 5.25-inch flex module involves the following operations:

- "Slim optical drive" on page 75

- "Card reader" on page 78

- "eSATA connector or IEEE 1394 connector" on page 81

Slim optical drive

To install or replace a slim optical drive in the flex module, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. Remove the flex module from the front of the computer. See "Device in an optical-drive bay" on page 65.

3. Lift the clip on the rear of the flex module. Then, slide the flex module cover to the rear of the flex module to remove the cover.
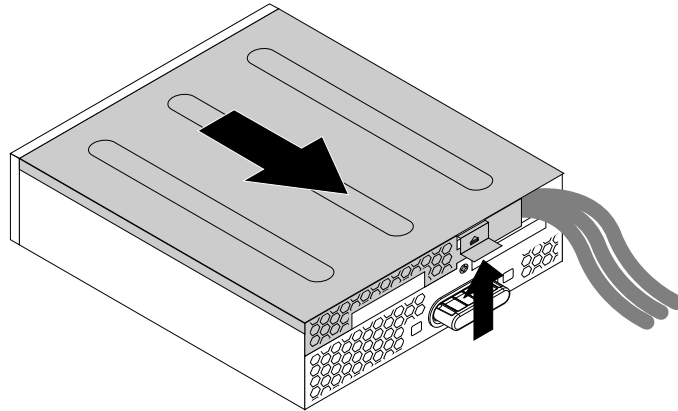
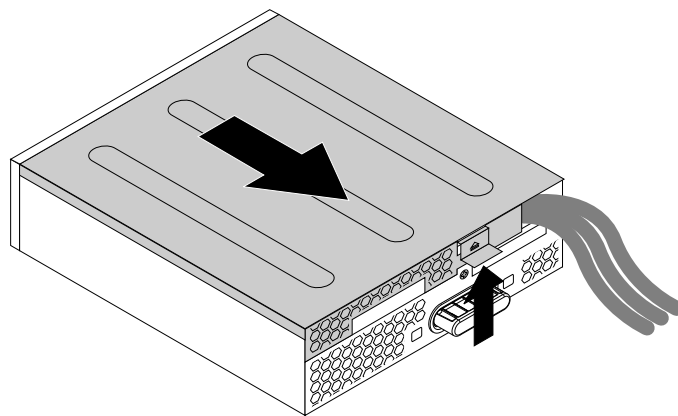*Figure 31. Removing the flex module cover*

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

   • If you are installing a new slim optical drive, press the two metal clips **1** to remove the plastic clip with the two screws as shown. Remove the two screws and then go to Step 5 on page 77.
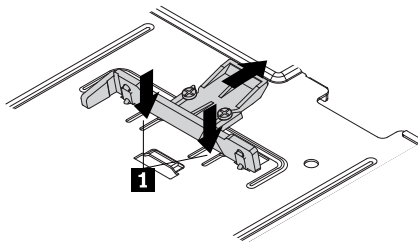
Figure 32. Removing the plastic clip with the two screws

   • If you are replacing an old slim optical drive, do the following:

a. Press the button as shown to remove the slim optical drive from the flex module.
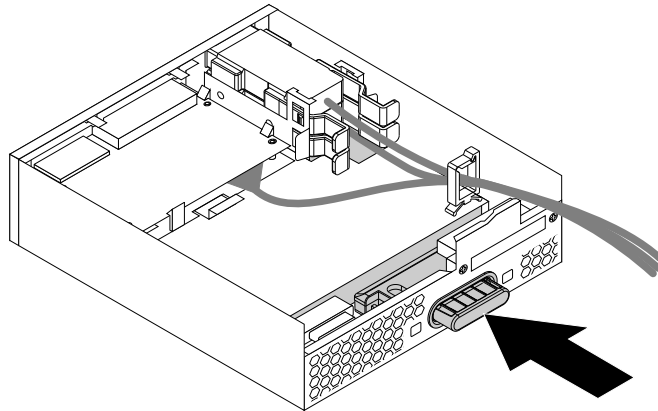
Figure 33. Removing the slim optical drive from the flex module

b. Remove the two screws that secure the clip to remove the plastic clip from the rear of the slim optical drive.
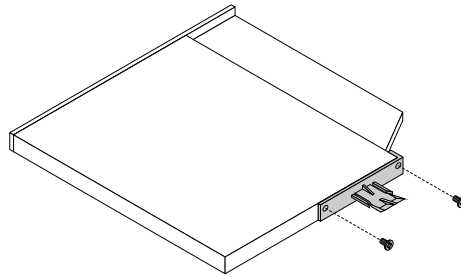
Figure 34. Removing the plastic clip from the slim optical drive

5. Install the two screws to secure the plastic clip on the rear of the new slim optical drive.
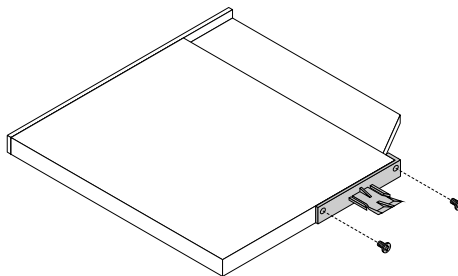
Figure 35. Installing the plastic clip to the slim optical drive

6. Slide the new slim optical drive with the plastic clip into the flex module until the slim optical drive snaps into position.
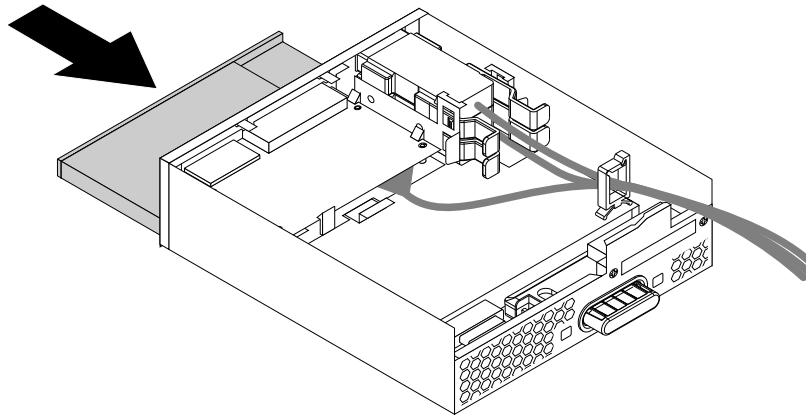
Figure 36. Installing the slim optical drive in the flex module

7. Position the flex module cover on the flex module. Ensure that the rail guides on the bottom of the flex module cover engage the rails on the flex module. Then, push the cover to the front of the flex module until it snaps into position.
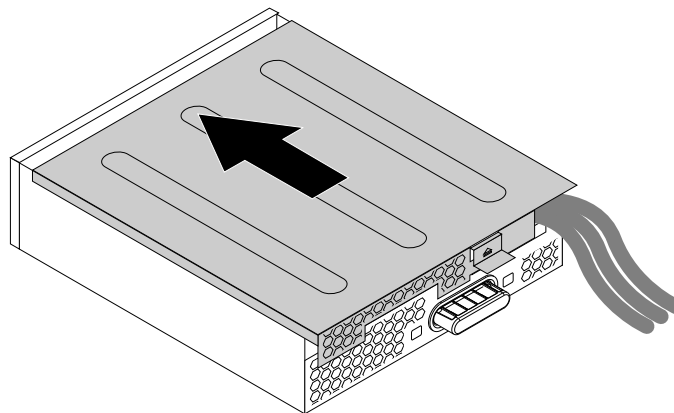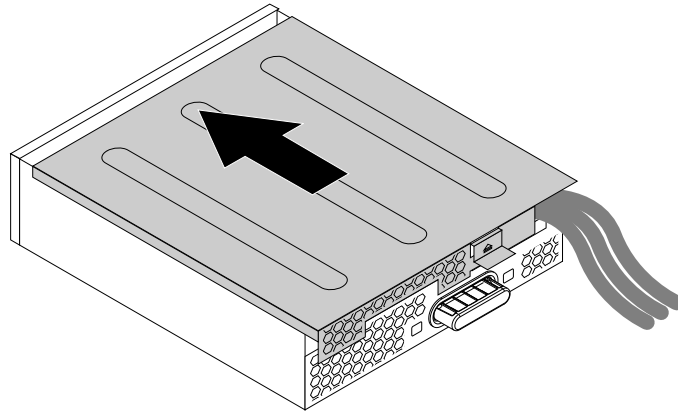

Figure 37. Reinstalling the flex module cover

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 132.

Card reader

To install or replace a card reader in the flex module, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. Remove the flex module from the front of the computer. See "Device in an optical-drive bay" on page 65.

3. Lift the clip on the side of the flex module upward. Then, slide the flex module cover to the rear of the flex module to remove the cover.
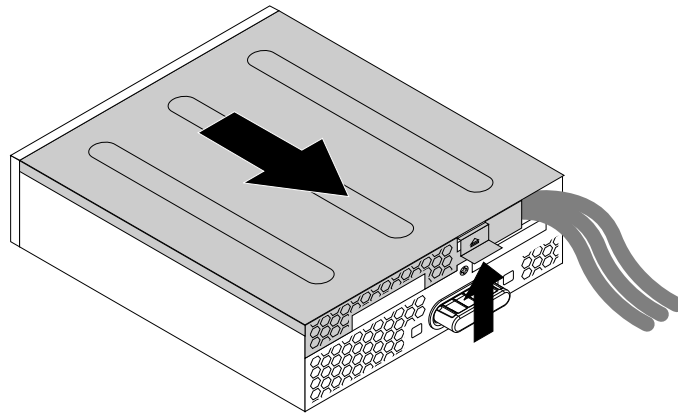
Figure 38. Removing the flex module cover

4. If you are replacing a card reader, do the following:

   a. Disconnect the card reader cable from the system board. See "Parts on the system board" on page 7.

   b. Pull the clip as shown to remove the card reader with the card reader retaining bracket out of the flex module.
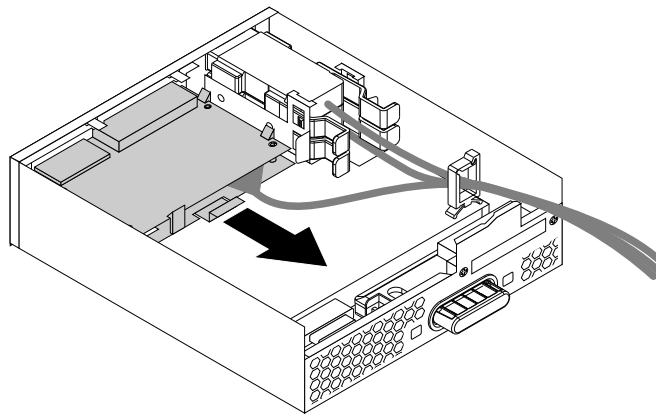
Figure 39. Removing the card reader in the flex module

   c. Flex the four clips on the sides of the card reader retaining bracket to remove the card reader from the bracket.
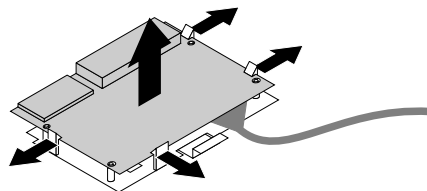
Figure 40. Removing the card reader from the card reader retaining bracket

5. To install a new card reader into the card reader retaining bracket, align the four holes in the card reader with the corresponding studs on the bracket. Then, press the new card reader downward until it snaps into position.
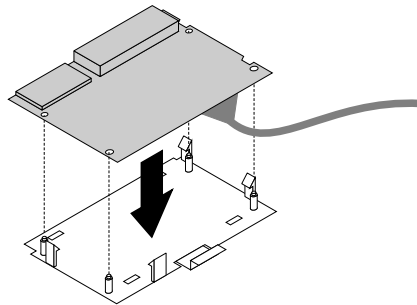
Figure 41. Installing the card reader into the card reader retaining bracket

6. Note the orientation of the new card reader and route the card reader cable into the cable clip. Hold the clip on the card reader retaining bracket. Then, insert the new card reader into the card reader slot in flex module until it snaps into position.
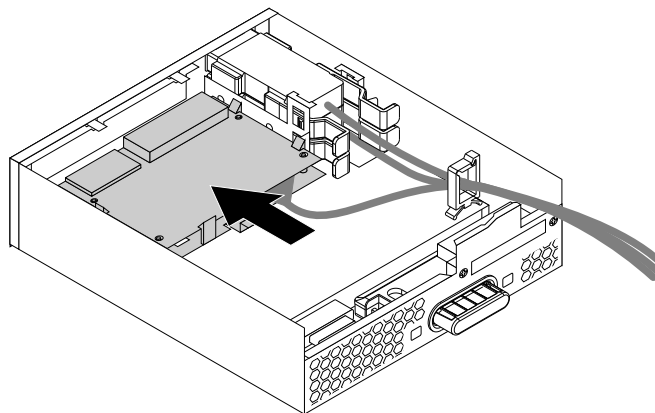
Figure 42. Installing the card reader in the flex module

7. Position the flex module cover on the flex module. Ensure that the rail guides on the bottom of the flex module cover engage the rails on the flex module. Then, push the cover to the front of the flex module until it snaps into position.
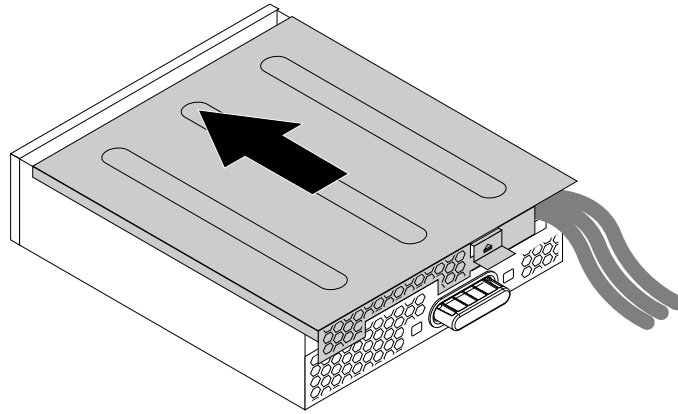
Figure 43. Reinstalling the flex module cover

8. Connect the card reader cable to the USB 2.0 connector or card reader connector on the system board. See "Parts on the system board" on page 7.

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 132.

eSATA connector or IEEE 1394 connector

To install or replace an eSATA connector or IEEE 1394 connector in the flex module, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Slide the flex module out of the front of the computer. See "Device in an optical-drive bay" on page 65.
3. Lift the clip on the side of the flex module upward. Then, slide the flex module cover to the rear of the flex module to remove the cover.

Figure 44. Removing the flex module cover

4. If you are replacing an eSATA connector or IEEE 1394 connector, do the following:

a. Disconnect the eSATA connector or IEEE 1394 connector cable from the system board. See "Parts on the system board" on page 7.

b. Press the two clips toward each other as shown to pull the eSATA connector or IEEE 1394 connector out of the flex module.
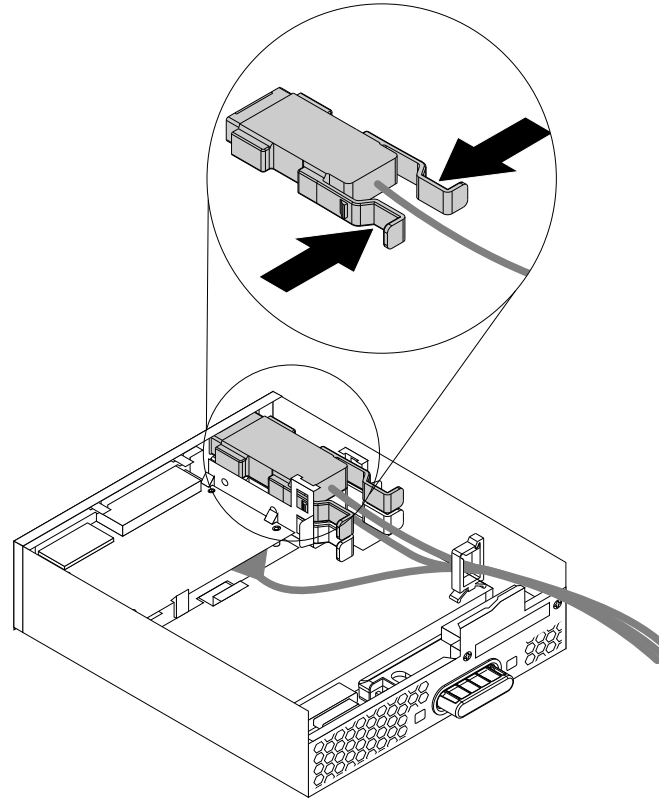
Figure 45. Removing the eSATA connector or IEEE 1394 connector in the flex module

5. Note the orientation of the eSATA connector or IEEE 1394 connector and route the eSATA connector or IEEE 1394 connector cable into the cable clip.

6. Place the eSATA connector or IEEE 1394 connector into the metal retainer. Then, insert the eSATA connector or IEEE 1394 connector into the corresponding slot in the flex module as shown.
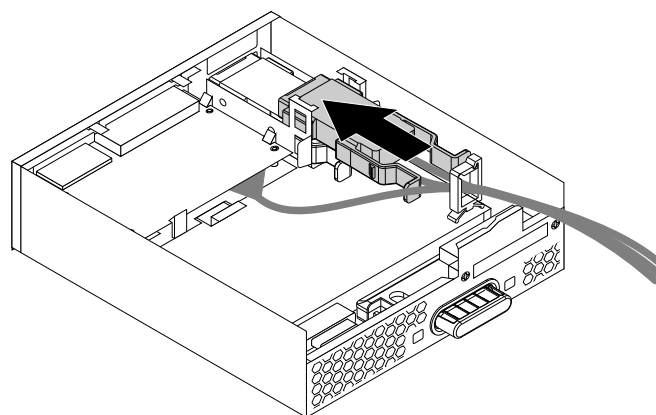
Figure 46. Installing the eSATA connector or IEEE 1394 connector in the flex module

7. Position the flex module cover on the flex module. Ensure that the rail guides on the bottom of the flex module cover engage the rails on the flex module. Then, push the cover to the front of the flex module until it snaps into position.

