

Hardware Maintenance Manual

Lenovo
ThinkStation



Lenovo

ThinkStation P4

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Contents

Preface: About this manual.....	v
Chapter 1 Overview.....	1
Front.....	1
Left.....	3
Rear.....	5
USB specifications.....	6
Chapter 2 Specification and expansion.....	7
Basic specifications.....	7
AI foundation.....	8
Memory.....	8
Storage device.....	10
I/O connector.....	12
Cooling system.....	13
Chapter 3 Safety requirements for hardware maintenance.....	15
General safety requirements.....	15
Electrical safety requirements.....	16
Safety inspection guide.....	18
Handle devices that are sensitive to electrostatic discharge.....	18
Important danger warning in multiple languages.....	19
Chapter 4 Diagnostics and troubleshooting.....	41
Overall procedure.....	41
Diagnostic tools.....	42
Hardware scan in Vantage.....	43
ThinkStation Diagnostics solution.....	43
Lenovo UEFI diagnostic tool.....	44
Advanced diagnostic tools.....	45
Symptom-to-CRU/FRU index.....	45
POST error codes.....	46
Beep symptoms.....	47
Storage drive boot error.....	47
Power supply problems.....	48
Miscellaneous error conditions.....	48
Undetermined problems.....	51
Call Lenovo.....	51
Before contacting Lenovo support.....	51
Find your serial number.....	52
Lenovo Customer Support Center.....	52
Chapter 5 Hardware replacement.....	54
Before hardware replacement.....	54
Service tools.....	54
CRU/FRU definition.....	57
CRU list.....	59
FRU list.....	60
Look up a part.....	60
Prerequisites for hardware replacement.....	60
System board illustration.....	63

Handling thermal interface materials.....	64
Left side cover.....	65
Storage.....	66
On-board M.2 SSD, heat sink kit, thermal pad, and holder.....	66
3.5-inch HDD.....	68
HDD and slim-ODD cages.....	72
Storage installation rule.....	76
Slim ODD and slim-ODD latch.....	78
Front I/O bracket and SD card reader.....	78
Fans.....	79
Side fan with bracket.....	80
Front top fan.....	80
Rear fan.....	81
Front bezel.....	82
Front-access-HDD-cage bezel.....	83
Flex-bay dummy bezel.....	84
PCIe card.....	84
PCIe card replacement rule.....	85
PCIe card bracket.....	85
PCIe adapter card.....	86
Graphics card.....	87
Flexible I/O port card.....	91
Chassis beam.....	93
Cover presence switch.....	94
Internal speaker.....	95
Wi-Fi antenna cover.....	96
Smart cable clip.....	97
Memory module.....	98
E-lock.....	99
Chassis rubber foot.....	100
Power supply assembly.....	101
Wi-Fi card.....	103
Front Wi-Fi antenna.....	103
Rear Wi-Fi antenna.....	104
CPU cooler.....	105
65 W CPU air cooler.....	105
120 W CPU air cooler.....	106
CPU liquid cooler.....	107
Liquid cooler bracket.....	110
CPU.....	111
System board.....	113
Coin-cell battery.....	114
Rear I/O shielding.....	115
Power button and power indicator.....	116
VRM heat sink.....	117

Chapter 6 Supplemental instructions.....119

Use the SD card.....	119
UEFI BIOS.....	119
Enter the UEFI BIOS menu.....	119
Navigate the UEFI BIOS menu.....	119
Map UEFI BIOS USB ports to physical connectors.....	120
Update the UEFI BIOS.....	121
BIOS recovery.....	122
Clear CMOS.....	122
Recover from a BIOS update failure.....	122
RAID.....	122
What is RAID.....	122
Configure RAID with RAIDXpert2 Configuration Utility.....	123

Appendix A Important notice for Quebec consumers.....	127
Appendix B Self-help resource.....	128
Appendix C Notice for USB connector name update.....	131
Appendix D Notices and trademarks.....	132

About this manual

This manual contains hardware maintenance instructions for the product listed in the following table.

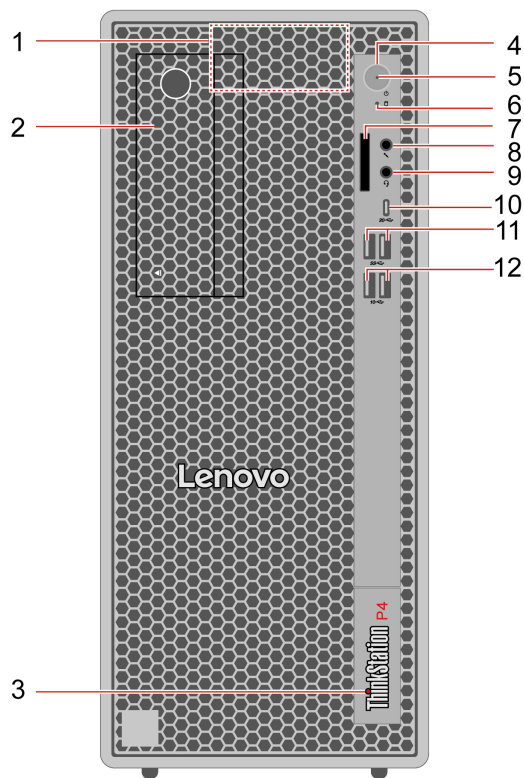
Product name	Machine types (MT)
ThinkStation P4	30KN, 30KQ, 30KR

Important:

- Hardware or software configurations vary by machine type. Some statements or illustrations in this manual may differ slightly from your computer.
- It is recommended that the computer be repaired by trained service technicians.
- For customers electing to service the computer on their own, it is still recommended to contact Lenovo Customer Support Center for guidance. See [Call Lenovo](#) on page 51. Depending on the complexity of the repair, it may be recommended to have a Lenovo-authorized service provider repair the computer.
- Before servicing a computer, be sure to follow all instructions carefully and read all the information under [Safety requirements for hardware maintenance](#) on page 15 and [Before hardware replacement](#) on page 54.

Chapter 1 Overview

Front



* for selected models

Item	Description	Item	Description
1	Internal speaker	2	Flex bay
3	ThinkStation LED	4	Power button
5	Power indicator	6	Storage indicator
7	Secure Digital (SD™) card reader*	8	Microphone connector
9	Headset connector	10	USB-C® connector (USB 20Gbps)
11	USB-A® connectors (USB 5Gbps)	12	USB-A connectors (USB 10Gbps)

i Note:

For more information about the USB connector name update, see [Notice for USB connector name update](#) on page 131

Flex bay

The flex bay is an optional expansion area that can be configured with different devices depending on the computer model. For supported devices and configuration details, see [Storage device](#) on page 10.

Power indicator

The power indicator shows the system status of your computer.

- **On:** The computer is starting up or working.
- **Off:** The computer is off or in hibernation mode.
- **Blinking:** The computer is in sleep mode.

Storage indicator

The storage indicator blinks when the system is reading from or writing to a storage drive.

SD card reader*

The SD card reader allows you to insert an SD card. For supported card types and configuration details, see [Storage device](#) on page 10.