Figure 47. Reinstalling the flex module cover

8. Connect the eSATA connector or IEEE 1394 connector cable to the corresponding connector on the system board. See "Parts on the system board" on page 7.

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 132.

Internal storage drive

Depending on your computer model, your computer might come with one or more of the following internal storage drives:

- 3.5-inch hard disk drive
- 3.5-inch hybrid drive
- 2.5-inch hard disk drive
- 2.5-inch solid-state drive
- M.2 solid-state drive
- PCI Express solid-state drive

To install or replace an internal storage drive, refer to one of the following topics:

- "3.5-inch storage drive" on page 83
- "2.5-inch storage drive" on page 86
- "M.2 solid-state drive" on page 91
- "PCI card" on page 104 (applies to a PCI Express solid-state drive)

3.5-inch storage drive

Note: Depending on your computer model, a 3.5-inch hard disk drive or a 3.5-inch hybrid drive might come with your computer.

To install or replace a 3.5-inch storage drive in a hard-disk-drive bay, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. Locate the hard-disk-drive bay in which you want to install or replace a storage drive. See "Internal drives" on page 9.

3. Press the pit on the cover of the hard disk drive bay so that the cover is opened. Then, pull the cover edge as shown to remove the hard-disk-drive bracket from the hard-disk-drive bay.
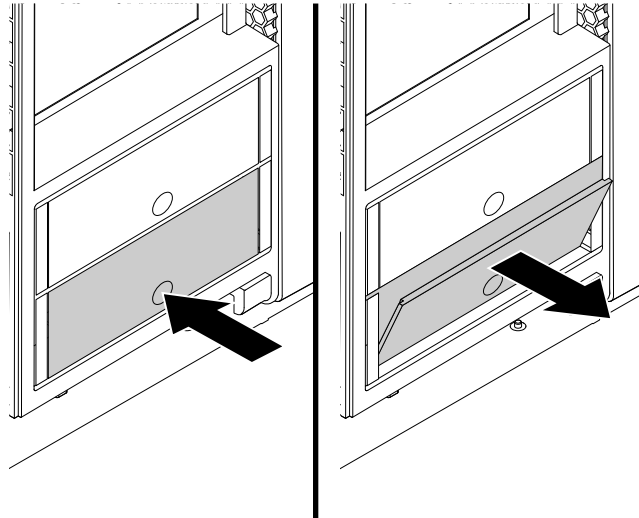
Figure 48. Removing the hard-disk-drive bracket

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

   • If you are installing a storage drive, go to step 6.

   • If you are replacing a storage drive, flex the sides of the bracket to release the four pins **1** from the storage drive. Then, remove the storage drive from the bracket.
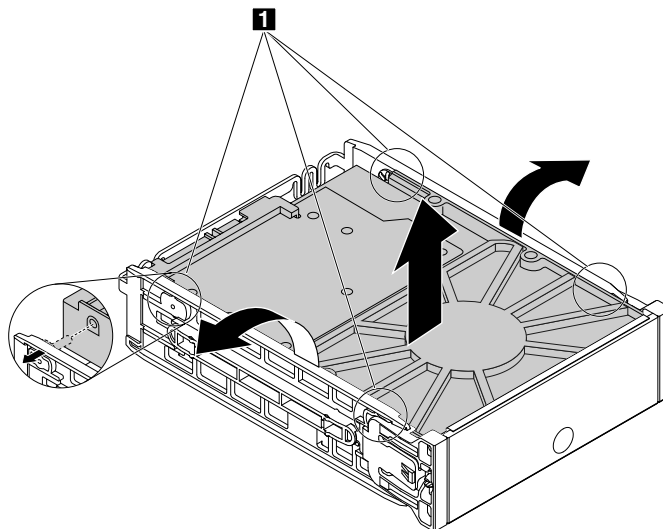
Figure 49. Removing the storage drive from the bracket

5. Hold the storage drive so that the connectors face towards the rear of the bracket and the circuit board **2** faces upward. Then, flex the sides of the bracket and align the four pins **1** on the bracket with the corresponding holes in the storage drive.

   Note: Do not touch the circuit board **2** of the storage drive.
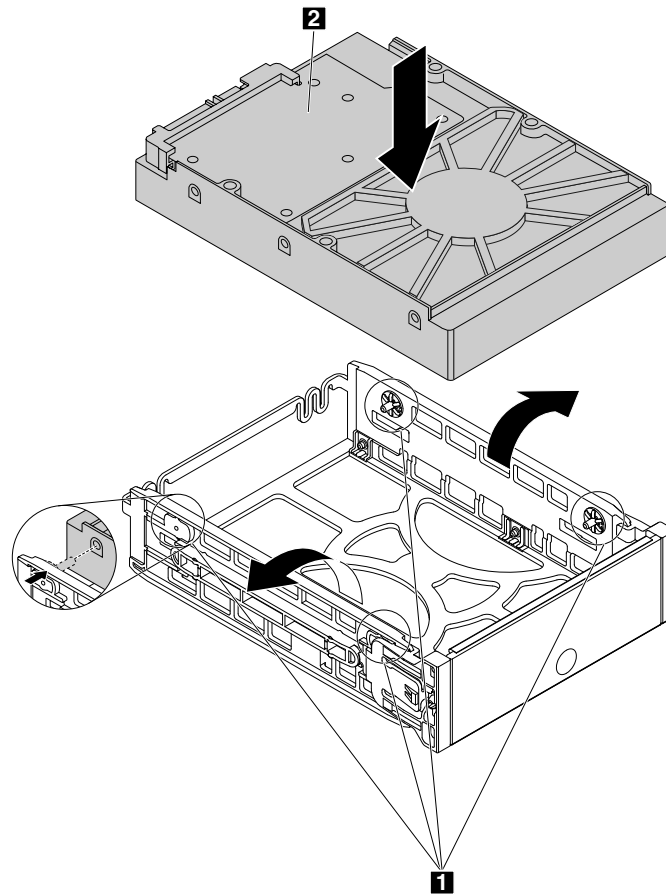
Figure 50. Installing the storage drive into the bracket

6. Slide the bracket together with the installed storage drive into the hard-disk-drive bay until the bracket snaps into position.
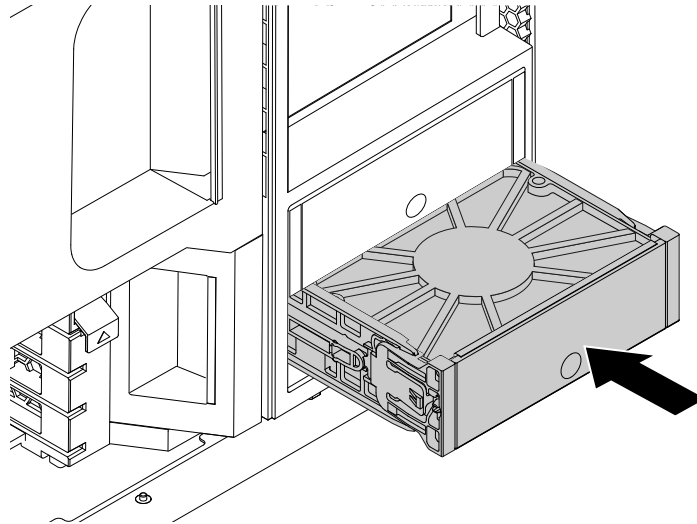
Figure 51. Installing the hard-disk-drive bracket

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 132.

2.5-inch storage drive

Note: Depending on your computer model, a 2.5-inch hard disk drive or a 2.5-inch solid-state drive might come with your computer.

To install or replace a 2.5-inch storage drive, refer to one of the following topics:

- "Installing or replacing a 2.5-inch storage drive in a hard-disk-drive bay" on page 86
- "Installing or replacing a 2.5-inch storage drive with a converter in a hard-disk-drive bay" on page 88

Installing or replacing a 2.5-inch storage drive in a hard-disk-drive bay

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

To install or replace a 2.5-inch storage drive in a hard-disk-drive bay, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Locate the hard disk drive bay in which you want to install or replace a storage drive. See "Internal drives" on page 9.
3. Remove the storage drive bracket from the hard-disk-drive bay. See step 3 on page 84.
4. Depending on whether you are installing or replacing a storage drive, do one of the following:

    - If you are installing a storage drive, go to step 6.

- If you are replacing a storage drive, flex the sides of the bracket to release the four pins **1** from the storage drive. Then, remove the storage drive from the bracket.

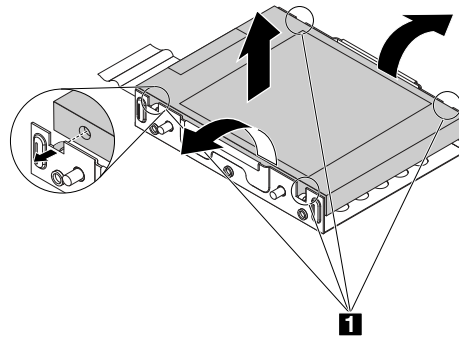*Figure 52. Removing the storage drive from the bracket*

5. Keep the connector on the storage drive on the right as shown. Then, flex the sides of the bracket and align the four pins **1** on the bottom of the bracket with the corresponding holes in the storage drive.

   Note: Do not touch the circuit board (if accessible) of the 2.5-inch storage drive.
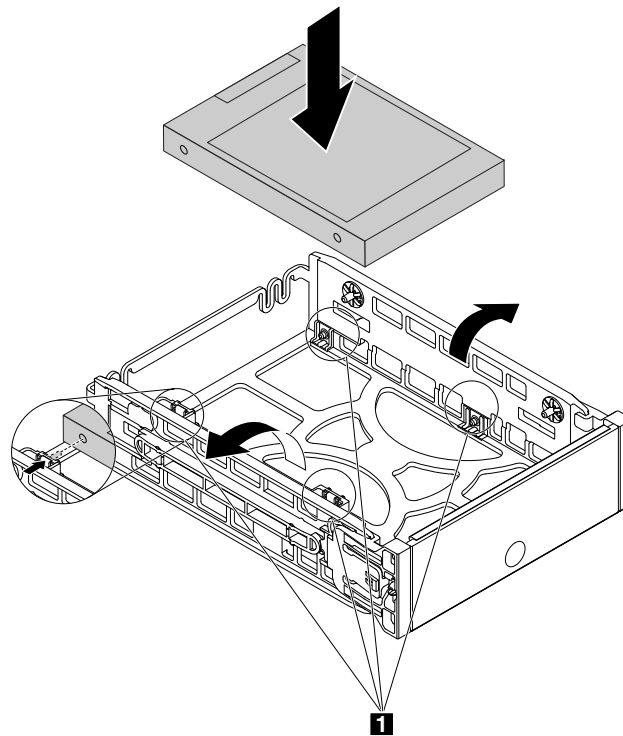
Figure 53. Installing the storage drive into the bracket

6. Install the bracket with the new storage drive into the hard-disk-drive bay. See step 6 on page 86.

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 132.

Installing or replacing a 2.5-inch storage drive with a converter in a hard-disk-drive bay

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

To install or replace a 2.5-inch storage drive with a 2.5-inch to 3.5-inch converter in a hard-disk-drive bay, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Locate the hard-disk-drive bay in which you want to install or replace a storage drive. See "Internal drives" on page 9.
3. Remove the storage drive bracket from the hard-disk-drive bay. See step 3 on page 84.
4. Depending on whether you are installing or replacing a storage drive, do one of the following:

   • If you are installing a storage drive, pivot tab **1** on the metal adapter upward. Then, push the adapter as shown until the four tabs on the adapter are slide into the four notches **2**. Pivot the adapter as shown to remove it from the converter.
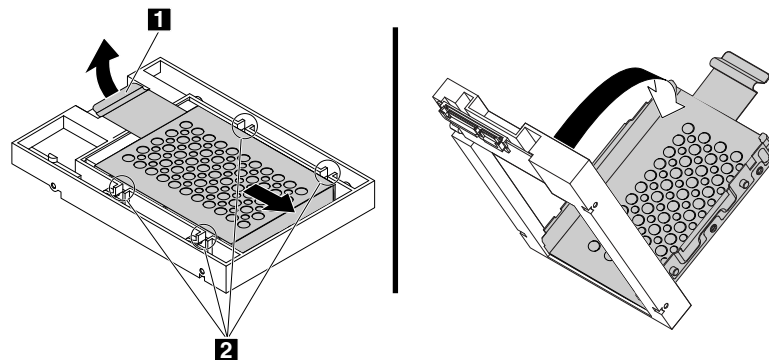
Figure 54. Removing the adapter from the converter

   • If you are replacing a storage drive, do the following:

   a. Remove the converter from the bracket. See step 4 on page 84.

b. Pivot tab **1** on the metal adapter upward and push the adapter as shown until the four tabs on the adapter are slide into the notches **2**. Then, pivot the adapter as shown to remove it with the storage drive from the converter.
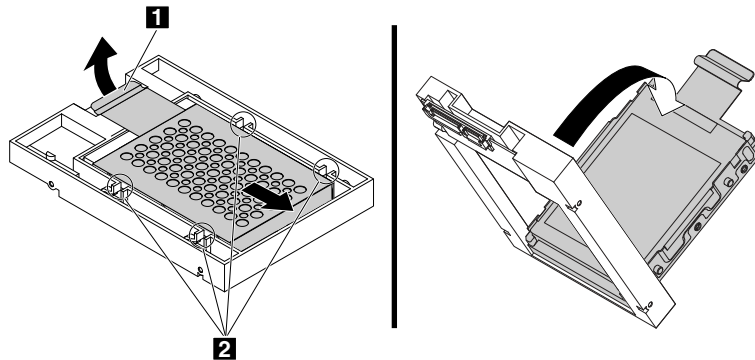
Figure 55. Removing the adapter from the converter

c. Flex the sides of the adapter to release the four pins **1** from the storage drive. Then, remove the storage drive from the adapter.

Figure 56. Removing the storage drive from the adapter

5. Note the orientation of the connector on the new storage drive. Then, flex the sides of the adapter and align the four pins **1** with the corresponding holes in the storage drive.

   Note: Do not touch the circuit board (if accessible) of the 2.5-inch storage drive.
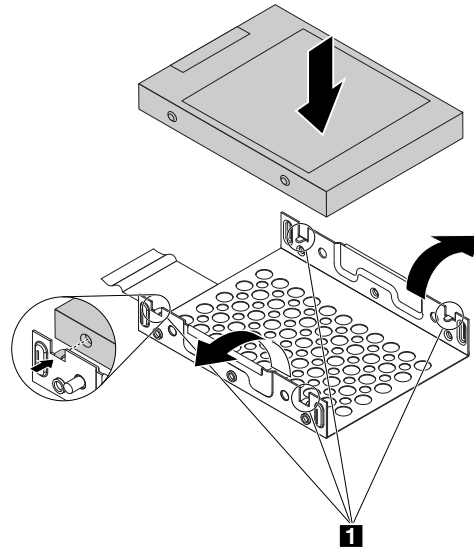
Figure 57. Installing the storage drive into the adapter

6. Align the four tabs on the adapter with the corresponding notches **1** in the converter. Then, slide the storage drive as shown until the tab **2** snaps into position. The adapter with the storage drive is installed into the converter.
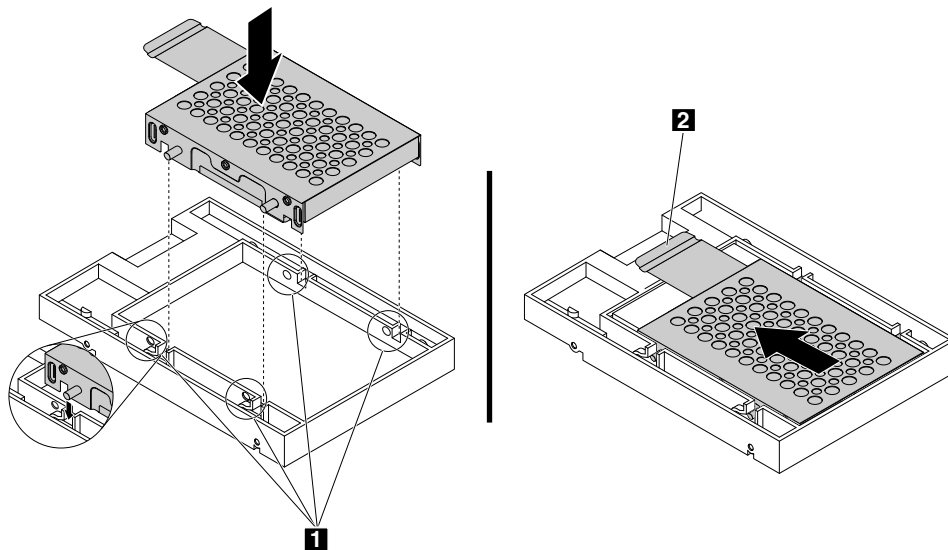
Figure 58. Installing the adapter into the converter

7. Install the converter with the new storage drive into the bracket and the bracket into the hard-disk-drive bay. See step 5 on page 85 and step 6 on page 86.

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 132.

M.2 solid-state drive

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

To replace an M.2 solid-state drive, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. Lay the computer on its side for easier access to the flex adapter slots.

3. Locate the flex adapter slots. See "Parts on the system board" on page 7.

4. Locate and remove the flex adapter on which you want to install or replace an M.2 solid-state drive. See "Flex adapter" on page 101.

5. Open the cover of the flex adapter.
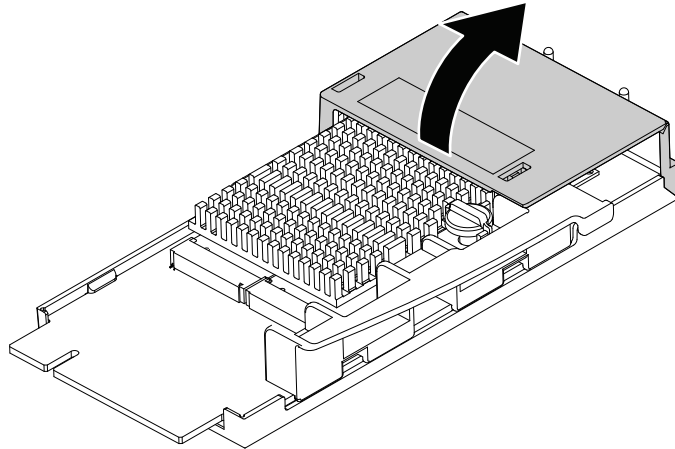
Figure 59. Opening the cover of the flex adapter

6. The heat sink is secured by a mounting stud. Pinch the tab of the mounting stud and turn the mounting stud 90-degree counterclockwise to release the heat sink. Then, lift the heat sink off the flex adapter.
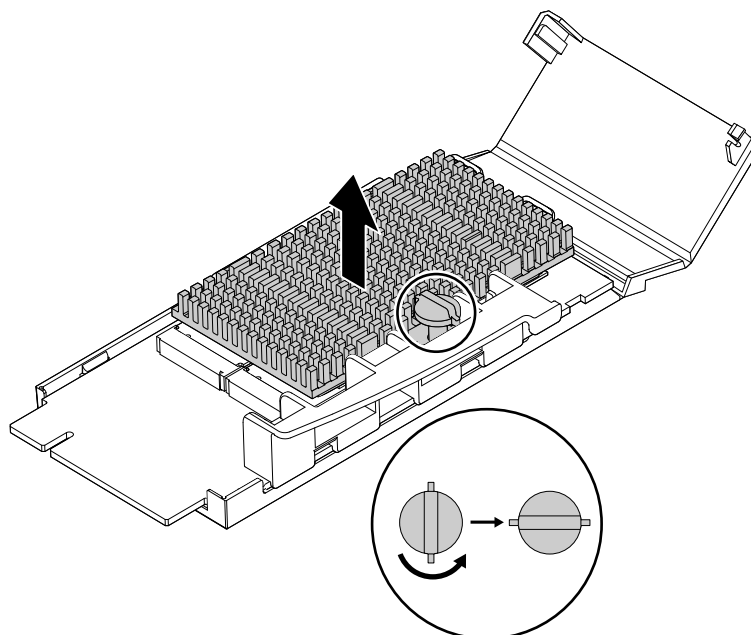
Figure 60. Removing the heat sink from the flex adapter

7. Locate the M.2 solid-state drive that you want to replace.
8. The M.2 solid-state drive is secured by a retention latch. Pull the handle of the retention latch outward to release the M.2 solid-state drive. Then, gently pull the M.2 solid-state drive out of the M.2 slot.
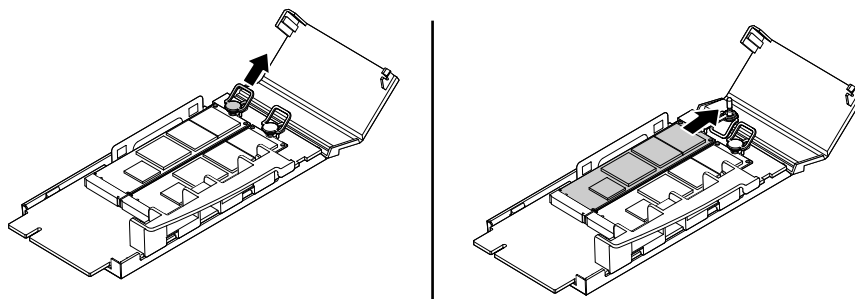
Figure 61. Removing the M.2 solid-state drive

9. Hold the new M.2 solid-state drive by its edges, ensure that the circuit board side is upward, and then insert the drive into the M.2 slot until it is secured tightly. Then, insert the plug of the retention latch into the hole to secure the new drive.

   Notes:

   - Do not touch the circuit board of the M.2 solid-state drive.
   - If only one M.2 solid-state drive is installed on the flex adapter, ensure that you install the drive in the slot printed with SLOT 1.
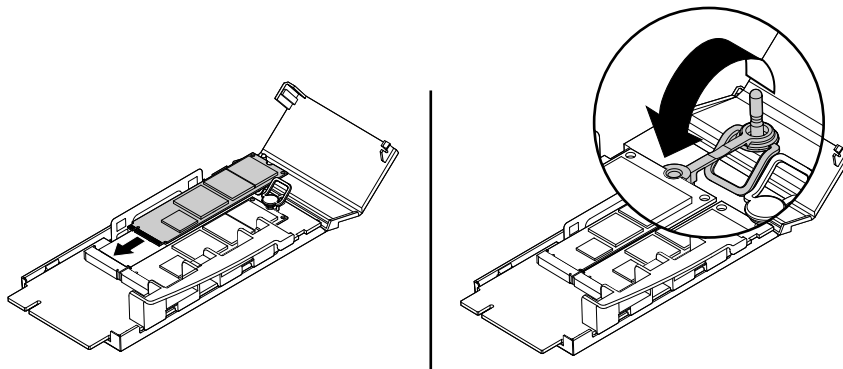
Figure 62. Installing the M.2 solid-state drive

10. Insert the two hooks on the heat sink into the holes in the retention plate on the flex adapter as shown **1**. Then, press the heat sink downward **2**. Ensure that the mounting stud on the heat sink is aligned with the hole in the flex adapter.
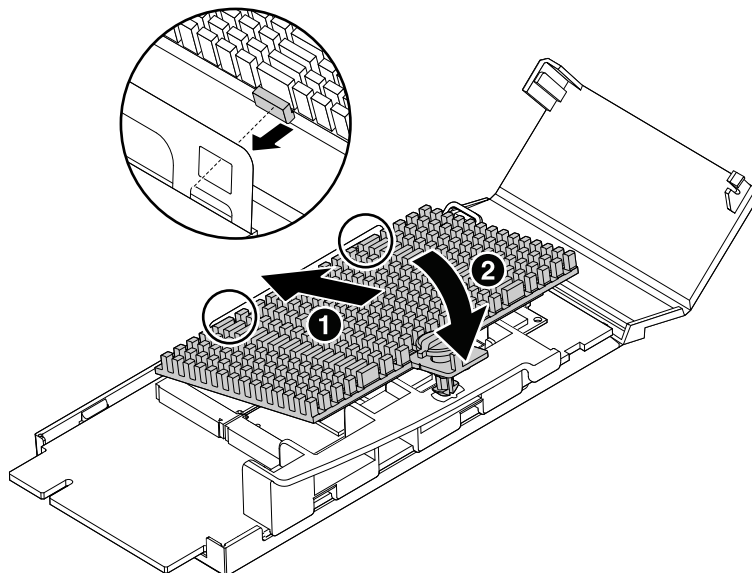
Figure 63. Installing the heat sink onto the flex adapter

11. Pinch the tab of the mounting stud and press the mounting stud downward. Then, turn the mounting stud 90-degree clockwise to secure the heat sink to the flex adapter.
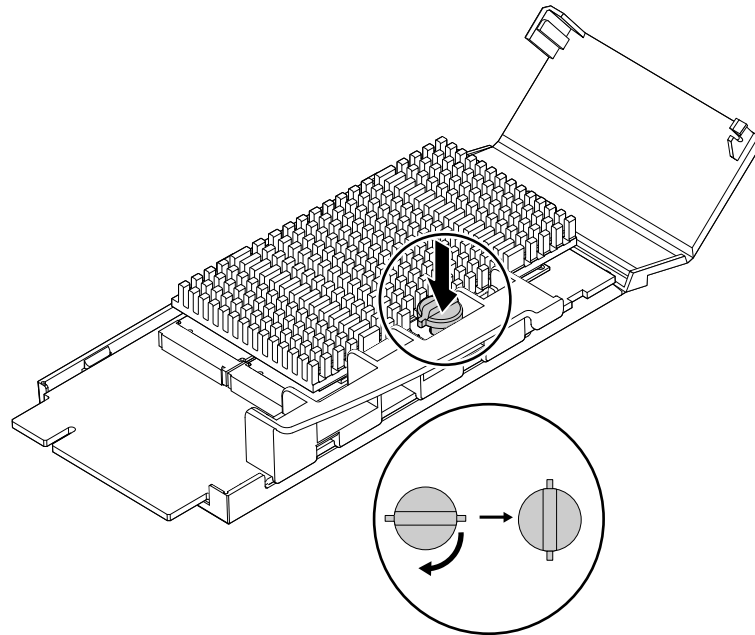
Figure 64. Securing the heat sink on the flex adapter

12. Pivot the cover of the flex adapter as shown until you hear a click. The cover is secured in position.
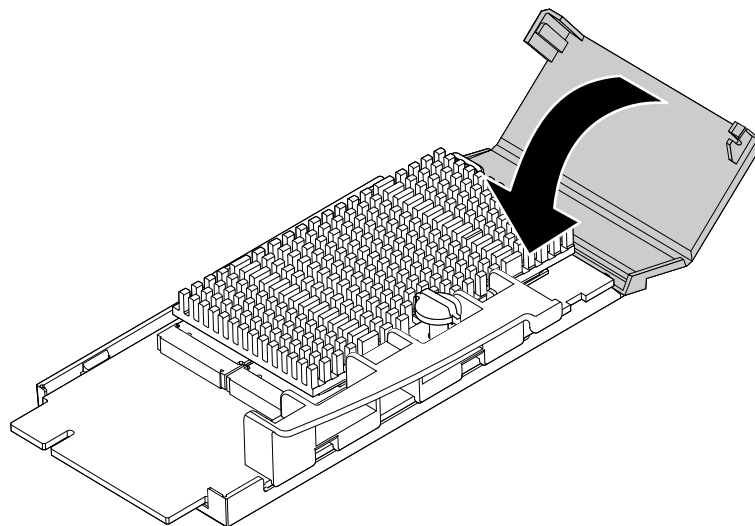
Figure 65. Pivoting the cover of the flex adapter

13. Install the flex adapter into the flex adapter slot. See "Flex adapter" on page 101.

    Note: If your computer is installed with only one flex adapter, ensure that you install the flex adapter into the flex adapter slot 1. See "Parts on the system board" on page 7.

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 132.

Front fan assembly

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

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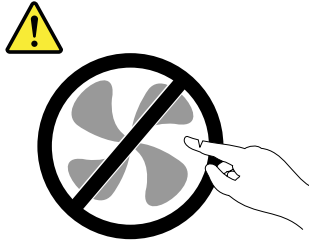
Hazardous moving parts. Keep fingers and other body parts away.

To replace a front fan assembly, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Locate the failing front fan assembly. See "Computer components" on page 6.
3. Press the tab **1** and slide the front fan assembly outward by the handle **2** to remove it from the chassis.
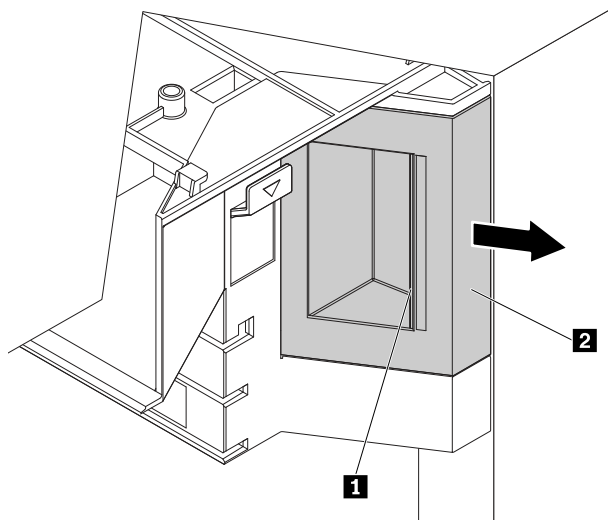
Figure 66. Removing the front fan assembly

4. Slide the front fan assembly into the multi-function bracket until it snaps into position.
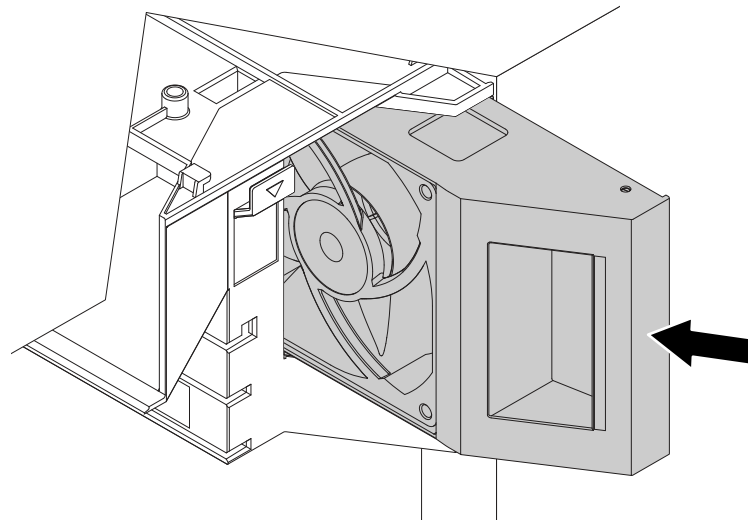
Figure 67. Installing the front fan assembly

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 132.

Multi-function brackets

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

Your computer is installed with two multi-function brackets. The brackets are used to secure the front fan assembly, flex adapters, and full-length PCI Express cards. The bracket installed in the upper position of the chassis also can be used to secure the power supply assembly.

To remove and reinstall either of the multi-function brackets, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. If necessary, remove the direct cooling air baffle for easier operation. See "Direct cooling air baffle" on page 63.
3. Locate the multi-function bracket you want to remove. See "Computer components" on page 6.
4. If you are replacing the multi-function bracket installed in the upper position of the chassis, remove the power supply assembly. See "Power supply assembly" on page 98.
5. Remove the front fan assembly in the bracket you want to remove. See "Front fan assembly" on page 95.
6. Lay the computer on its side for easier access to the bracket.

7. Hold the handle **1** and the foot **2** at the same time and pull the bracket to the rear of the chassis to remove the bracket.
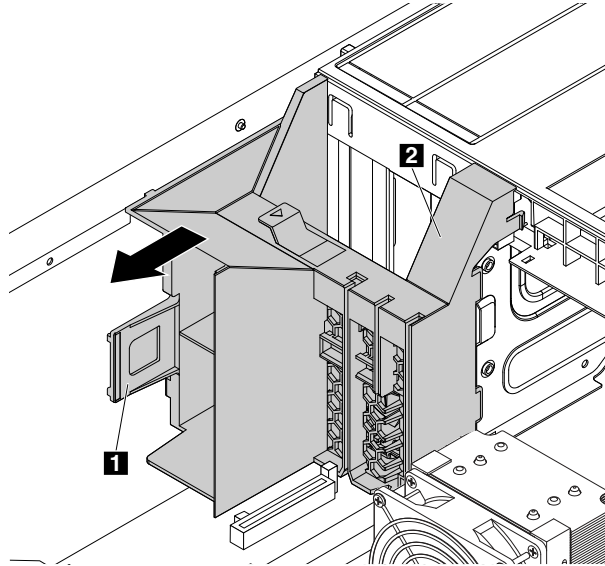
Figure 68. Removing the multi-function bracket

8. Align the three tabs **1** on the bracket with the corresponding holes in the chassis. Then, insert the three tabs into the corresponding holes until the bracket snaps into position.
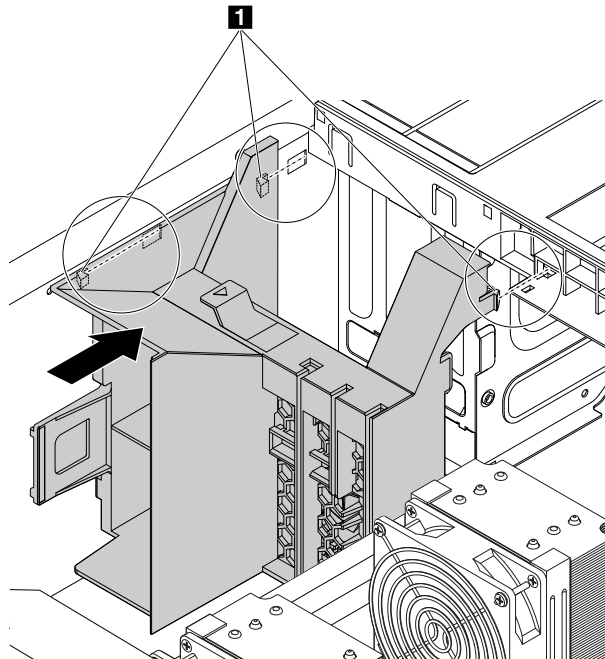

Figure 69. Reinstalling the multi-function bracket

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 132.

Power supply assembly

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

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

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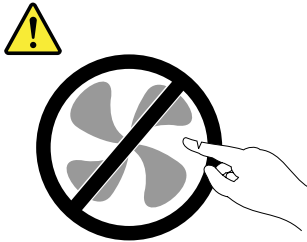
Hazardous moving parts. Keep fingers and other body parts away.

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

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

To replace the power supply assembly, do the following:
1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Locate the power supply assembly. See "Computer components" on page 6.