Headset connector

The headset connector is compatible with:

- Headphones or earphones with a 3.5 mm (0.14 inches), TRS (3-pole) plug
- Headsets with a 3.5 mm (0.14 inches), CTIA-compliant TRRS (4-pole) plug, or OMTP-compliant TRRS (4-pole) plug

i Note:

This headset connector does not support standalone external microphones with a TRS (3-pole) plug.

USB Charge in Hibernate or Power-off mode

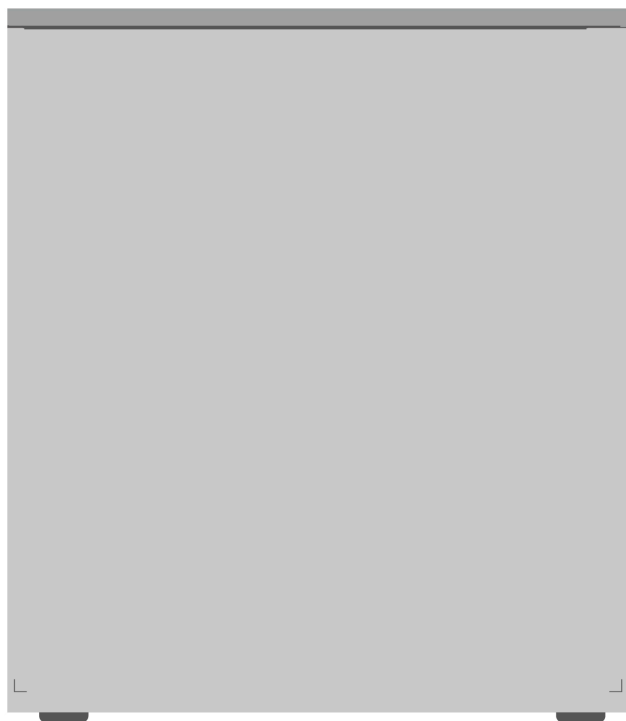
The USB-C connector (USB 20Gbps) on the front panel can charge a USB-compatible device when the system is in hibernate or power-off state when the feature is enabled. When disabled, power is available only when the computer is on.

To enable or disable the feature, do the following:

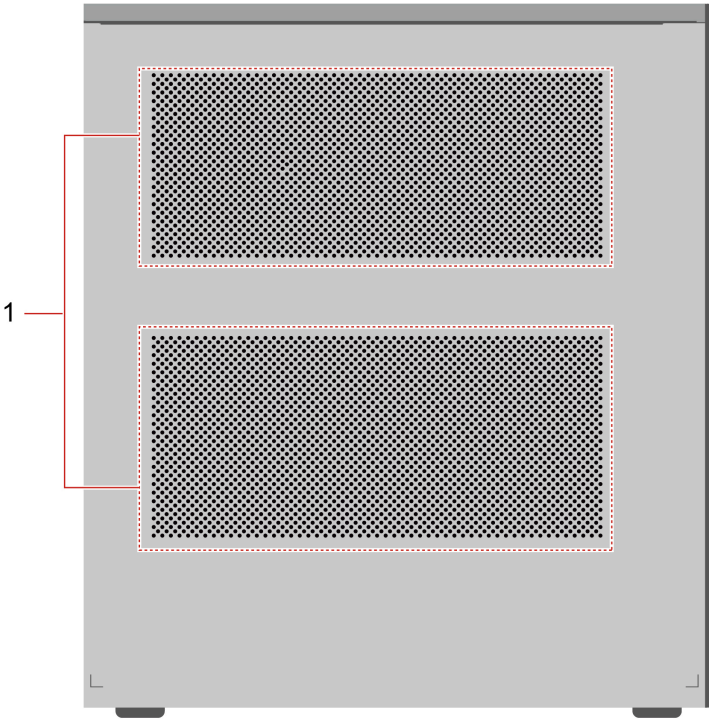
1. Turn on or restart the computer. When the logo screen is displayed, press F1 or Fn+F1 to enter the UEFI BIOS menu.
2. Click **Power** and select **Enabled** or **Disabled** under the **USB Charge in Hibernate/Power-off**.

Left

For models with 500-watt power supply



For models with 750-watt or 1100-watt power supply



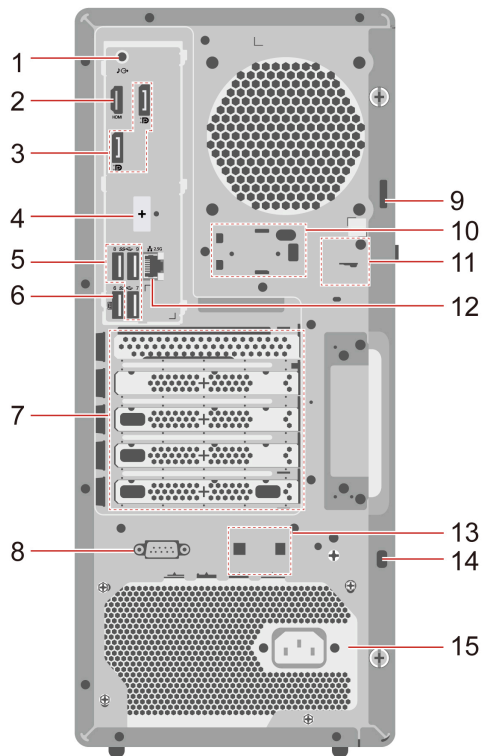
Item	Description
1	Side air vents



Attention:

Do not block air vents on the side cover. To ensure heat dissipation, do not place any objects within 30 mm (1.18 inches) from the side cover.

Rear



Item	Description	Item	Description
1	Audio line-out connector	2	HDMI™ out connector
3	DisplayPort™ out connectors	4	Flexible I/O connector
5	USB-A connector (USB 5Gbps)	6	USB-A connector (USB 5Gbps) (with smart power-on feature)
7	PCIe card I/O connectors	8	Serial out connector*
9	Padlock loop	10	Wi-Fi antenna cover slot
11	E-lock slots	12	Ethernet connector (RJ45)
13	Smart cable clip slots	14	Security-lock slot
15	Power cord connector		

* for selected models

Flexible I/O connector and PCIe card I/O connectors

The flexible I/O connector and the PCIe card I/O connectors support multiple configurations depending on the cards installed in the system. For supported cards and corresponding I/O connectors, see [I/O connector](#) on page 12.

Serial out connector

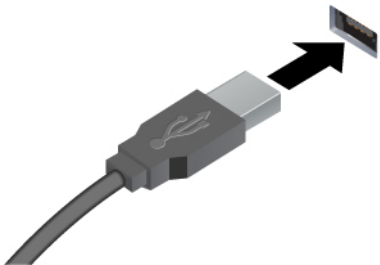
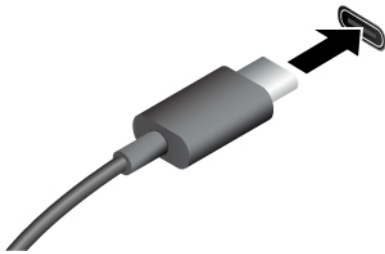
Connect an external modem, a serial printer, or other devices that use a serial out connector.