3. Pivot the handle **1** to the left at an angle of about 90 degrees. Then, pull the handle as shown to remove the power supply assembly from the chassis.
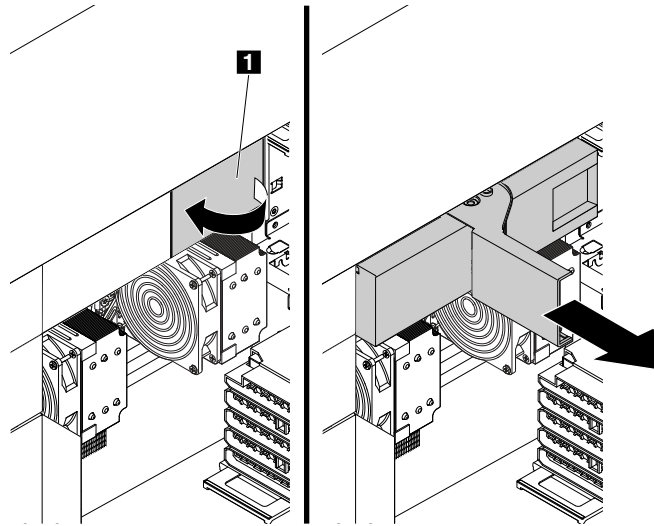
Figure 70. Removing the power supply assembly

4. With the handle **1** open, slide the power supply assembly into the power supply assembly bay until it snaps into position. Pivot the handle to the closed position to ensure that the new power supply assembly is fully installed into position.
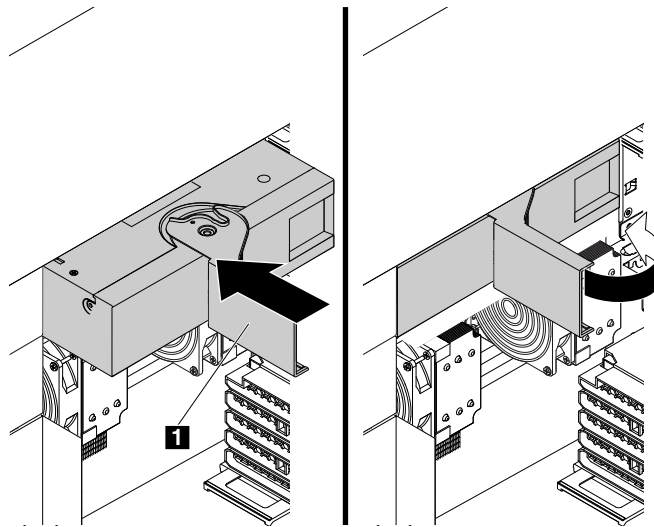

Figure 71. Installing the power supply assembly

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 132.

Battery

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

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

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

Refer to the "Lithium coin cell battery notice" in the *Safety, Warranty, and Setup Guide* for information about disposing of the battery.

To replace the battery, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Remove the direct cooling air baffle. See "Direct cooling air baffle" on page 63.
3. To access the battery, you must remove the power supply assembly, the upper front fan assembly, and the upper multi-function bracket. See "Power supply assembly" on page 98, "Front fan assembly" on page 95, and "Multi-function brackets" on page 96.
4. Locate the battery. See "Parts on the system board" on page 7.
5. Remove the old battery as shown.
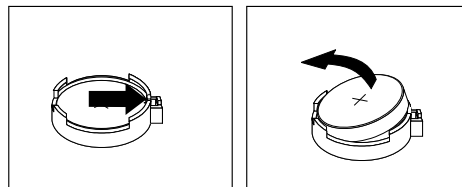
Figure 72. Removing the battery
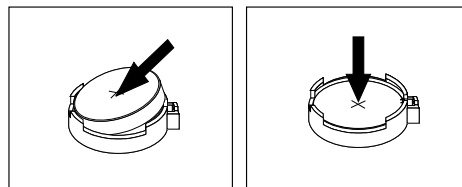
6. Install the new battery as shown.

Figure 73. Installing the battery

7. Reinstall the upper multi-function bracket, the upper front fan assembly, and the power supply assembly. See "Multi-function brackets" on page 96, "Front fan assembly" on page 95, and "Power supply assembly" on page 98.
8. Reinstall the direct cooling air baffle. See "Direct cooling air baffle" on page 63.
9. Reinstall the computer cover and reconnect the cables. See "Completing the parts replacement" on page 132.

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

10. Turn on the computer and all attached devices.

11. Use the Setup Utility program to set the date, time, and any passwords. See "Using the Setup Utility program" on page 35.

Flex adapter

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

Depending on your computer model, the following flex adapters might be installed in the flex adapter slots:

• Flex adapter with two mini-SAS HD connectors

• Flex adapter with one SATA 3.0 connector, one USB 2.0 connector, and two mini-SAS HD connectors

• Flex adapter with two M.2 slots (with the M.2 solid-state drive installed in some models)

To install or replace a flex adapter, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. Lay the computer on its side for easier access to the flex adapter slots.

3. Locate the flex adapter slot in which you want to install or replace a flex adapter. See "Parts on the system board" on page 7.

   Note: If your computer is installed with only one microprocessor, ensure you install a flex adapter into the flex adapter slot 1. If your computer is installed with two microprocessors, ensure that you install flex adapters into the flex adapter slot 1 first, and then the flex adapter slot 2.

4. Depending on whether you are installing or replacing a flex adapter, do one of the following:

   • If you are installing a flex adapter, pivot the tab **1** upward to open the latch **2** inside the multi-function bracket.
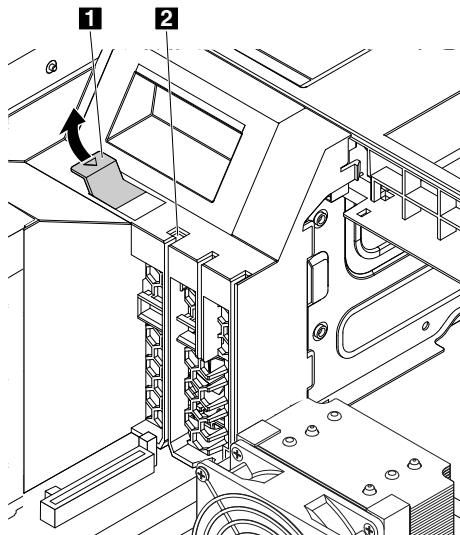

Figure 74. Opening the card latch

- If your are replacing a failing flex adapter, pivot the tab **1** upward to open the latch **2** inside the multi-function bracket. Then, grasp the failing flex adapter by its edges and gently pull it out of the flex adapter slot.

  Notes:

  – If there is any cable connected to the failing flex adapter, disconnect the cable first.

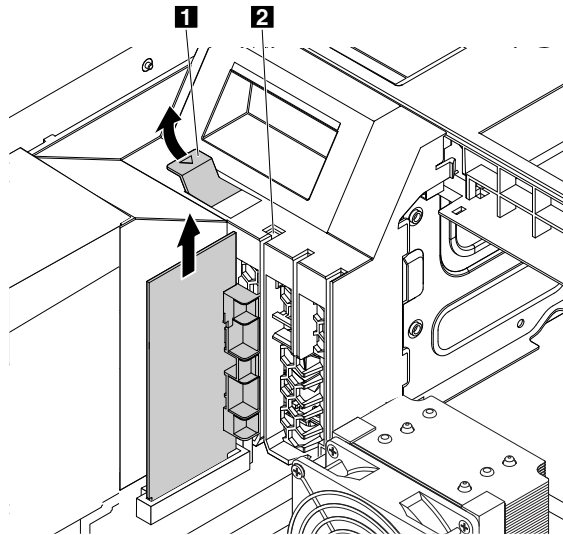 – The flex adapter might fit tightly into the flex adapter slot. If necessary, alternately move each side of the adapter a small amount until it is removed from the slot.

Figure 75. Removing the flex adapter

5. Align the notch **1** on the new flex adapter with the slot key **2** in a flex adapter slot. Then, slide the plastic retainer of the new flex adapter downward into the corresponding slot in the multi-function bracket. Then, insert the adapter into the flex adapter slot until it is secured tightly.

   Notes:

   • Do not touch the circuit board of the flex adapter.

   • Ensure that you install the flex adapter only into a flex adapter slot. Do not install the flex adapter into a PCI or PCI Express card slot.
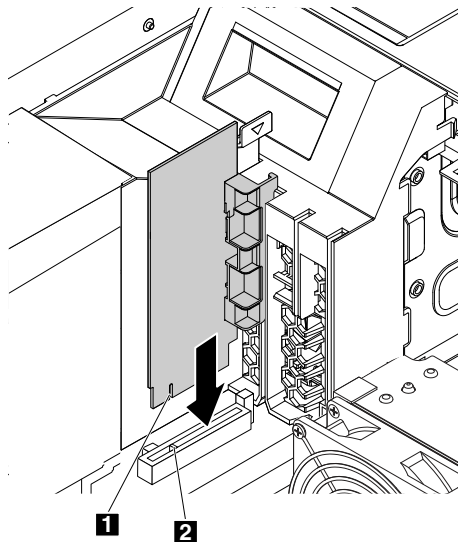
Figure 76. Installing the flex adapter

6. Pivot the tab **1** downward until it snaps into position. Ensure that the latch inside the multi-function bracket is closed.
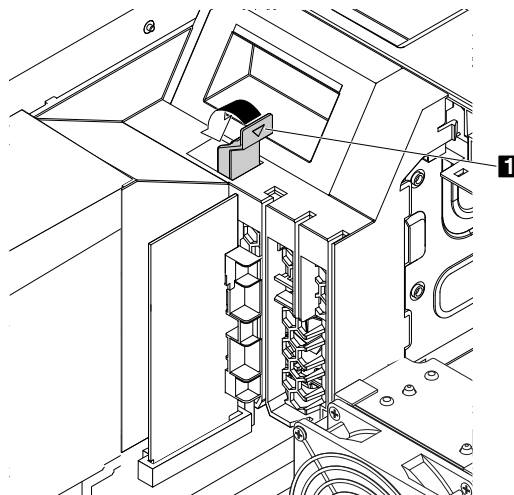
Figure 77. Closing the card latch

7. If a device only works with its cable connected to the flex adapter, connect the cable to the new flex adapter.

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 132.

PCI card

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

Your computer has the following PCI card slots:

- PCI Express x1 card slot
- PCI Express x4 card slot
- PCI Express x16 graphics card slot

Notes:

- PCI cards available vary by computer model.
- To install or replace a full-length PCI Express card, see "Full-length PCI Express card" on page 112.
- If you want to use an NVIDIA compute card, ensure that your computer also has an NVIDIA graphics card installed.

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

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Lay the computer on its side for easier access to the PCI card slots.
3. Locate the PCI card slot in which you want to install or replace a PCI card. See "Parts on the system board" on page 7.

   Note: If your computer is installed with only one microprocessor, refer to the order of installing PCI cards shown on the left figure. If your computer is installed with two microprocessors, refer to the order of installing PCI cards shown on the right figure. Install PCI Express cards according to the corresponding slot types and the installation order.
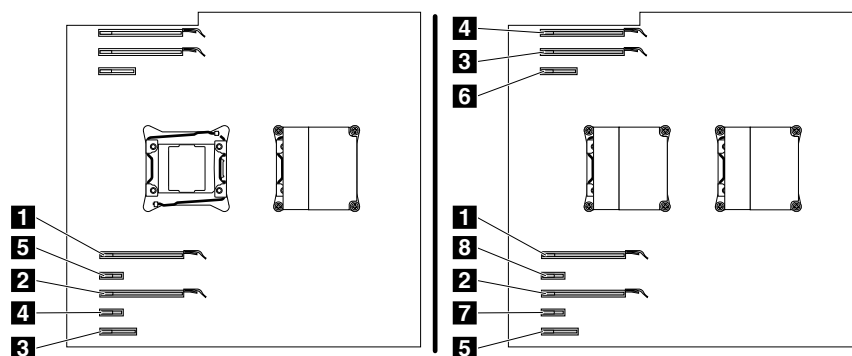

Figure 78. The order of installing PCI cards

4. If necessary, remove the direct cooling air baffle for easier operation. See "Direct cooling air baffle" on page 63.
5. Depending on whether you are installing or replacing a PCI card, do one of the following:

   - If you are installing a PCI card, do the following:

a. On the left of the PCI card slot, lift the handle **2** until it stops, and then pivot it to the left until it stops. The PCI card latch **1** is opened.
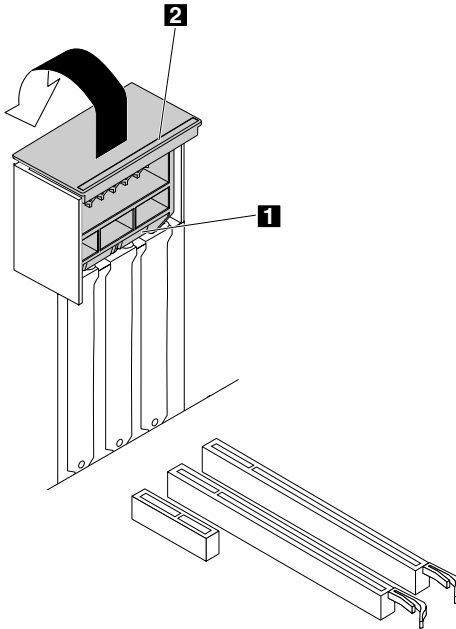

Figure 79. Opening the PCI card latch

b. Remove the appropriate metal slot cover on the rear of the chassis.

- If you are replacing a PCI card, do the following:

a. For some models, you must remove the PCI card retainer first. Pivot the tab **1** upward to open the latch **2** inside the multi-function bracket.
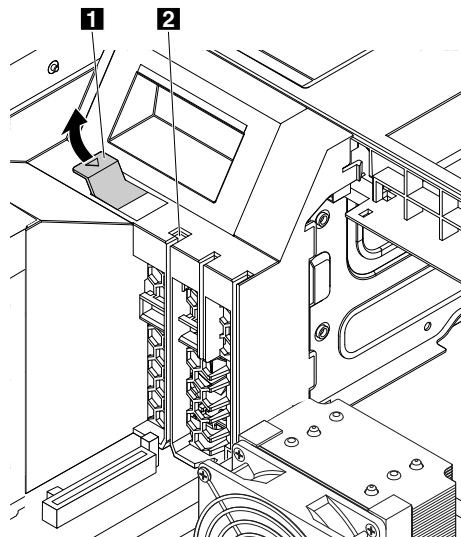

Figure 80. Opening the card latch

b. Grasp the PCI card retainer by its edges and gently pull it out of the latch. Remove the retainer completely from the PCI card latch.
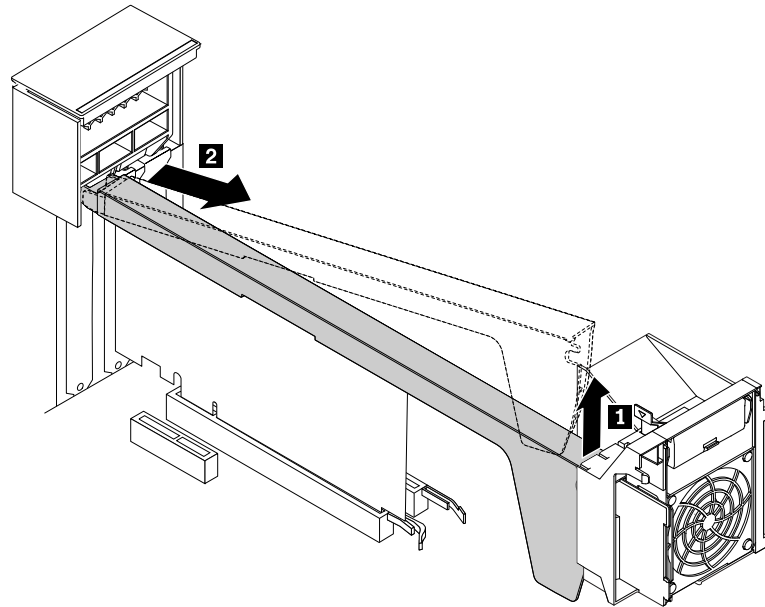

Figure 81. Removing the PCI card retainer

c. On the left of the PCI card slot, lift the handle **2** until it stops, and then pivot it to the left until it stops. The PCI card latch **1** is opened.
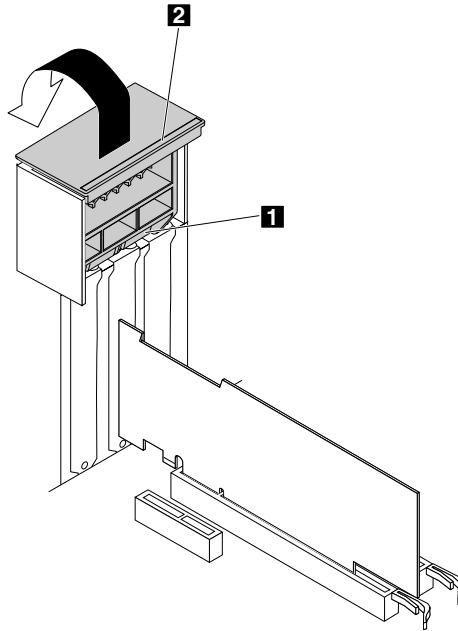
Figure 82. Opening the PCI card latch

d. Grasp the card that is currently installed and gently pull it out of the slot.

Notes:

– If the card is connected to other device, disconnect the cables from the card.

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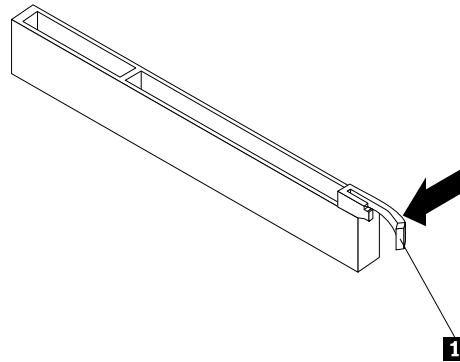

Figure 83. Disengaging the card retaining latch

– 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.
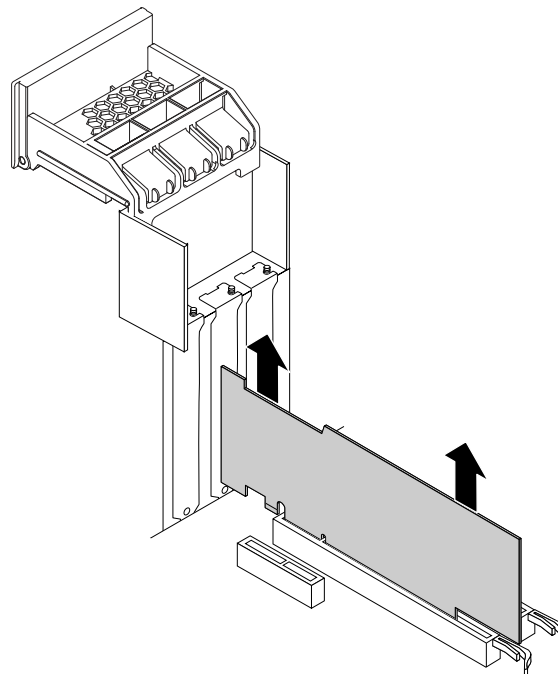

Figure 84. Removing the PCI card

6. To install a new PCI card, align the notch ▮1 on the new PCI card with the slot key ▮2 in the PCI card slot. Then, insert the new PCI card downward into the card slot until it is secured tightly. See "Parts on the system board" on page 7.

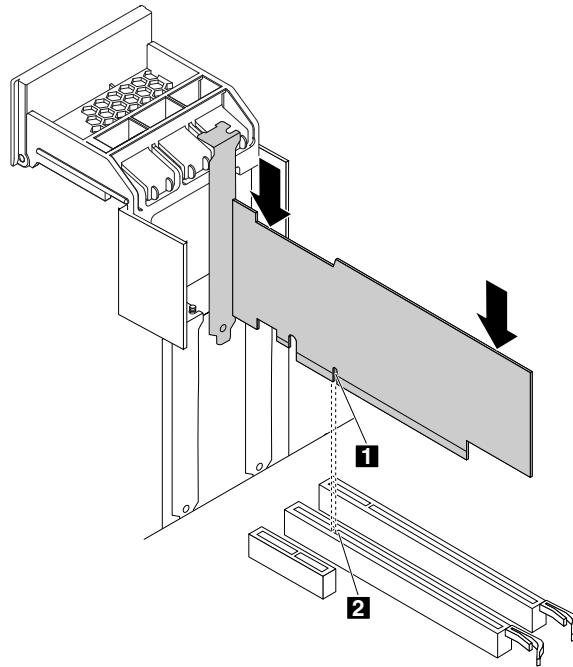   **Note:** Do not touch the circuit board of the PCI card.

Figure 85. Installing the PCI card

7. Pivot the handle **2** to the right until it stops, and then press it downward until the latch **1** snaps into position.
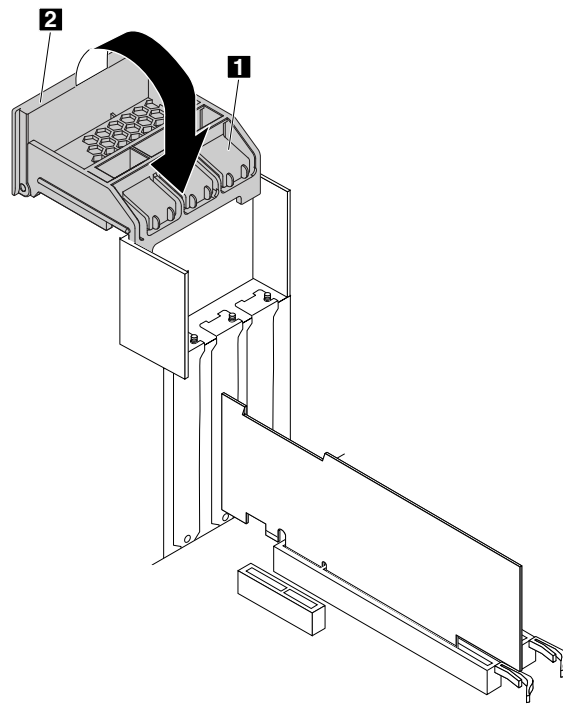

Figure 86. Closing the PCI card latch

8. Insert the corresponding end of the PCI card retainer into the gaps in the PCI card latch as shown. Pivot the retainer downward to insert part **a** into the corresponding slot in the front fan assembly.
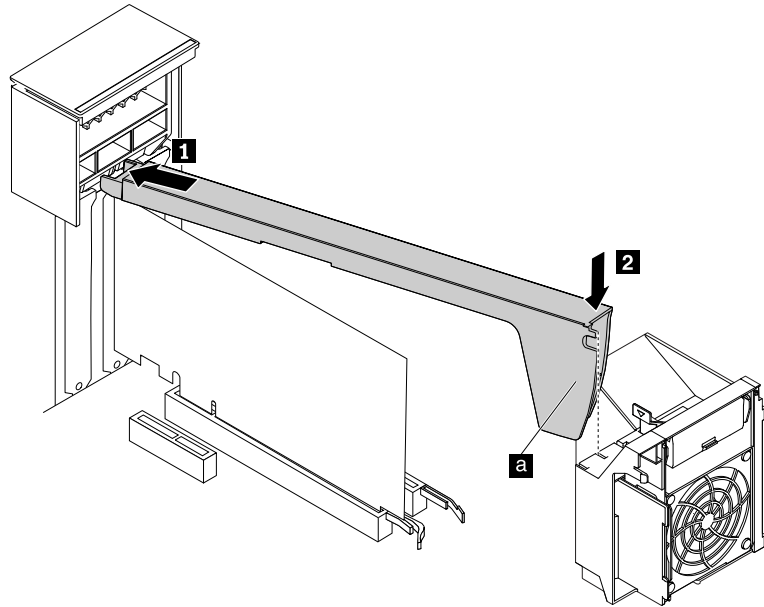

Figure 87. Installing the PCI card retainer

9. Pivot the tab **1** downward until it snaps into position.
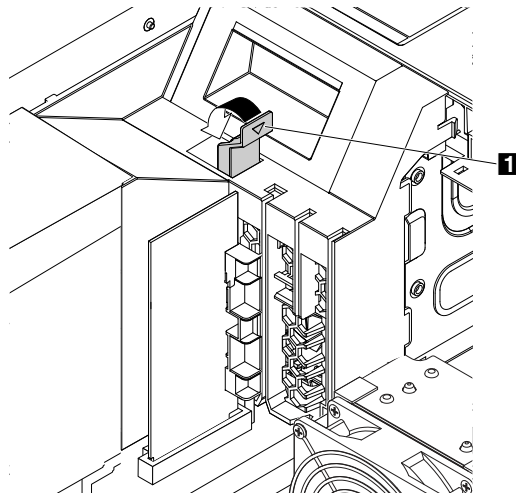

Figure 88. Closing the card latch

10. If the new PCI card needs to be connected to another device, connect the cable of the device to the card.
11. Reinstall the direct cooling air baffle if you have removed it. See "Direct cooling air baffle" on page 63.

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 132.

Full-length PCI Express card

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

Your computer has the following PCI card slots:

- PCI Express x1 card slot
- PCI Express x4 card slot
- PCI Express x16 graphics card slot

Notes:

- The full-length PCI Express card is available only on some models.
- If you want to use an NVIDIA compute card, ensure that your computer also has an NVIDIA graphics card installed.

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

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Lay the computer on its side for easier access to the PCI card slots.
3. Locate the PCI card slot in which you want to install or replace a PCI card. See "Parts on the system board" on page 7.

   Note: If your computer is installed with only one microprocessor, refer to the order of installing PCI cards shown on the left figure. If your computer is installed with two microprocessors, refer to the order of installing PCI cards shown on the right figure.
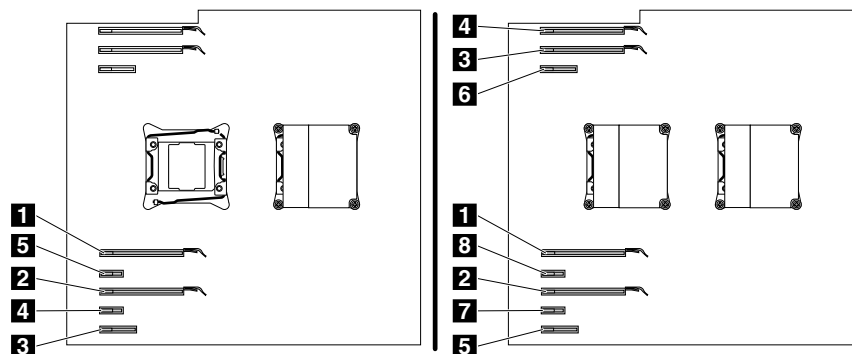

Figure 89. The order of installing PCI cards

4. Remove the direct cooling air baffle if it impedes your operation. See "Direct cooling air baffle" on page 63.
5. Depending on whether you are installing or replacing a full-length PCI Express card, do one of the following:

   - If you are installing a full-length PCI Express card, do the following:

a. On the right of the PCI card slot, pivot the tab **1** outward until it stops. The card latch **2** is opened. On the left of the PCI card slot, lift the handle **4** until it stops, and then pivot it to the left until it stops. The card latch **3** is opened.

Figure 90. Opening PCI card latches

b. Remove the metal slot cover of the PCI card slot on the rear of the chassis.

• If you are replacing a full-length PCI Express card, do the following:

a. On the right of the PCI card slot, pivot the tab **1** outward until it stops. The card latch **2** is opened. On the left of the PCI card slot, lift the handle **4** until it stops, and then pivot it to the left until it stops. The card latch **3** is opened.
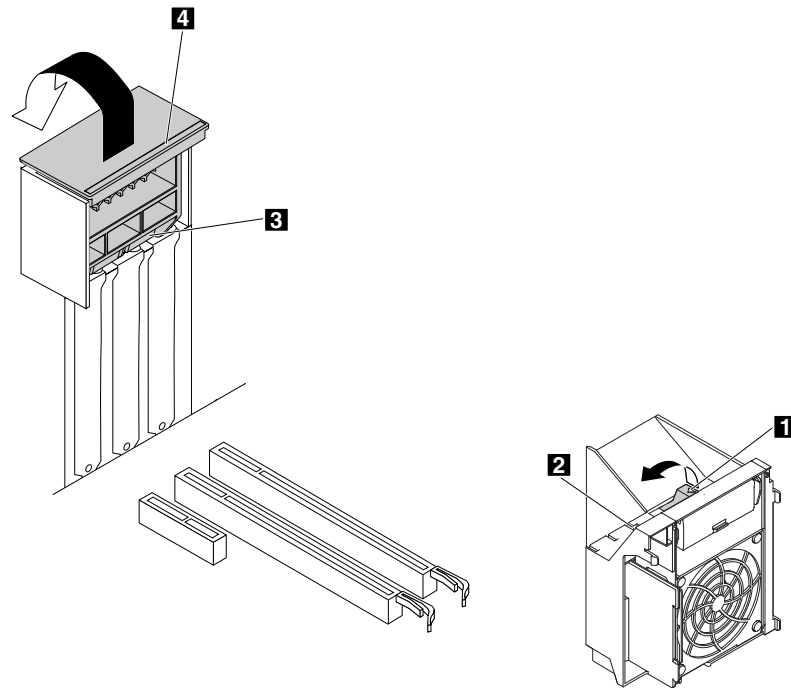

Figure 91. Opening PCI card latches

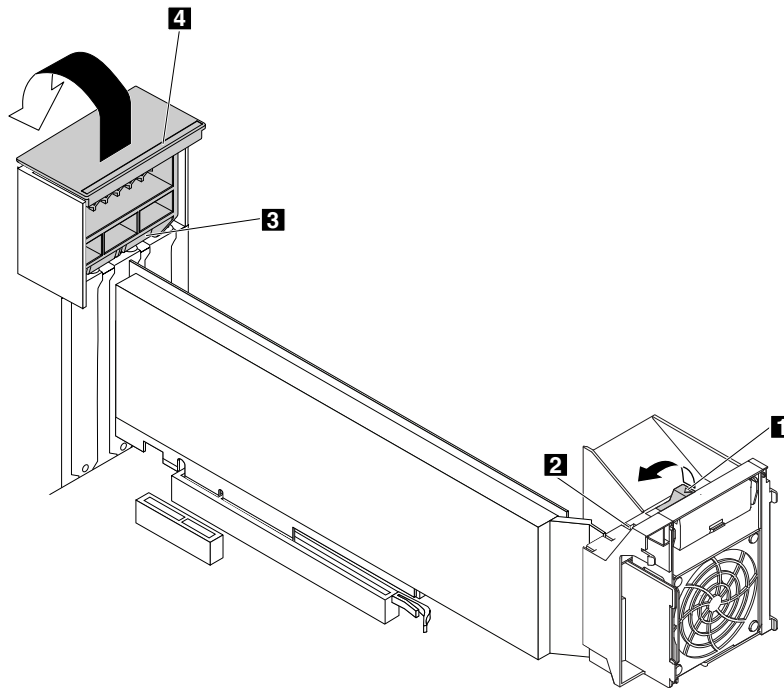b. Disconnect the power cable from the full-length PCI Express card, and then grasp the card that is currently installed and gently pull it out of the slot.

Notes:

– If the card is held in place by a retaining latch, press the card retaining latch **1** as shown to disengage the latch. Grasp the card and gently pull it out of the slot.
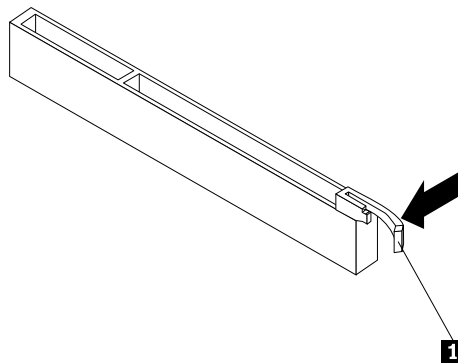
Figure 92. Disengaging the card retaining latch

– 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.
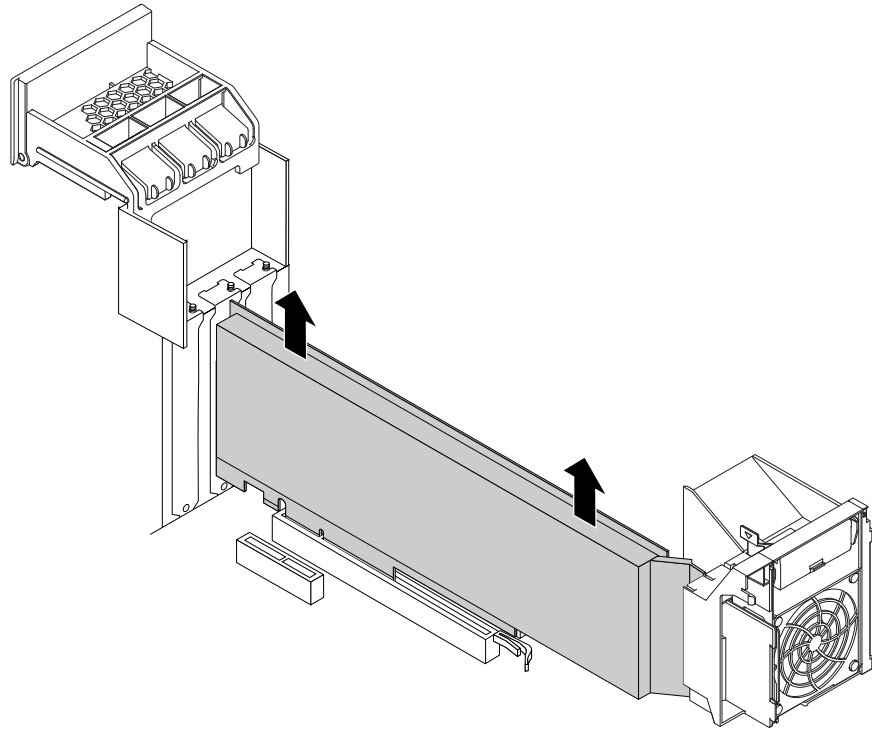
Figure 93. Removing the full-length PCI Express card

6. To install a new full-length PCI Express card, align the notch **1** on the new full-length PCI Express card with the slot key **2** in the PCI card slot. Then, insert the new card downward into the card slot until it is secured tightly. See "Parts on the system board" on page 7.

   Note: Do not touch the circuit board of the PCI card.