USB specifications



Note:

Depending on the model, some USB connectors might not be available on your computer.

Connector name	Description
 •  USB-A connector (Hi-Speed USB) •  USB-A connector (USB 5Gbps) •  USB-A connector (USB 10Gbps)	Connect USB-A compatible devices, such as a USB-A keyboard, USB-A mouse, USB-A storage device, or USB-A printer.
 •  USB-C connector (USB 20Gbps) •  USB-C connector (USB4 40Gbps)	• Charge USB-C compatible devices with the output voltage and current of 5 V and 5 A. • Depending on the computer model, the flexible I/O connector on the rear panel can be a USB-C out connector. Connect to an external display using the USB-C out connector. • Connect to USB-C accessories to help expand your computer functionality. To purchase USB-C accessories, go to https://www.lenovo.com/accessories.

Chapter 2 Specification and expansion

This chapter lists the key specifications of your computer and the supported expansion options.

Basic specifications

View your hardware configuration in Windows

Installed hardware varies by model and configuration. Supported expansion options for the main components are described in the following topics of this chapter. Use the following steps to view your hardware configuration in Windows:

- Type **Device Manager** in the Windows search box and press Enter.
- If prompted, enter the administrator password or provide confirmation.

Chassis

- Form factor: 30 L tower
- Width: 180 mm (7.1 inches)
- Depth: 402 mm (15.8 inches)
- Height (with feet): 415 mm (16.3 inches)
- Weight (maximum configuration as shipped without packaging): 16 kg (35 lb)

Power supply

Your computer comes with one of the following power supplies:

- 1100-watt automatic voltage-sensing power supply
- 750-watt automatic voltage-sensing power supply
- 500-watt automatic voltage-sensing power supply

Electrical input

- Input voltage: From 100 V ac to 240 V ac
- Input frequency: 50/60 Hz

Network features

- Bluetooth*
- Ethernet LAN
- Wireless LAN*

* for selected models

Operating environment

- Maximum altitude (without pressurization):
 - Operating: From 0 m (0 ft) to 3048 m (10 000 ft)
 - Storage: From 0 m (0 ft) to 12192 m (40 000 ft)

- Temperature:
 - Operating: From 10°C (50°F) to 35°C (95°F)
 - Storage: From -40°C (-40°F) to 60°C (140°F)
- Relative humidity:
 - Operating: 20% to 80% (non-condensing)
 - Storage: 10% to 90% (non-condensing)

AI foundation

Your computer is an AI-ready workstation. The central processing unit (CPU) and graphics processing unit (GPU) provide the compute foundation for AI-assisted and professional workloads. The CPU delivers the speed, responsiveness, and sustained performance required for demanding professional workflows. The GPU provides exceptional compute and graphics performance for complex visual and data-intensive workloads. Key AI-related specifications of your computer are listed below:

CPU

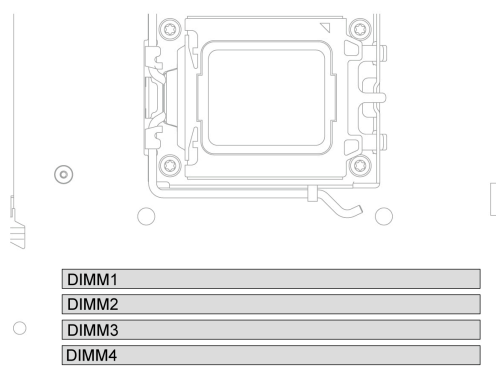
- Processor family: AMD® Ryzen™ 5 / 7 / 9 PRO 9000 Series, with up to 16 cores, 5.5 GHz, and 170W TDP
- Integrated graphics: AMD Radeon™ Graphics

GPU

- Discrete graphics support: up to one NVIDIA RTX PRO 6000 Blackwell Workstation Edition
- AI performance: up to 4000 TOPS

For graphics-related I/O connectors and PCIe slot support, see [I/O connector](#) on page 12.

Memory



Quantity

1, 2, or 4 memory modules

Capacity and type

Capacity	Type
8 GB, 16 GB, 32 GB, or 48 GB	DDR5-5600 non-ECC UDIMM
16 GB or 32 GB	DDR5-5600 ECC UDIMM
64 GB	DDR5-6400 non-ECC CUDIMM

System memory speed

Your memory modules will run up to the following speed depending on the quantity, capacity, and type:

Memory module speed	Memory module quantity	Memory module type
5600 MT/s	1 or 2	• DDR5-5600 non-ECC UDIMM • 16 GB DDR5-5600 ECC UDIMM • DDR5-6400 non-ECC CUDIMM
5200 MT/s	1 or 2	32 GB DDR5-5600 ECC UDIMM
3600 MT/s	4	• DDR5-5600 non-ECC UDIMM • DDR5-5600 ECC UDIMM
3200 MT/s	4	DDR5-6400 non-ECC CUDIMM

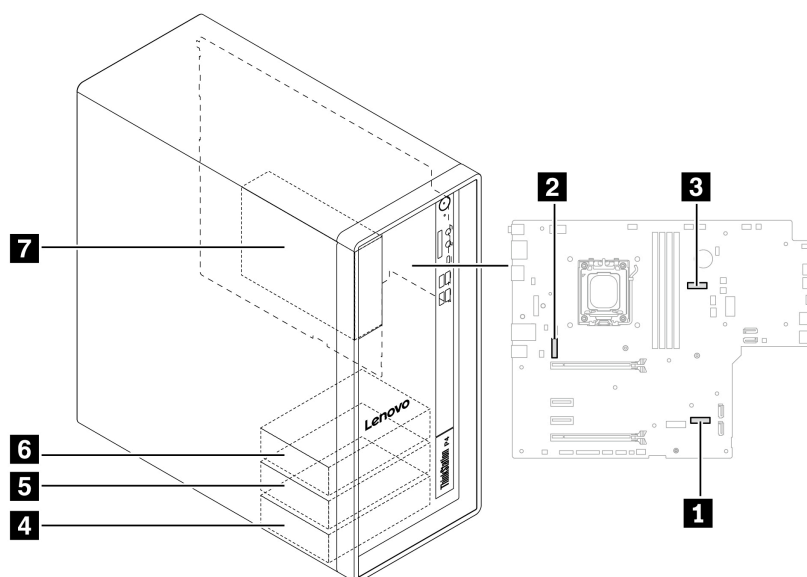
Note:

- To avoid unexpected frequency reduction, ensure that you install memory modules following the replacement steps and rules.
- The actual system memory speed of the memory modules varies depending on the CPU model. For example, your computer comes with 6400 MT/s memory modules, but the CPU only supports up to 5600 MT/s memory modules. Then the system memory speed will be no faster than 5600 MT/s. For CPU models supported in your computer, contact the Lenovo Customer Support Center.
- If you install memory modules of different speed, the actual system memory speed will be set to the lowest speed of all the memory modules.

Replacement steps and rules

To install or replace a memory module, see [Memory module](#) on page 98 for replacement steps and rules.

Storage device



M.2 SSD

Your computer has three on-board slots to install M.2 solid-state drive (SSD).