Figure 94. Installing the full-length PCI Express card

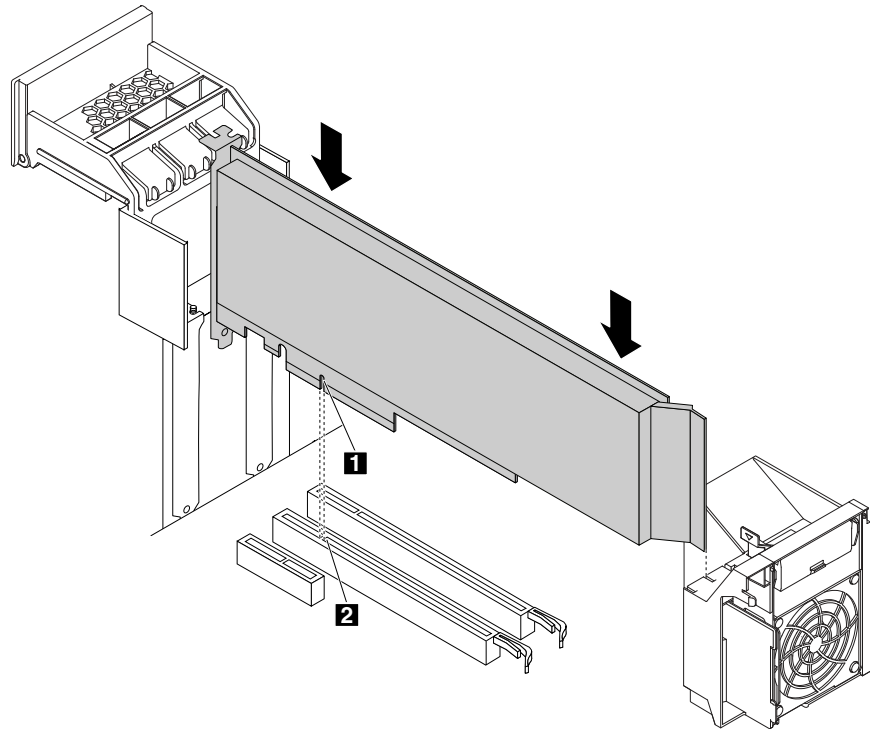7. Pivot the handle **2** to the right until it stops, and then press it downward until the latch **1** snaps into position. Pivot the tab **3** inward until it snaps into position.
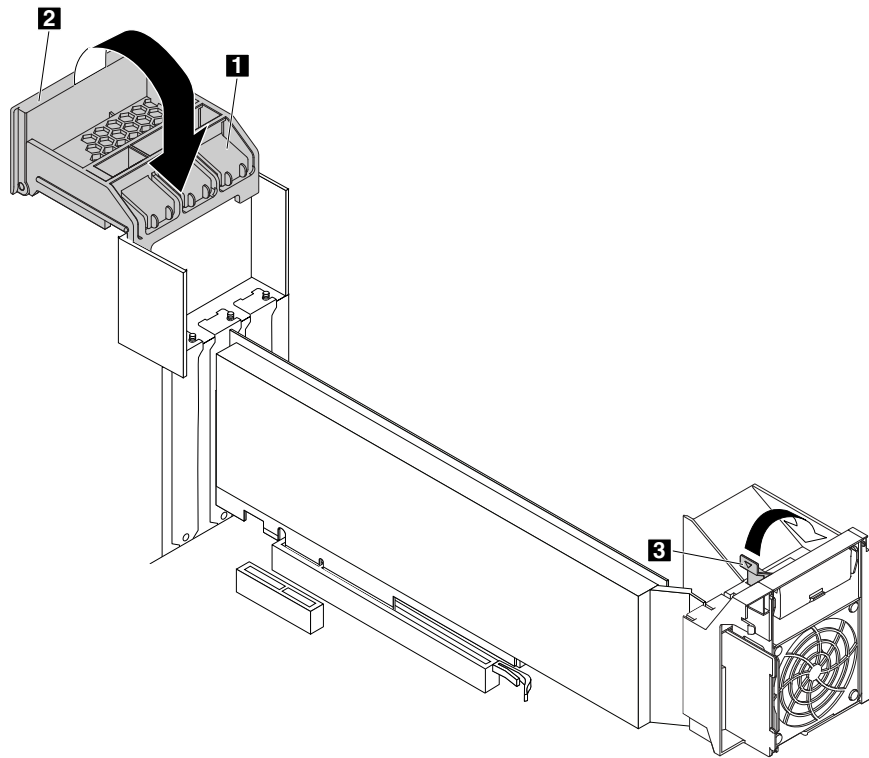
Figure 95. Closing PCI card latches

8. Connect the power cable of the full-length PCI Express card to the new card. See "Parts on the system board" on page 7.

9. Reinstall the direct cooling air baffle if you have removed it. See "Direct cooling air baffle" on page 63.

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 132.

Super capacitor module

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

To install or replace the super capacitor module, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. Lay the computer on its side for easier access to the super capacitor module.

3. Locate the PCI Express card slot in which the super capacitor module holder is installed. See "Computer components" on page 6.

4. If necessary, remove the direct cooling air baffle for easier operation. See "Direct cooling air baffle" on page 63.

5. Depending on whether you are installing or replacing the super capacitor module, do one of the following:

   • If you are installing the super capacitor module, go to step 7.

   • If you are replacing the super capacitor module, do the following:

      a. Disconnect the super capacitor module cable from the RAID card.

      b. Remove the holder with the failing super capacitor module from the PCI Express card slot in which it is installed. See "PCI card" on page 104.

      c. Gently pivot the plastic retaining clip **1** on the bracket as shown and remove the failing super capacitor module from the bracket at the same time.
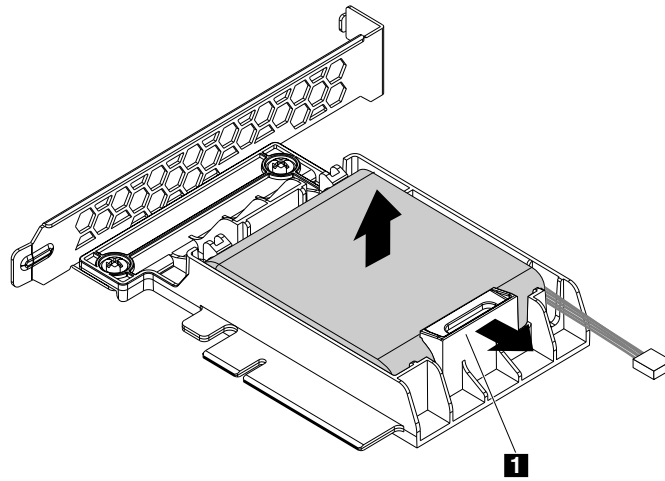

Figure 96. Removing the super capacitor module from the bracket

6. Touch the static-protective package that contains the new super capacitor module and its holder to any unpainted surface on the outside of the computer. Then, remove the new super capacitor module and its holder from the package.

7. Gently pivot the plastic retaining clip **1** on the bracket as shown and install the new super capacitor module into the bracket at the same time.

   Note: Ensure that the cable of the super capacitor module is oriented as shown.
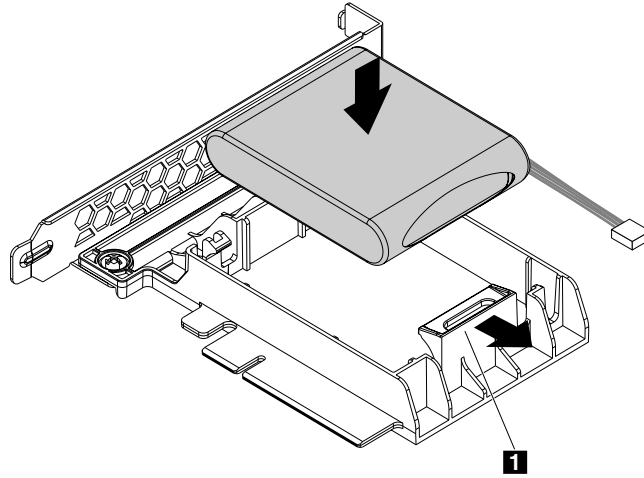
Figure 97. Installing the super capacitor module into the bracket

8. Install the holder with the new super capacitor module into a PCI Express card slot. See "PCI card" on page 104.

   Note: It is recommended that you use the PCI Express card slot with the fewest lanes.

9. Connect the super capacitor module cable to the super capacitor module connector on the RAID card as shown.
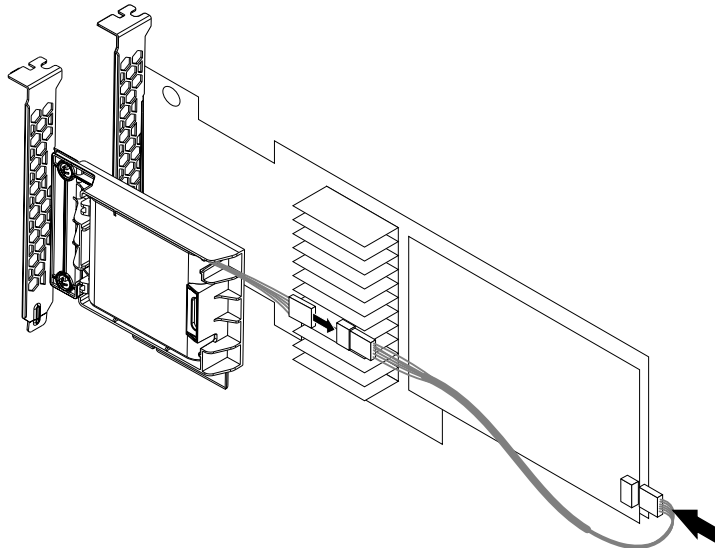
Figure 98. Connecting the super capacitor module cable

10. Reinstall the direct cooling air baffle if you have removed it. See "Direct cooling air baffle" on page 63.

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 132.

Memory module

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

Your computer has 16 slots for installing or replacing DDR4 DIMMs that provide up to a maximum of 1024 GB system memory. When installing or replacing a memory module, use the following guidelines:

- Use any of DDR4 ECC RDIMMs or DDR4 ECC LRDIMMs for your computer. Do not install the RDIMMs and LRDIMMs into the same computer.

- Use 4 GB, 8 GB, 16 GB, or 32 GB RDIMMs in any combination up to a maximum of 512 GB.

- Use 64 GB LRDIMMs up to a maximum of 1024 GB.

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

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Remove the direct cooling air baffle. See "Direct cooling air baffle" on page 63.
3. Lay the computer on its side for easier access to the memory slots.
4. Locate the memory slot in which you want to install or replace a memory module.

   Note: If your computer is installed with only one microprocessor, refer to the order of installing memory modules shown on the left figure. If your computer is installed with two microprocessors, refer to the order of installing memory modules shown on the right figure.
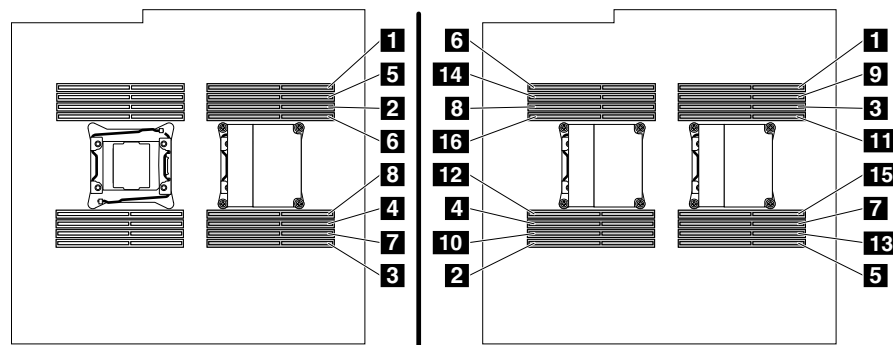
Figure 99. The order of installing memory modules

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

- If you are installing a memory module, open the retaining clips of the memory slot into which you want to install the memory module.
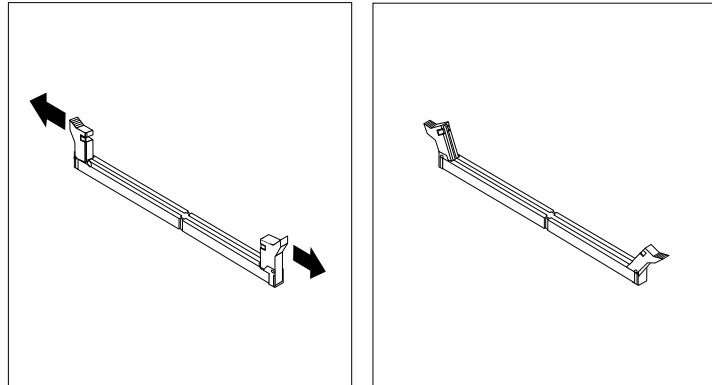
Figure 100. Opening retaining clips

- If you are replacing a memory module, open the retaining clips and gently pull the memory module out of the memory slot.
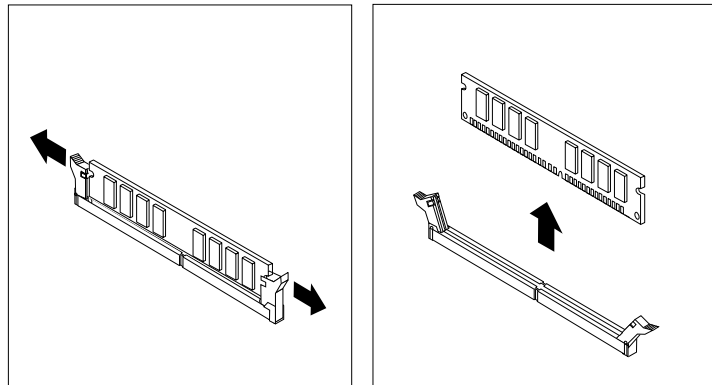
Figure 101. Removing the memory module

6. To install a new memory module, position the new memory module over the memory slot. Ensure 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.

   Note: Do not touch the circuit board of the memory module.
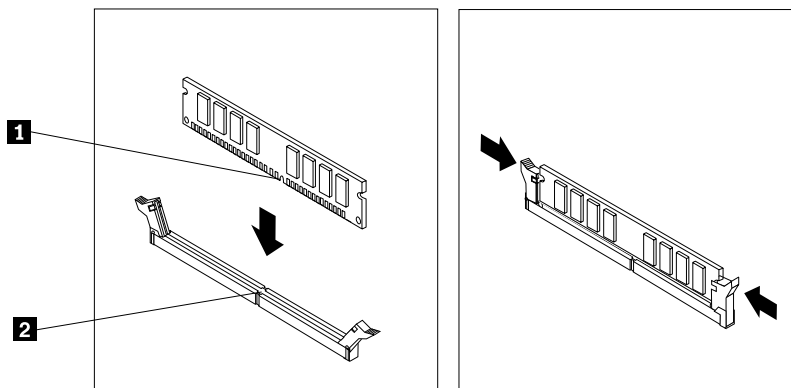
Figure 102. Installing the memory module

7. Reinstall the direct cooling air baffle. See "Direct cooling air baffle" on page 63.

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 132.

Heat sink and fan assemblies

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

CAUTION:

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

Depending on your computer model, your computer might be installed with one or two heat sink and fan assemblies.

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

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. Remove the direct cooling air baffle. See "Direct cooling air baffle" on page 63.

3. Lay the computer on its side for easier access to the heat sink and fan assembly.

4. Locate the heat sink and fan assembly that does not work properly. See "Computer components" on page 6.

5. Disconnect the heat sink and fan assembly cable from the system board.

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.
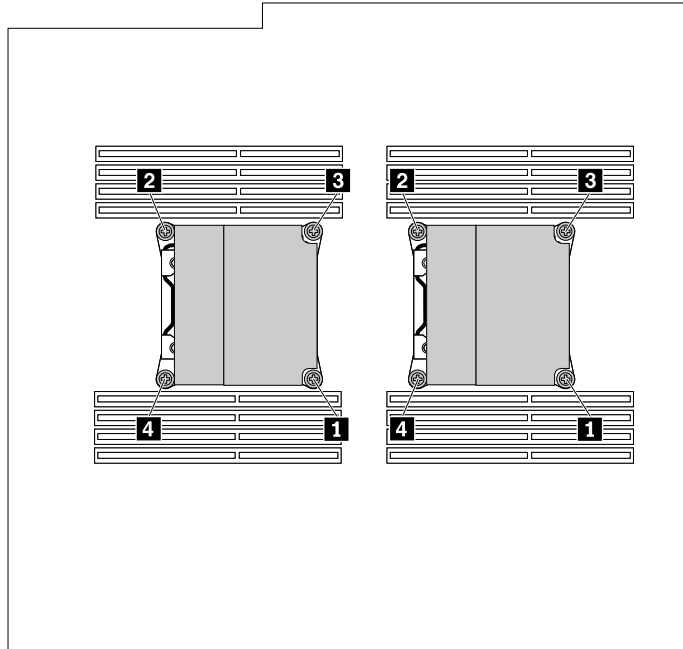
Figure 103. Removing the heat sink and fan assembly

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

   Notes:

   - You might have to gently twist the heat sink and fan assembly to free it from the microprocessor.
   - Do not touch the thermal grease while handling the heat sink and fan assembly.

8. To install the new heat sink and fan assembly, position the new heat sink and fan assembly on the system board. Ensure 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 heat-sink-and-fan-assembly 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 cable of the new heat sink and fan assembly to the system board. See "Parts on the system board" on page 7.

11. Reinstall the direct cooling air baffle. See "Direct cooling air baffle" on page 63.

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 132.

Rear fan assembly

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

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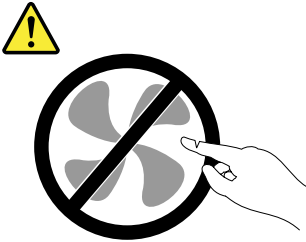
Hazardous moving parts. Keep fingers and other body parts away.

To replace the rear fan assembly, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. Remove the direct cooling air baffle. See "Direct cooling air baffle" on page 63.
3. Locate the rear fan assembly. See "Computer components" on page 6.
4. Slide the rear fan assembly outward by the handle **1** to remove it from the chassis.
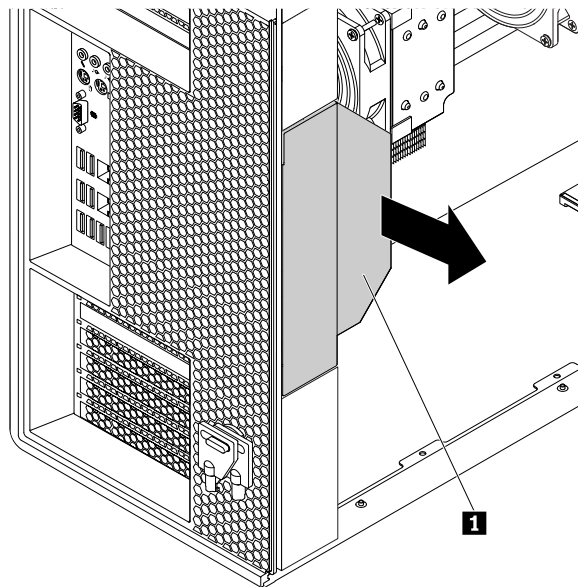
Figure 104. Removing the rear fan assembly

5. Slide the new rear fan assembly into the rear fan assembly bay until it snaps into position.
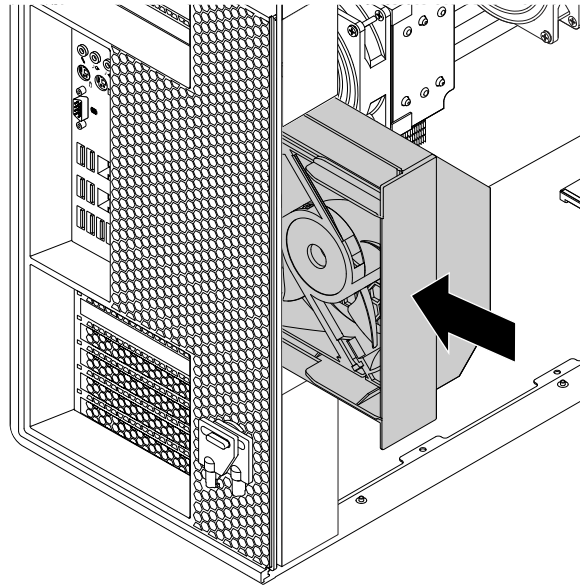
Figure 105. Installing the rear fan assembly

6. Reinstall the direct cooling air baffle. See "Direct cooling air baffle" on page 63.

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 132.