Slot	Supported M.2 SSD type
1 M.2 SSD slot 1 (Gen 5)	Empty or one of the following: • 2280 Gen 4 M.2 SSD (256 GB, 512 GB, or 1 TB) • 2280 Gen 5 M.2 SSD (512 GB, 1 TB, 2 TB, or 4 TB)
2 M.2 SSD slot 2 (Gen 5)	Empty or one of the following: • 2280 Gen 4 M.2 SSD (256 GB, 512 GB, or 1 TB) • 2280 Gen 5 M.2 SSD (512 GB, 1 TB, 2 TB, or 4 TB)
3 M.2 SSD slot 3 (Gen 4)	Empty or one of the following: • 2280 Gen 4 M.2 SSD (256 GB, 512 GB, or 1 TB) • 2280 Gen 5 M.2 SSD (512 GB, 1 TB, 2 TB, or 4 TB)

Note:

A Gen 4 M.2 SSD installed in a Gen 5 slot, or a Gen 5 M.2 SSD installed in a Gen 4 slot, runs at Gen 4 protocols.

HDD and ODD

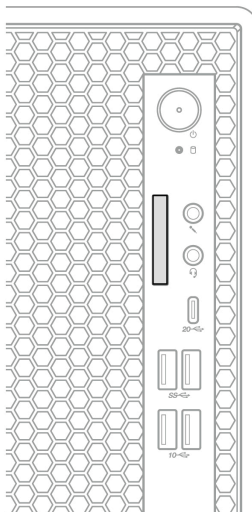
Your computer has up to four bays to install hard disk drives (HDD) and up to one bay to install a slim optical drive (ODD):

Bay	Cage installed in the bay	Supported HDD or ODD type
4	1st HDD cage	Empty or one 3.5-inch HDD (2 TB, 4 TB, 6 TB, or 12 TB)
5	Empty or 2nd HDD cage	Empty or one 3.5-inch HDD (2 TB, 4 TB, 6 TB, or 12 TB)
6	Empty. You can add the 4th HDD cage when the power supply is 500-watt and the slot 1 is empty.	Empty or one 3.5-inch HDD (2 TB, 4 TB, 6 TB, or 12 TB)
7	Empty or one of the following: 3rd HDD cage - Front-access HDD cage - Slim-ODD cage	3rd HDD cage: Empty or one 3.5-inch HDD (2 TB, 4 TB, 6 TB, or 12 TB) - Front-access HDD cage: Empty or one 3.5-inch HDD (2 TB, 4 TB, 6 TB, or 12 TB) - Slim-ODD cage: Empty or one slim ODD Note: The HDD in the front-access HDD cage cannot be used as the OS drive.

Note:

When you purchase the storage cage from Lenovo, the matching HDD tray and SATA cables will be included.

SD card



The SD card reader is available on some computer models and supports one of the following types of SD card.

- SD card
- SD High Capacity (SDHC™) card

- SD Extended Capacity (SDXC™) card

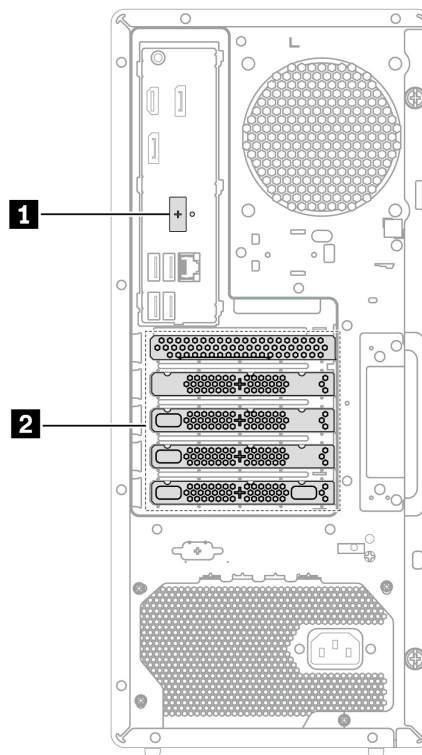
Insert a compatible SD card into the SD card reader. The card can then be accessed through the operating system for file transfer and storage. To install or remove an SD card, see [Use the SD card](#) on page 119.

Replacement steps and rules of storage devices

To add or replace the storage devices, see [Storage](#) on page 66 for replacement steps and rules.

I/O connector

This topic introduces expandable I/O connectors. For standard I/O connectors, see [Front](#) on page 1 and [Rear](#) on page 5.



Flexible I/O connector

Depending on the flexible I/O port card installed in your system, the connector **1** can be a dummy connector or one of the following video output connectors:

- DisplayPort out connector
- HDMI out connector
- VGA out connector
- USB-C out connector

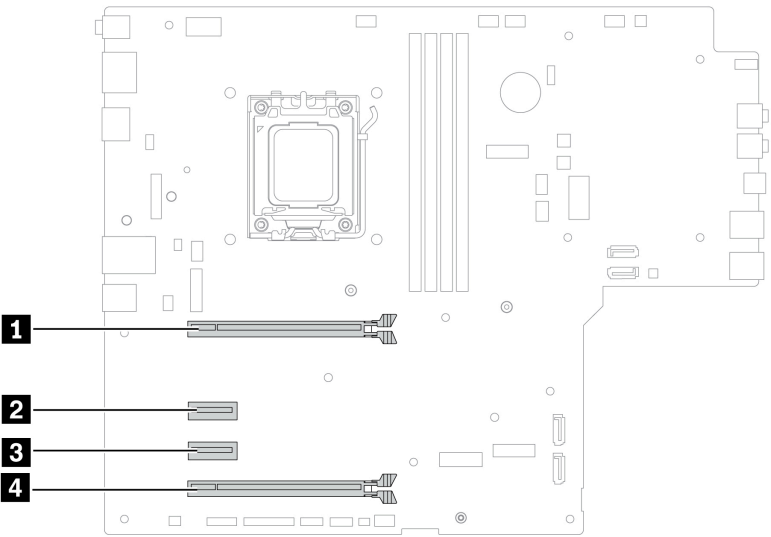
To install or replace a flexible I/O port card, see [Flexible I/O port card](#) on page 91 for replacement steps.

PCIe card I/O connectors

Depending on the PCIe cards installed in your system, connectors in area **2** might be USB connectors, Ethernet connectors, video output connectors, or other connectors. If a graphic card is installed, there can be the following video out connectors:

- DisplayPort out connector
- HDMI out connector
- MiniDisplayPort out connector

Your computer has four PCIe slots to install PCIe cards, including graphics card, USB4 PCIe card, Ethernet adapter card, and other kinds of PCIe adapter card:

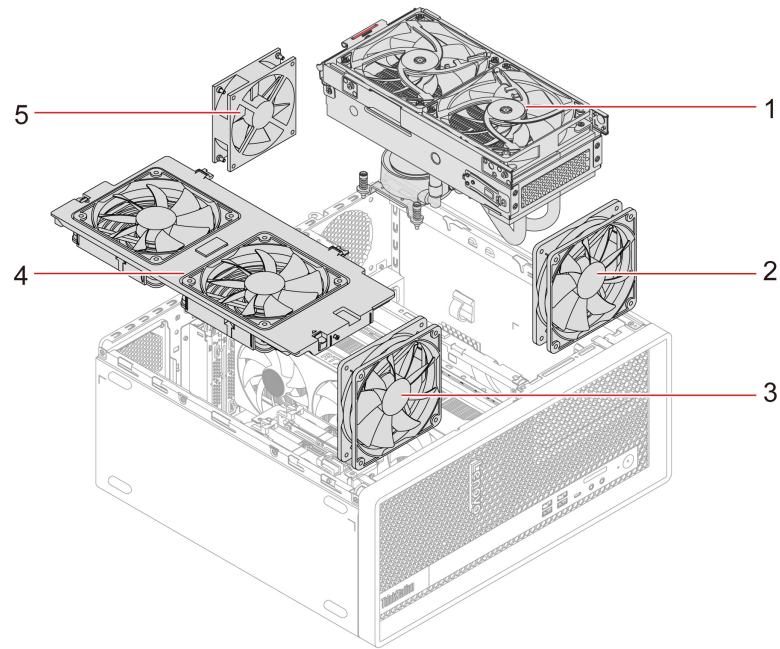


Slot	Type
1	PCIe Gen 5 x16 slot
2	PCIe x1 slot (open ended)
3	PCIe x1 slot (open ended)
4	PCIe Gen 4 x4 slot (physical link width x16 and negotiable link width x4)

To install or replace a PCIe card, see [PCIe card](#) on page 84 for replacement steps and rules.

Cooling system

The cooling system of your computer allows for unobstructed airflow. On selected models, a liquid cooler is available for higher-power CPU options to help maintain sustained performance under heavy workloads. Illustrations and descriptions of the fans and heat sinks are as follows:



Item	Description
1	Liquid cooler*
2	Front top fan*
3	Front bottom fan
4	Side fan*
5	Rear fan*

*for selected models

Replacement steps and rules

To install or replace the fans, see [Fans](#) on page 79 for replacement steps.

Note:

Liquid cooler is not a CRU. The replacement steps are not included in this *User Guide*.

Chapter 3 Safety requirements for hardware maintenance

General safety requirements

Meet the following requirements on environment, personnel and outfit, and operation to ensure general safety:

Environment requirements

Observe good housekeeping in the area of the machine during and after maintenance.

Personnel and outfit requirements

- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconductive clip, about 8 centimeters (3 inches) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing, because metal objects are good electrical conductors.
- Wear safety glasses when you are hammering, drilling, soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that might be hazardous to your eyes.

Operation requirements

- Before you start the machine, ensure that no one is in a hazardous position.
- Do not perform any action that causes personal injury or that makes the equipment unsafe.
- Keep your tool case away from walk areas so that other people will not trip over it.
- When lifting any heavy object:
 1. Ensure that you can stand safely without slipping.
 2. Distribute the weight of the object equally between your feet.
 3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
 4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. Do not attempt to lift any object that weighs more than 16 kg (35 lb) or that you think is too heavy for you.
- Place removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.
- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective. Reinstall all covers correctly.

 CAUTION:



Keep fingers and other parts of your body away from hazardous, moving parts. If you suffer an injury, seek medical care immediately. 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.

 CAUTION:



Avoid contact with hot components inside the computer. During operation, some components become hot enough to burn the skin. Before you open the computer cover, turn off the computer, disconnect the power, and wait approximately 10 minutes for the components to cool.

Electrical safety requirements

To ensure electrical safety, meet the following requirements on environment, outfit, and operation when working on the computer:

Environment requirements

- Find the room emergency power-off (EPO) switch, disconnecting switch, or electrical outlet. If an electrical accident occurs, you can then operate the switch or unplug the power cord quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Always look carefully for possible hazards in your work area. Examples of these hazards are moist floors, nongrounded power extension cables, power surges, and missing safety grounds.

Outfit requirements

- Do not use worn or broken tools and testers.
- Use only approved tools and test equipment. Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents.
- Regularly inspect and maintain your electrical hand tools for safe operational condition.
- Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to decrease electrostatic discharges (ESD). Do not use this type of mat to protect yourself from electrical shock.

Operation requirements



**CAUTION:**

Electrical current from power, telephone, and communication cables can be hazardous. To avoid personal injury or equipment damage, disconnect the attached power cords, telecommunication systems, networks, and modems before you open the computer covers, unless instructed otherwise in the installation and configuration procedures.

- Disconnect all power before:
 - Performing a mechanical inspection
 - Working near power supplies
 - Removing or installing Field Replaceable Units (FRUs) or Customer Replaceable Units (CRUs)
- Do not service the following parts with the power on when they are removed from their normal operating places in a machine:
 - Power supply units
 - Pumps
 - Blowers and fans
 - Motor generators

This practice ensures the correct grounding of the units.

- Electrical grounding of the computer is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.
- Observe the special safety precautions when you work with very high voltages. Instructions for these precautions are in the safety sections of maintenance information. Use extreme care when measuring high voltages.
- Before you start to work on the machine, unplug the power cord. If you cannot unplug it, power off the wall box that supplies power to the machine and lock the wall box in the off position.
- Never assume that power has been disconnected from a circuit. First, check that it has been powered off.
- Avoid touching live electrical circuits with the reflective surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- If you need to work on a machine that has exposed electrical circuits, observe the following precautions:
 - Ensure that another person, familiar with the power-off controls, is nearby. That person must be there to switch off the power, if necessary.
 - Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

**CAUTION:**

An electrical shock can occur only when there is a complete circuit. By observing the above rule, you may prevent a current from passing through your body.

- When using testers, set the controls correctly and use the approved probe leads and accessories for that tester.
- Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.
- If an electrical accident occurs:
 - Use caution; do not become a victim yourself.
 - Switch off power.
 - Send another person to get medical aid.

Safety inspection guide

The intent of this inspection guide is to assist you in identifying potentially unsafe conditions on these products. Each machine, as it was designed and built, had required safety items installed to protect users and service personnel from injury. This guide addresses only those items. However, good judgment should be used to identify potential safety hazards due to attachment of features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard could be and whether you can continue without first correcting the problem. Consider these conditions and the safety hazards they present:

- Electrical hazards, especially primary power (primary voltage on the frame can cause serious or fatal electrical shock)
- Explosive hazards, such as a damaged CRT face or a bulging capacitor
- Mechanical hazards, such as loose or missing hardware

To determine whether there are any potentially unsafe conditions, use the following checklist at the beginning of every service task. Begin the checks with the power off and the power cord disconnected:

- Before removing the cover:
 1. Check exterior covers for damage (loose, broken, or sharp edges).
 2. Power off the computer. Disconnect the power cord. Check the power cord for:
 - a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
 - b. The power cord should be the authorized type specified for your computer.
 - c. Insulation must not be frayed or worn.
- After removing the cover:
 1. Check for any obvious alterations. Use good judgment as to the safety of any alterations.
 2. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
 3. Check for worn, frayed, or pinched cables.
 4. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Handle devices that are sensitive to electrostatic discharge

Any computer part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). ESD damage can occur when there is a difference in charge between objects. Static electricity, although harmless to you, can seriously damage computer components and options. It is necessary to protect against ESD damage by equalizing the charge so that the machine, the part, the work mat, and the person handling the part are all at the same charge.