Wi-Fi units

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

The Wi-Fi units include a Wi-Fi adapter card, a Wi-Fi card module, and a Wi-Fi antenna.

Replacing the Wi-Fi units involves the following operations:

- "Removing the Wi-Fi units" on page 125
- "Installing the Wi-Fi units" on page 129

Removing the Wi-Fi units

To remove the Wi-Fi units, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.

2. Unscrew the Wi-Fi antenna connectors to remove the Wi-Fi antenna from the rear of the computer.
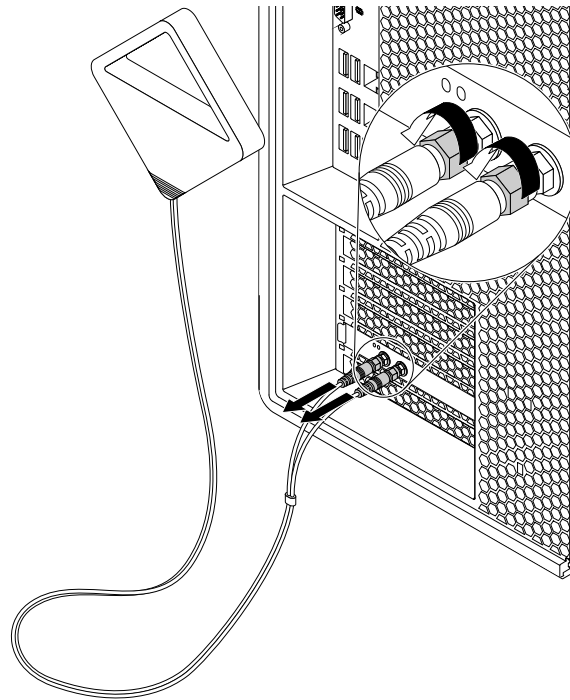
Figure 106. Removing the Wi-Fi antenna

3. To remove the Wi-Fi adapter card, do the following:

    a. If your computer comes with a Wi-Fi card module that supports the Bluetooth function, disconnect the Bluetooth cable from the Wi-Fi adapter card.
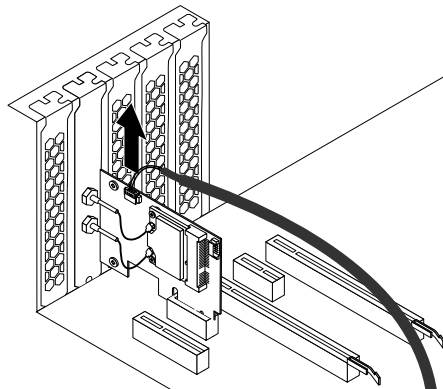
Figure 107. Disconnecting the Bluetooth cable

b. On the rear of the computer, lift the handle **2** and pivot it as shown until it stops. The PCI card latch **1** is opened.
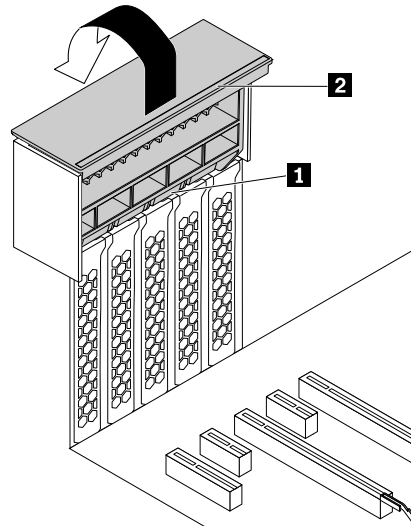
Figure 108. Opening the PCI card latch

c. Grasp the Wi-Fi adapter card and gently pull it out of the slot.
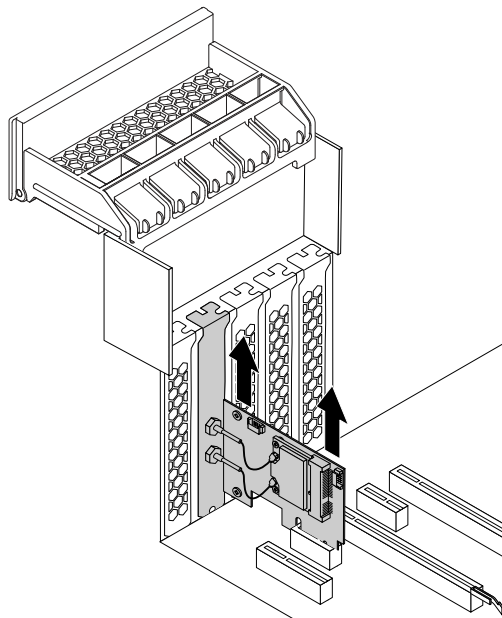
Figure 109. Removing the Wi-Fi adapter card

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

4. To remove the Wi-Fi card module, do the following:

a. Remove the Wi-Fi adapter card from the computer, and then disconnect the two Wi-Fi antenna cables from the Wi-Fi card module.
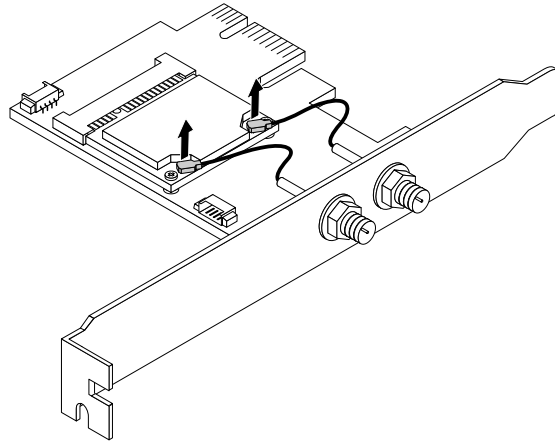
Figure 110. Disconnecting the Wi-Fi antenna cables

b. Remove the two screws that secure the Wi-Fi card module to the Wi-Fi adapter card.
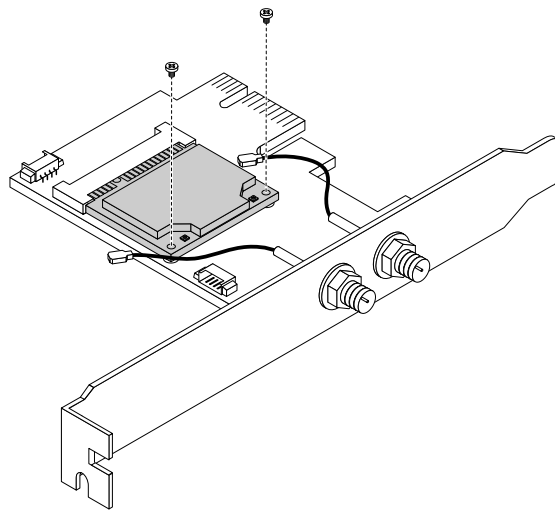
Figure 111. Removing the screws that secure the Wi-Fi card module

c. Pull the Wi-Fi card module out of the mini PCI Express slot.
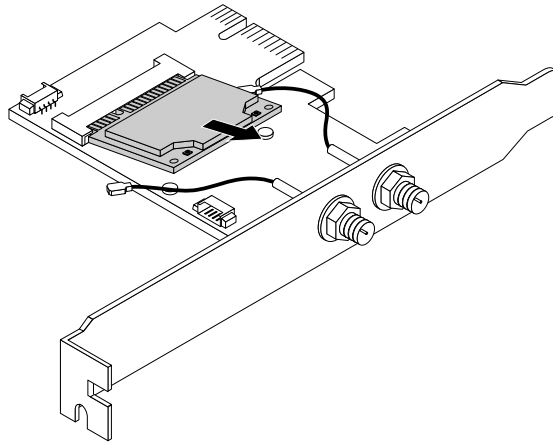
Figure 112. Removing the Wi-Fi card module

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 132.

Installing the Wi-Fi units

To install the Wi-Fi units, do the following:

1. Prepare your computer. See "Preparing your computer and removing the computer cover" on page 59.
2. To install the Wi-Fi card module, do the following:
    a. Insert the Wi-Fi card module into the mini PCI Express slot on the Wi-Fi adapter card.
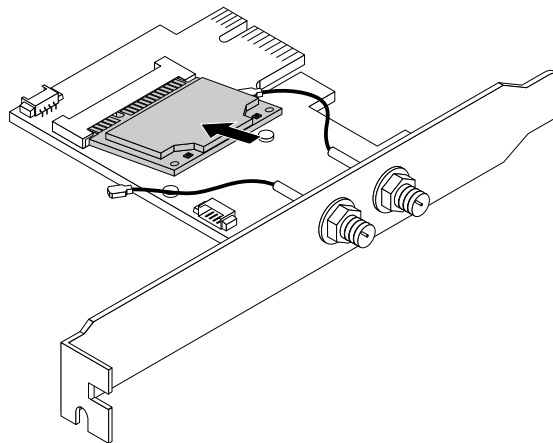
Figure 113. Installing the Wi-Fi card module

b. Install the two screws to secure the Wi-Fi card module to the Wi-Fi adapter card.
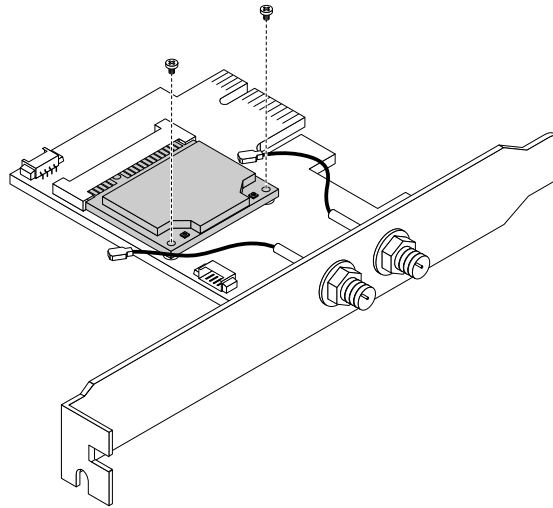
Figure 114. Installing the screws to secure the Wi-Fi card module

c. Connect the two Wi-Fi antenna cables to the Wi-Fi card module.
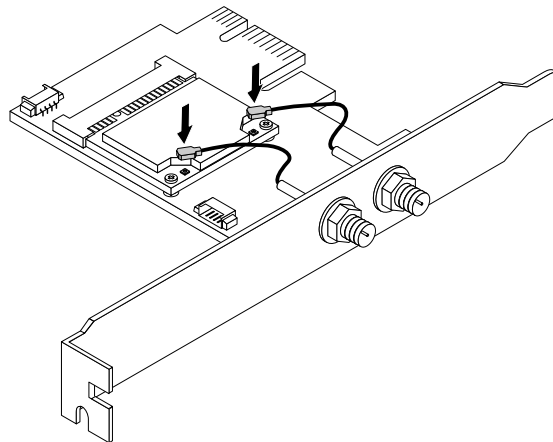
Figure 115. Connecting the Wi-Fi antenna cables

3. To install the Wi-Fi adapter card, do the following:

a. Install the Wi-Fi adapter card into the PCI Express card slot on the system board. See "Parts on the system board" on page 7.
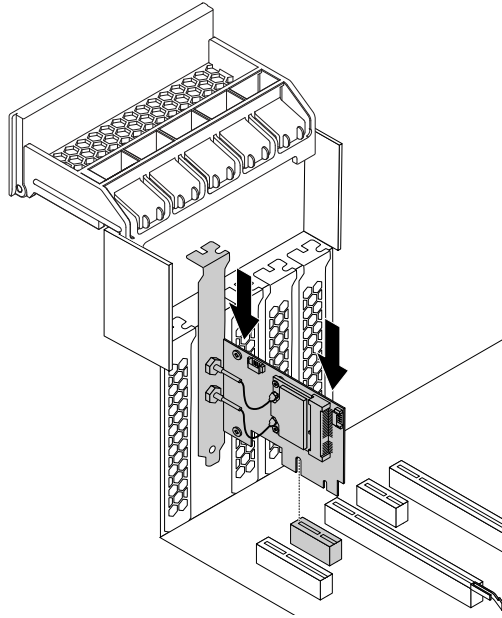
Figure 116. Installing the Wi-Fi adapter card

b. Pivot the PCI card latch and push it back in until it snaps into position.
c. If the installed Wi-Fi card module supports the Bluetooth function, connect a Bluetooth cable from the Bluetooth connector on the Wi-Fi adapter card to the 29-in-1 card reader connector on the system board. See "Parts on the system board" on page 7.

4. Attach the Wi-Fi antenna cable connectors **1** to the corresponding Wi-Fi antenna connectors **2** on the rear of the computer as shown.
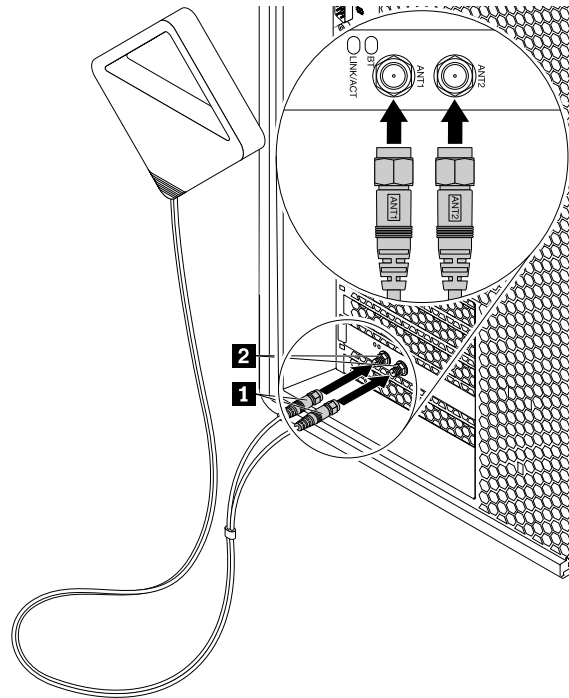
Figure 117. Installing the Wi-Fi antenna

5. Tighten the Wi-Fi antenna cable connectors to secure them to the rear of the computer.

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 132.

Completing the parts replacement

After completing the installation or replacement for all parts, 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 "Using the Setup Utility program" on page 35.

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

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer. See "Computer components" on page 6 for the locations of various components in your computer.

2. Ensure 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.

3. 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, pivot the handle **1** inward until it snaps into position so that the cover is secured tightly.
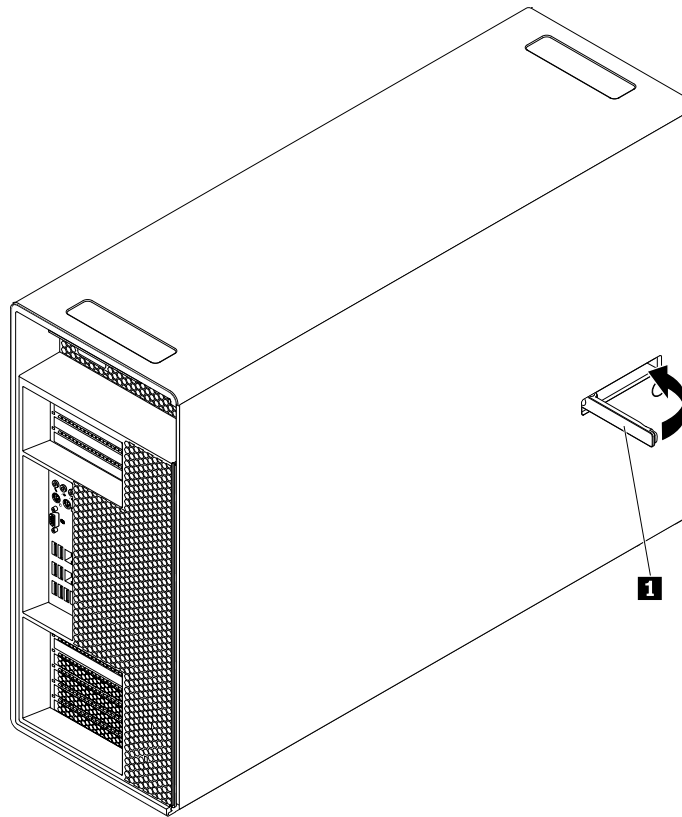
Figure 118. Reinstalling the computer cover

4. Place the computer in an upright position.
5. If there is any locking device available, lock the computer cover. See "Locking your computer" on page 29.
6. Reconnect the external cables and power cords to the corresponding connectors on the computer. See "Hardware locations" on page 1.
7. Update the configuration of your computer if necessary. See "Using the Setup Utility program" on page 35.
8. If a newly installed hardware component does not work normally, update the device driver. See "Keeping your computer current" on page 26.

Chapter 8. Getting information, help, and service

This chapter contains the following topics:

- "Information resources" on page 135
- "Help and service" on page 136

Information resources

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

Accessing the user guide in various languages

To access the user guide in various languages, go to:
http://www.lenovo.com/support

Windows help system

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

To access the Windows help system, do the following:

1. Click the Start button to open the Start menu.
2. Depending on your Windows version, do one of the following:

    - For Windows 7: Click **Help and Support**. You can choose to use the online or offline help at the bottom of the screen.
    - For Windows 10: Click **Get Started**.

Note: Using online help for Windows 7 or the help for Windows 10 requires an active Internet connection.

Safety and warranty

The *Safety, Warranty, and Setup Guide* provided with your computer contains important safety information, product warranty terms, initial setup procedure, and legal notices. Ensure that you read and understand all safety information in the *Safety, Warranty, and Setup Guide* before using your computer.

In addition, read and understand "Read this first: Important safety information" on page v before using your computer. This preface provides additional safety information that applies to topics and tasks described in this *User Guide*.

Lenovo Web site

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

- Shop for desktop and notebook computers, monitors, projectors, upgrades, and accessories for your computer, and special offers.
- Purchase additional services, such as support for hardware, operating systems, application programs, network setup and configuration, and custom installations.
- Purchase upgrades and extended hardware repair services.
- Access troubleshooting and support information for your computer model and other supported products.
- Find a Service Provider located near you.

Lenovo Support Web site

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

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

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

Frequently asked questions

For the answers to frequently asked questions about your computer, go to:
http://www.lenovo.com/support/faq

Help and service

This section provides information about obtaining help and service.

Calling for service

During the warranty period, you can get help and information by telephone through the Customer Support Center. For the warranty period of your computer, go to http://www.lenovo.com/warranty-status. For a list of Lenovo Support phone numbers, go to http://www.lenovo.com/support/phone.

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.

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

If possible, be at your computer when you call. Have the following information available:
- Machine type and model
- Serial numbers of your hardware products

- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

Using other services

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

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

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

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

Purchasing additional services

During and after the warranty period, you can purchase additional services. Examples of these additional services include:

- Support for hardware, operating systems, and application programs

- Network setup and configuration services

- Upgraded or extended hardware repair services

- Custom installation services

Service availability and service name might vary by country or region. For more information about these services, go to the Lenovo Web site at:
http://www.lenovo.com

Appendix A. System memory speed

The Intel Xeon® microprocessor families compatible with this ThinkStation computer feature an integrated memory controller, which provides the microprocessor with direct access to the system memory. The system memory speed, therefore, is determined by various factors, including the microprocessor model and the type, speed, size (capacity), and number of DIMMs installed. Refer to the following table for the information about the supported system memory speed for your own computer model.

Table 1. DIMM type and speed: RDIMM PC4-2400-R

DIMM operating voltage	Microprocessor model	Memory frequency
1.2 V	Intel Xeon E5-2699 v4, E5-2698 v4, E5-2697A v4, E5-2697 v4, E5-2695 V4, E5-2690 v4, E5-2689 v4, E5-2683 v4, E5-2680 v4, E5-2667 v4, E5-2660 v4, E5-2687W v4, E5-2658 v4, E5-2650L v4, E5-2650 v4, E5-2648L v4, E5-2643 v4, E5-2637 v4, E5-1680 v4, E5-1660 v4, E5-1650 v4, E5-1630 v4, E5-1620 v4,	2400 MHz
1.2 V	Intel Xeon E5-2640 v4, E5-2630L v4, E5-2630 v4, E5-2623 v4, E5-2620 v4, E5-2628L v4, E5-2618L v4, E5-1607 v4, E5-1603 v4, E5-1650 v3, E5-1620 v3	2133 MHz
1.2 V	Intel Xeon E5-2609 v4, E5-2603 v4, E5 2608L v4, E5-2620 v3	1866 MHz
1.2 V	Intel Xeon E5-2609 v3	1600 MHz

Table 2. DIMM type and speed: LRDIMM PC4-2400-L

DIMM operating voltage	Microprocessor model	Memory frequency
1.2 V	Intel Xeon E5-2699 v4, E5-2698 v4, E5-2697A v4, E5-2697 v4, E5-2695 V4, E5-2690 v4, E5-2689 v4, E5-2683 v4, E5-2680 v4, E5-2667 v4, E5-2660 v4, E5-2687W v4, E5-2658 v4, E5-2650L v4, E5-2650 v4, E5-2648L v4, E5-2643 v4, E5-2637 v4, E5-1680 v4, E5-1660 v4, E5-1650 v4, E5-1630 v4, E5-1620 v4,	2400 MHz
1.2 V	Intel Xeon E5-2640 v4, E5-2630L v4, E5-2630 v4, E5-2623 v4, E5-2620 v4, E5-2628L v4, E5-2618L v4, E5-1607 v4, E5-1603 v4, E5-1650 v3, E5-1620 v3	2133 MHz
1.2 V	Intel Xeon E5-2609 v4, E5-2603 v4, E5 2608L v4, E5-2620 v3	1866 MHz
1.2 V	Intel Xeon E5-2609 v3	1600 MHz

Appendix B. Supplemental information about the Ubuntu operating system

In limited countries or regions, Lenovo offers customers an option to order computers with the preinstalled Ubuntu® operating system.

If the Ubuntu operating system is available on your computer, read the following information before you use the computer. Ignore any information related to Windows-based programs, utilities, and Lenovo preinstalled applications in this documentation.

Accessing the Lenovo Limited Warranty

This product is covered by the terms of the Lenovo Limited Warranty (LLW), version L505-0010-02 08/2011. You can view the LLW in a number of languages from the following Web site. Read the Lenovo Limited Warranty at:

http://www.lenovo.com/warranty/llw_02

The LLW also is preinstalled on the computer. To access the LLW, go to the following directory:

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

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

Accessing the Ubuntu help system

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

To learn more about the Ubuntu operating system, go to:

http://www.ubuntu.com

Getting support information

If you need help, service, technical assistance, or more information about the Ubuntu operating system or other applications, contact the provider of the Ubuntu operating system or the provider of the application. If you need the service and support for hardware components shipped with your computer, contact Lenovo. For more information about how to contact Lenovo, refer to the *User Guide* and *Safety, Warranty, and Setup Guide*.

To access the latest *User Guide* and *Safety, Warranty, and Setup Guide*, go to:

http://www.lenovo.com/support

Appendix C.   Regulatory information

The latest compliance information is available at
http://www.lenovo.com/compliance.

Export classification notice

This product is subject to the United States Export Administration Regulations (EAR) and has an Export Classification Control Number (ECCN) of 5A992.c. It can be re-exported except to any of the embargoed countries in the EAR E1 country list.

Electronic emissions notices

The following information refers to Lenovo personal computer machine types 30B8 and 30B9.

Federal Communications Commission Declaration of Conformity

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

Lenovo is not responsible for any radio or television interference caused by using other than specified or recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party:
Lenovo (United States) Incorporated
1009 Think Place - Building One
Morrisville, NC 27560
Phone Number: 919-294-5900

Industry Canada Class B emission compliance statement

CAN ICES-3(B)/NMB-3(B)

European Union - Compliance to the Electromagnetic Compatibility (EMC) Directive or Radio Equipment Directive

Models without a radio device: This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC (until 19 April, 2016) and Council Directive 2014/30/EU (from 20 April, 2016) on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Models with a radio device: This product is in conformity with all the requirements and essential norms that apply to EU Council R&TTE Directive 1999/5/EC on the approximation of the laws of the Member States relating to radio equipment.

Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the installation of option cards from other manufacturers. This product has been tested and found to comply with the limits for Class B equipment according to European Standards harmonized in the Directives in compliance. The limits for Class B equipment were derived for typical residential environments to provide reasonable protection against interference with licensed communication devices.

Lenovo, Einsteinova 21, 851 01 Bratislava, Slovakia

German Class B compliance statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse B EU-Richtlinie zur Elektromagnetischen Verträglichkeit
Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU (früher 2004/108/EC) zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der Klasse B der Norm gemäß Richtlinie.

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 EMV EU Richtlinie 2014/30/EU (früher 2004/108/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 EU Richtlinie 2014/30/EU (früher 2004/108/EC), 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, Meitnerstr. 9, D-70563 Stuttgart.

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:
Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse B.

Korea Class B compliance statement

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

Japan VCCI Class B compliance statement

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

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

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

Japan notice for ac power cord
The ac power cord shipped with your product can be used only for this specific product. Do not use the ac power cord for other devices.

本製品およびオプションに電源コード・セットが付属する場合は、
それぞれ専用のものになっていますので他の電気機器には使用し
ないでください。

Lenovo product service information for Taiwan

委製商/進口商名稱: 荷蘭商聯想股份有限公司台灣分公司
進口商地址: 台北市內湖區堤頂大道2段89號5樓
進口商電話: 0800-000-702 (代表號)

Keyboard and mouse compliance statement for Taiwan

本產品隨貨附已取得經濟部標準檢驗局認可之PS/2或USB的鍵盤與滑鼠一組

Eurasian compliance mark

ΕΠC

Brazil audio notice

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

Mexico wireless-radio compliance information

Advertencia: En Mexico la operación de este equipo estásujeta a las siguientes dos condiciones: (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Additional regulatory information

For additional regulatory information, refer to the *Regulatory Notice* shipped with your computer. Depending on the configuration of your computer and the country or region where the computer was purchased, you might have received additional printed regulatory notices. All regulatory notices are available on the Lenovo Support Web site in electronic format. To access electronic copies of the documentation, go to http://www.lenovo.com/support.

Appendix D. WEEE and recycling information

Lenovo encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. Lenovo offers various programs and services to assist equipment owners in recycling their IT products. The latest environmental information is available at http://www.lenovo.com/ecodeclaration.

Important WEEE information
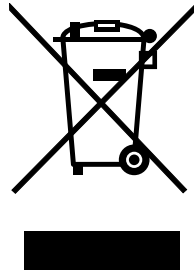
The WEEE marking on Lenovo products applies to countries with WEEE and e-waste regulations (for example, the European WEEE Directive, India E-Waste Management & Handling Rules). Appliances are labeled in accordance with local regulations concerning waste electrical and electronic equipment (WEEE). These regulations determine the framework for the return and recycling of used appliances as applicable within each geography. This label is applied to various products to indicate that the product is not to be thrown away, but rather put in the established collection systems for reclaiming these end of life products.

Users of electrical and electronic equipment (EEE) with the WEEE marking must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, and recovery of WEEE and to minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. Lenovo electrical and electronic equipment (EEE) may contain parts and components, which at end-of-life might qualify as hazardous waste.

EEE and waste electrical and electronic equipment (WEEE) can be delivered free of charge to the place of sale or any distributor that sells electrical and electronic equipment of the same nature and function as the used EEE or WEEE.

For additional WEEE information, go to:
http://www.lenovo.com/recycling

WEEE information for Hungary

Lenovo, as a producer, bears the cost incurred in connection with the fulfillment of Lenovo's obligations under Hungary Law No. 197/2014 (VIII.1.) subsections (1)-(5) of section 12.

Recycling information for Japan

Collecting and recycling a disused Lenovo computer or monitor

If you are a company employee and need to dispose of a Lenovo computer or monitor that is the property of the company, you must do so in accordance with the Law for Promotion of Effective Utilization of Resources. Computers and monitors are categorized as industrial waste and should be properly disposed of by an industrial waste disposal contractor certified by a local government. In accordance with the Law for Promotion of Effective Utilization of Resources, Lenovo Japan provides, through its PC Collecting

and Recycling Services, for the collecting, reuse, and recycling of disused computers and monitors. For details, visit the Lenovo Web site at http://www.lenovo.com/recycling/japan. Pursuant to the Law for Promotion of Effective Utilization of Resources, the collecting and recycling of home-used computers and monitors by the manufacturer was begun on October 1, 2003. This service is provided free of charge for home-used computers sold after October 1, 2003. For details, visit the Lenovo Web site at http://www.lenovo.com/recycling/japan.

Disposing of Lenovo computer components

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

Disposing of disused lithium batteries from Lenovo computers

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

Recycling information for Brazil

Declarações de Reciclagem no Brasil

Descarte de um Produto Lenovo Fora de Uso

Equipamentos elétricos e eletrônicos não devem ser descartados em lixo comum, mas enviados à pontos de coleta, autorizados pelo fabricante do produto para que sejam encaminhados e processados por empresas especializadas no manuseio de resíduos industriais, devidamente certificadas pelos orgãos ambientais, de acordo com a legislação local.

A Lenovo possui um canal específico para auxiliá-lo no descarte desses produtos. Caso você possua um produto Lenovo em situação de descarte, ligue para o nosso SAC ou encaminhe um e-mail para: reciclar@lenovo.com, informando o modelo, número de série e cidade, a fim de enviarmos as instruções para o correto descarte do seu produto Lenovo.
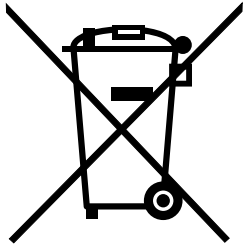
Battery recycling information for Taiwan

廢電池請回收

Battery recycling information for the European Union

EU

Notice: This mark applies only to countries within the European Union (EU).

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury, and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances.

Before placing electrical and electronic equipment (EEE) in the waste collection stream or in waste collection facilities, the end user of equipment containing batteries and/or accumulators must remove those batteries and accumulators for separate collection.

Disposing of lithium batteries and battery packs from Lenovo products

A coin-cell type lithium battery might be installed inside your Lenovo product. You can find details about the battery in the product documentation. If the battery needs to be replaced, contact your place of purchase or contact Lenovo for service. If you need to dispose of a lithium battery, insulate it with vinyl tape, contact your place of purchase or a waste-disposal operator, and follow their instructions.

Disposing of battery packs from Lenovo products

Your Lenovo device might contain a lithium-ion battery pack or a nickel metal hydride battery pack. You can find details on the battery pack in the product documentation. If you need to dispose of a battery pack, insulate it with vinyl tape, contact Lenovo sales, service, or your place of purchase, or a waste-disposal operator, and follow their instructions. You also can refer to the instructions provided in the user guide for your product.

For proper collection and treatment, go to:
http://www.lenovo.com/lenovo/environment

Appendix E. Restriction of Hazardous Substances Directive (RoHS)

The latest environmental information is available at http://www.lenovo.com/ecodeclaration.

European Union RoHS

This Lenovo product, with included parts (cables, cords, and so on) meets the requirements of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment ("RoHS recast" or "RoHS 2").

For more information about Lenovo worldwide compliance on RoHS, go to: http://www.lenovo.com/social_responsibility/us/en/RoHS_Communication.pdf

China RoHS

<div align="center">产品中有害物质的名称及含量</div>

部件名称	有害物质					
	铅(Pb)	汞(Hg)	镉(Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板组件*	X	O	O	O	O	O
硬盘	X	O	O	O	O	O
光驱	X	O	O	O	O	O
内存	X	O	O	O	O	O
电脑I/O 附件	X	O	O	O	O	O
电源	X	O	O	O	O	O
键盘	X	O	O	O	O	O
鼠标	X	O	O	O	O	O
机箱/ 附件	X	O	O	O	O	O

本表格依据 SJ/T 11364 的规定编制。
〇：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。
注：表中标记"×"的部件，皆因全球技术发展水平限制而无法实现有害物质的替代。
印刷电路板组件*：包括印刷电路板及其零部件、电容和连接器
根据型号的不同，可能不会含有以上的所有部件，请以实际购买机型为准

在中华人民共和国境内销售的电子信息产品必须标识此标志，标志内的数字代表在正常使用状态下的产品的环保使用期限

Turkish RoHS

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

Türkiye AEEE Yönetmeliğine Uygunluk Beyanı

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

AEEE Yönetmeliğine Uygundur.

Ukraine RoHS

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

India RoHS

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

Taiwan RoHS

單元	限用物質及其化學符號					
	鉛 (Pb)	汞 (Hg)	鎘 (Cd)	六價鉻 (Cr^{+6})	多溴聯苯 (PBB)	多溴二苯醚 (PBDE)
印刷電路板組件	—	○	○	○	○	○
硬碟	—	○	○	○	○	○
光碟機	—	○	○	○	○	○
記憶體	—	○	○	○	○	○
電腦I/O配件	—	○	○	○	○	○
電源供應器	—	○	○	○	○	○
鍵盤	—	○	○	○	○	○
滑鼠	—	○	○	○	○	○
機殼/配件	—	○	○	○	○	○
電池	—	○	—	○	○	○
備考1.〝超出0.1 wt %〞及〝超出0.01 wt %〞係指限用物質之百分比含量超出百分比含量基準值。 備考2.〝○〞係指該項限用物質之百分比含量未超出百分比含量基準值。 備考3.〝—〞係指該項限用物質為排除項目。						

Appendix F. ENERGY STAR model information

ENERGY STAR® is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy aimed at saving money and protecting the environment through energy efficient products and practices.

Lenovo is proud to offer our customers products with an ENERGY STAR compliant designation. Some models of the following machine types have been designed and tested to conform to the ENERGY STAR program requirement for computers at the time of manufacture: 30B8Z28ZUS and 30B8Z290US. For more information about ENERGY STAR ratings for Lenovo computers, go to:
http://www.lenovo.com

By using ENERGY STAR compliant products and taking advantage of the power-management features of your computer, you reduce the consumption of electricity. Reduced electrical consumption contributes to potential financial savings, a cleaner environment, and the reduction of greenhouse gas emissions.

For more information about ENERGY STAR, go to:
http://www.energystar.gov

Lenovo encourages you to make efficient use of energy an integral part of your day-to-day operations. To help in this endeavor, set the following power-management features to take effect when your computer has been inactive for a specified duration:

Table 3. ENERGY STAR power-management features

Windows 7 or Windows 10 operating system

Power plan: Default
 • Turn off the display: After 10 minutes
 • Put the computer to sleep: After 25 minutes
 • Advanced power settings:
   – Turn off hard disk drives: After 20 minutes
   – Hibernate: Never

To awaken your computer from a Sleep mode, press any key on your keyboard.

To change power settings, do the following:
1. Open Control Panel by doing one of the following:
   - For Windows 7: Click the Start button to open the Start menu.
   - For Windows 10: Right-click the Start button to open the Start context menu.
2. Click **Control Panel**. View Control Panel by Large icons or Small icons, and then click **Power Options**.
3. Follow the instructions on the screen.

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