Note:

1. Use product-specific ESD procedures when they exceed the requirements noted here.
2. Make sure that the ESD protective devices you use have been certified (ISO 9000) as fully effective.

When handling ESD-sensitive parts:

- Wear a grounded wrist strap against your skin to eliminate static on your body.

- Use the black side of a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
- Select a grounding system, such as those listed below, to provide protection that meets the specific service requirement.
 - Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
 - Use an ESD common ground or reference point when working on a double-insulated or battery-operated system. You can use coax or connector-outside shells on these systems.
 - Use the round ground-prong of the ac plug on ac-operated computers.

Note:

The use of a grounding system is desirable but not required to protect against ESD damage.

- Avoid contact with other people while handling the part.
- Prevent others from touching the options and other computer components.
- Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
- Limit your movement. Movement can cause static electricity to build up around you.
- Do not place the part on the computer cover or other metal surface.
- Always handle computer components and options carefully. Hold PCI/PCIe cards, memory modules, system boards, and CPUs only by the edges. Never touch any exposed circuitry.
- 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.
- 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.
- Keep the parts in protective packages until they are inserted into the product.
- 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 and level surface and place the part on the package.

Important danger warning in multiple languages

The safety notices in this section are provided in the following languages:

- English
- Arabic
- Brazilian/Portuguese
- Chinese (simplified)
- Chinese (traditional)
- French
- German
- Hebrew
- Italian
- Korean
- Spanish

English



DANGER

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

To avoid a shock hazard:

- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- Connect all power cords to a properly wired and grounded electrical outlet.
- Connect to properly wired outlets any equipment that will be attached to this product.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.
- Connect and disconnect cables as described in the following tables when installing, moving, or opening covers on this product or attached devices.

To Connect	To Disconnect
1. Turn everything OFF. 2. First, attach all cables to devices. 3. Attach signal cables to connectors. 4. Attach power cords to outlet. 5. Turn device ON.	1. Turn everything OFF. 2. First, remove power cords from outlet. 3. Remove signal cables from connectors. 4. Remove all cables from devices.



CAUTION

If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Dispose of the battery as required by local ordinances or regulations.



CAUTION

When laser products (such as CD-ROMs, DVD-ROM 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.



CAUTION

Use safe practices when lifting.



≥ 18 kg (37 lb)



≥ 32 kg (70.5 lb)

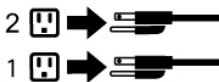


≥ 55 kg (121.2 lb)



CAUTION

The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Arabic



التيار الكهربائي الموجود بمصدر الطاقة أو أجهزة التليفون أو أسلاك الاتصالات يشكل خطورة.

لستفادي مخاطر الصدمات الكهربائية:

لا تحاول توصيل أو فصل أي أسلاك أو القيام بعملية تركيب أو صيانة أو إعادة توصيف لهذا المنتج أثناء وجود عاصفة كهربائية.

يجب توصيل كل أسلاك الكهرباء في مخارج كهرباء ذات توصيلات أسلاك وتوصيلات أرضية صحيحة

يجب توصيل أي جهاز سيتم الحاقه بهذا المنتج في مخارج كهرباء ذات توصيلات أسلاك صحيحة.

وإن أمكن يجب استخدام يد واحدة فقط في توصيل أو فصل أسلاك الإشارة.

لا تحاول تشغيل أي جهاز إذا كان هناك أثر لحرق أو مياه أو تلف بالمكونات

يجب فصل أسلاك الكهرباء وأنظمة الاتصالات وشبكات الاتصال وأجهزة المودم الملحقة قبل فتح أغطية الجهاز، مالم يتم طلب خلاف ذلك في التعليمات الخاصة بالتركيب والتوصيف.

قم بتوصيل وفصل الأسلاك كما هو موضح في الجدول التالي وذلك عند القيام بعملية التركيب أو النقل أو فتح أغطية هذا المنتج أو الأجهزة الملحقة.

للتوصيل:	للفصل:
قم بإيقاف كل شيء.	قم بإيقاف كل شيء.
أولاً، قم بتوصيل كل الأسلاك بالأجهزة.	أولاً، قم بفصل كل أسلاك الكهرباء من المخرج.
قم بتوصيل أسلاك الإشارة في لموصلات.	قم بفصل أسلاك الإشارة من الموصلات.
قم بتوصيل أسلاك الكهرباء في المخارج.	قم بفصل كل الأسلاك من الأجهزة.
قم بتشغيل الجهاز.	



تنبيه :

إذا كان النظام الخاص يستخدم معه بطارية ليثيوم قم باستبدالها بنفس النوع الذي تم صناعته من خلال نفس المصنع. تحتوي البطارية على مادة الليثيوم ويمكن أن تنفجر في حالة عدم استخدامها أو التعامل معها بطريقة صحيحة أو عند التخلص منها بطريقة خطأ.

لا تقم بـ:

- القاء البطارية أو غمرها في الماء
- تسخينها أعلى من ١٠٠ درجة مئوية (٢١٢ ° فهرنهايت)
- بتصليحها أو فكها

تخلص من البطارية طبقاً للقانون أو النظام المحلي .



تنبيه :

أثناء تركيب منتجات ليزر (مثل CD-ROMs أو وحدة تشغيل DVD أو أجهزة Fiber Optic أو وحدات الإرسال) يجب مراعاة الآتي:

لا تنزع الأغشية. قد ينتج عن نزع أغشية منتج الليزر انفجار أشعة الليزر شديدة الخطورة.
لا يوجد أجزاء يمكن تغييرها داخل الجهاز. قد ينتج عن استخدام تحكمات أو تعديلات أو عمل أي تصرفات أخرى تخالف ما هو محدد هنا إلى انفجار أشعة شديدة الخطورة.



خطر

تحتوي بعض منتجات الليزر على الفئة داويد ليزر مدمج من الفئة Class 3A أو Class 3B. يجب مراعاة الآتي .

أشعة الليزر عند الفتح. لا تحقق إلى الإشعاع و لا تنظر إليه مباشرة بواسطة أي أجهزة مرئية وتجنب التعرض المباشر للإشعاع .



تنبيه :

يجب استخدام ممارسات أمانة عند الرفع



≥ 18 kg (37 lb)



≥ 32 kg (70.5 lb)

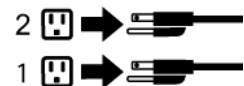


≥ 55 kg (121.2 lb)



تنبيه :

لا يقرم زر التحكم في التشغيل الموجود على الجهاز والمفتاح الكهربائي الموجود على لوحة التحكم بإيقاف التيار الكهربائي المار بالجهاز. قد يكون للجهاز أكثر من سلك كهربائي واحد. لإيقاف التيار الكهربائي المار بالجهاز، تأكد من فصل جميع أسلاك الكهرباء من مصدر الكهرباء .



Brazilian Portuguese



PERIGO

A corrente elétrica proveniente de cabos de alimentação, de telefone e de comunicações é perigosa.
Para evitar risco de choque elétrico:

- Não conecte nem desconecte nenhum cabo ou execute instalação, manutenção ou reconfiguração deste produto durante uma tempestade com raios.
- Conecte todos os cabos de alimentação a tomadas elétricas corretamente instaladas e aterradas.
- Todo equipamento que for conectado a este produto deve ser conectado a tomadas corretamente instaladas.
- Quando possível, utilize apenas uma das mãos para conectar ou desconectar cabos de sinal.
- Nunca ligue nenhum equipamento quando houver evidência de fogo, água ou danos estruturais.
- Antes de abrir tampas de dispositivos, desconecte cabos de alimentação, sistemas de telecomunicação, redes e modems conectados, a menos que especificado de maneira diferente nos procedimentos de instalação e configuração.
- Conecte e desconecte os cabos conforme descrito na tabela apresentada a seguir ao instalar, mover ou abrir tampas deste produto ou de dispositivos conectados.

Para Conectar:	Para Desconectar:
1. DESLIGUE Tudo. 2. Primeiramente, conecte todos os cabos aos dispositivos. 3. Conecte os cabos de sinal aos conectores. 4. Conecte os cabos de alimentação às tomadas. 5. LIGUE os dispositivos.	1. DESLIGUE Tudo. 2. Primeiramente, remova os cabos de alimentação das tomadas. 3. Remova os cabos de sinal dos conectores. 4. Remova todos os cabos dos dispositivos.



CUIDADO:

Se o seu sistema possui um módulo com uma bateria de lítio, substitua-o apenas por um módulo do mesmo tipo e do mesmo fabricante. A bateria contém lítio e pode explodir se não for utilizada, manuseada ou descartada de maneira correta.

Não:

- Jogue ou coloque na água
- Aqueça a mais de 100°C (212°F)
- Conserte nem desmonte

Descarte a bateria conforme requerido pelas leis ou regulamentos locais.



PRECAUCIÓN:

Quando produtos a laser (como unidades de CD-ROMs, unidades de DVD-ROM, dispositivos de fibra ótica ou transmissores) estiverem instalados, observe o seguinte:

- Não remova as tampas. A remoção das tampas de um produto a laser pode resultar em exposição prejudicial à radiação de laser. Não existem peças que podem ser consertadas no interior do dispositivo.
- A utilização de controles ou ajustes ou a execução de procedimentos diferentes dos especificados aqui pode resultar em exposição prejudicial à radiação.

PERIGO

Alguns produtos a laser contêm diodo de laser integrado da Classe 3A ou da Classe 3B. Observe o seguinte:

Radiação a laser quando aberto. Não olhe diretamente para o feixe a olho nu ou com instrumentos ópticos e evite exposição direta ao feixe.



CUIDADO:

Utilize procedimentos de segurança para levantar equipamentos.



≥ 18 kg (37 lb)



≥ 32 kg (70.5 lb)



≥ 55 kg
(121.2 lb)



CUIDADO:

O botão de controle de alimentação do dispositivo e o botão para ligar/desligar da fonte de alimentação não desligam a corrente elétrica fornecida ao dispositivo. O dispositivo também pode ter mais de um cabo de alimentação. Para remover toda a corrente elétrica do dispositivo, assegure que todos os cabos de alimentação estejam desconectados da fonte de alimentação.



Chinese (simplified)



危险

电源、电话和通信电缆中的电流是危险的。

为避免电击危险：

- 请勿在雷电期间连接或断开任何电缆的连接，或者对本产品进行安装、维护或重新配置。
- 将所有电源线连接到正确连线和妥善接地的电源插座。
- 将所有要连接到该产品的设备连接到正确连线的插座。
- 如果可能，请仅使用一只手来连接或断开信号电缆的连接。
- 切勿在有火、水、结构损坏迹象的情况下开启任何设备。
- 在打开设备外盖之前请断开已连接的电源线、远程通信系统、网络和调制解调器，除非在安装和配置过程中另有说明。
- 当安装、移动或打开该产品或连接设备的外盖时，请按照下表所述来连接或断开电缆的连接。

要连接	要断开连接
1. 切断所有电源。 2. 首先将所有电缆连接到设备。 3. 将信号电缆连接到接口。 4. 将电源线连接到插座。 5. 开启设备。	1. 切断所有电源。 2. 首先从插座上拔出电源线。 3. 从接口上拔出信号电缆。 4. 从设备上拔出所有电缆。



警告：
如果您的系统有包含锂电池的模块，请仅使用同一制造商生产的相同模块类型来替换该模块。
该电池中含有锂，如果使用、操作或处理不当，可能会发生爆炸。

切勿：

- 投入或浸入水中
- 加热到 100 °C (212 °F) 以上
- 维修或拆卸

请按照当地法令或条例的要求处理电池。



警告：
安装激光产品（例如 CD-ROM、DVD-ROM 驱动器、光纤设备或发射设备）时，
请注意以下声明：

- 请勿卸下外盖。卸下激光产品的外盖可能导致遭受激光辐射的危险。该设备内没有可维修的部件。
- 如果不按照此处指定的过程进行控制、调整或操作，则有可能导致遭受辐射的危险。



危险

某些激光产品包含嵌入式 3A 类或 3B 类激光二极管。请注意以下声明：

打开后有激光辐射。请勿注视光束，请勿直接用光学仪器查看，并请避免直接暴露在光束中。



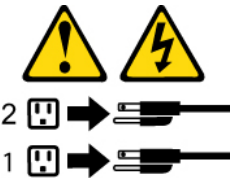
警告：
抬起时请采取安全措施。



≥18 千克 (37 磅) ≥32 千克 (70.5 磅) ≥55 千克 (121.2 磅)



警告：
设备上的电源控制按钮和电源上的电源开关不会切断供给该设备的电流。该设备还可能有多条电源线。要切断该设备的所有电流，请确保所有电源线都与电源断开连接。



Chinese (traditional)



危險

- 電源、電話及通訊纜線上的電流都具有危險性。
若要避免觸電危險：
- 請勿在雷雨期間，連接或拔除纜線、執行安裝、維護或重新配置本產品。
 - 將所有電源線連接到正確配線及接地的電源插座。
 - 任何與本產品連接的設備都必須連接到配線妥當的電源插座。
 - 請盡可能用單手連接或拔除信號線。
 - 發生火災、水災或結構損害時，絕對不要開啟任何設備。
 - 除非在安裝及配置程序中另有指示，否則在開啟裝置機蓋之前，請拔掉連接的電源線、電信系統、網路及數據機。
 - 安裝、移動或開啟本產品或附屬裝置的機蓋時，請遵循下列說明連接及拔掉纜線。

連線	切斷連線
1. 關閉所有開關。 2. 首先，連接所有接線到裝置。 3. 連接信號線到接頭。 4. 連接電源線到插座。 5. 開啟裝置。	1. 關閉所有開關。 2. 首先，拔掉插座上的電源線。 3. 拔掉接頭上的信號線。 4. 拔掉裝置上所有接線。



警告：

如果您的系統中含有鋰電池模組，請僅使用同一家製造商所生產的相同模組進行更換。

如果未以正確方式使用、處理或棄置含鋰的電池，會有爆炸的危險。

請勿：

- 沾溼或浸入水中
- 置於 **100°C (212°F)** 以上的高溫環境
- 修理或拆開

請按照各地區有關廢棄電池的法令和規定處理舊電池。



警告：

- 請勿移除機蓋。移除雷射產品的機蓋，可能會導致暴露在危險的雷射輻射中。裝置內部並無可自行維修的零件。
- 利用或執行非本文中所指定的控制、調整及執行程序，可能會導致危險的輻射外洩。



危險

部分雷射產品含有內嵌式 **Class 3A** 或 **Class 3B** 雷射二極體。請注意下列事項：

在開啟光碟機時，會發生雷射輻射。請勿直視光束或用光學儀器直接檢視，並避免直接暴露在光束中。



警告：

搬運時請注意安全。



≥ 18 公斤 (37 磅) ≥ 32 公斤 (70.5 磅) ≥ 55 公斤 (121.2 磅)



警告：

裝置上的電源控制按鈕及電源供應器上的電源開關，無法關閉裝置所產生的電流。

該裝置可能有多條電源線。若要除去裝置流出的所有電流，請確認已切斷所有電源線的電源。



French



DANGER

Le courant électrique provenant de l'alimentation, du téléphone et des câbles de transmission peut présenter un danger.

Pour éviter tout risque de choc électrique:

- Ne manipulez aucun câble et n'effectuez aucune opération d'installation, d'entretien ou de reconfiguration de ce produit au cours d'un orage.
- Branchez tous les cordons d'alimentation sur un socle de prise de courant correctement câblé et mis à la terre.
- Branchez sur des socles de prise de courant correctement câblés tout équipement connecté à ce produit.
- Lorsque cela est possible, n'utilisez qu'une seule main pour connecter ou déconnecter les câbles d'interface.
- Ne mettez jamais un équipement sous tension en cas d'incendie ou d'inondation, ou en présence de dommages matériels.
- Avant de retirer les carters de l'unité, mettez celle-ci hors tension et déconnectez ses cordons d'alimentation, ainsi que les câbles qui la relient aux réseaux, aux systèmes de télécommunication et aux modems (sauf instruction contraire mentionnée dans les procédures d'installation et de configuration).
- Lorsque vous installez, que vous déplacez, ou que vous manipulez le présent produit ou des périphériques qui lui sont raccordés, reportez-vous aux instructions ci-dessous pour connecter et déconnecter les différents cordons.

Connexion	Déconnexion
1. Mettez les unités HORS TENSION. 2. Commencez par brancher tous les cordons sur les unités. 3. Branchez les câbles d'interface sur des connecteurs. 4. Branchez les cordons d'alimentation sur des prises. 5. Mettez les unités SOUS TENSION.	1. Mettez les unités HORS TENSION. 2. Débranchez les cordons d'alimentation des prises. 3. Débranchez les câbles d'interface des connecteurs. 4. Débranchez tous les câbles des unités.



ATTENTION:

Si votre système est doté d'un module contenant une pile au lithium, vous devez le remplacer uniquement par un module identique, produit par le même fabricant. La pile contient du lithium et peut exploser en cas de mauvaise utilisation, de mauvaise manipulation ou de mise au rebut inappropriée.

Ne pas:

- la jeter à l'eau,
- l'exposer à des températures supérieures à 100°C,
- chercher à la réparer ou à la démonter.

Ne pas mettre la pile à la poubelle. Pour la mise au rebut, se reporter à la réglementation en vigueur.



ATTENTION:

Si des produits à laser (tels que des unités de CD-ROM, de DVD-ROM, des unités à fibres optiques, ou des émetteurs) sont installés, prenez connaissance des informations suivantes:

- Ne retirez pas le carter. En ouvrant l'unité de CD-ROM ou de DVD-ROM, vous vous exposez au rayonnement dangereux du laser. Aucune pièce de l'unité n'est réparable.
- Pour éviter tout risque d'exposition au rayon laser, respectez les consignes de réglage et d'utilisation des commandes, ainsi que les procédures décrites dans le présent manuel.



DANGER

Certains produits à laser contiennent une diode à laser intégrée de classe 3A ou 3B. Prenez connaissance des informations suivantes:

Rayonnement laser lorsque le carter est ouvert. Évitez toute exposition directe au rayon laser. Évitez de regarder fixement le faisceau ou de l'observer à l'aide d'instruments optiques.



ATTENTION:

Soulevez la machine avec précaution.



≥ 18 kg (37 lb)



≥ 32 kg (70.5 lb)

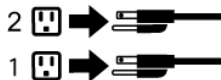


≥ 55 kg
(121.2 lb)



ATTENTION:

L'interrupteur de contrôle d'alimentation de l'unité et l'interrupteur du bloc d'alimentation ne coupent pas le courant électrique alimentant l'unité. En outre, le système peut être équipé de plusieurs cordons d'alimentation. Pour mettre l'unité hors tension, vous devez déconnecter tous les cordons de la source d'alimentation.



German



VORSICHT

An Netz-, Telefon- und Datenleitungen können gefährliche Spannungen anliegen.

Aus Sicherheitsgründen:

- Bei Gewitter an diesem Gerät keine Kabel anschließen oder lösen. Ferner keine Installations-, Wartungs- oder Rekonfigurationsarbeiten durchführen.
- Gerät nur an eine Schutzkontaktsteckdose mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
- Alle angeschlossenen Geräte ebenfalls an Schutzkontaktsteckdosen mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
- Die Signalkabel nach Möglichkeit einhändig anschließen oder lösen, um einen Stromschlag durch Berühren von Oberflächen mit unterschiedlichem elektrischem Potenzial zu vermeiden.
- Geräte niemals einschalten, wenn Hinweise auf Feuer, Wasser oder Gebäudeschäden vorliegen.
- Die Verbindung zu den angeschlossenen Netzkabeln, Telekommunikationssystemen, Netzwerken und Modems ist vor dem Öffnen des Gehäuses zu unterbrechen, sofern in den Installations- und Konfigurationsprozeduren keine anders lautenden Anweisungen enthalten sind.
- Zum Installieren, Transportieren und Öffnen der Abdeckungen des Computers oder der angeschlossenen Einheiten die Kabel gemäß der folgenden Tabelle anschließen und abziehen.

Zum Anschließen der Kabel gehen Sie wie folgt vor	Zum Abziehen der Kabel gehen Sie wie folgt vor
1. Schalten Sie alle Einheiten AUS. 2. Schließen Sie erst alle Kabel an die Einheiten an. 3. Schließen Sie die Signalkabel an die Buchsen an. 4. Schließen Sie die Netzkabel an die Steckdose an. 5. Schalten Sie die Einheit EIN.	1. Schalten Sie alle Einheiten AUS. 2. Ziehen Sie zuerst alle Netzkabel aus den Netzsteckdosen. 3. Ziehen Sie die Signalkabel aus den Buchsen. 4. Ziehen Sie alle Kabel von den Einheiten ab.



ACHTUNG:

Enthält das System ein Modul mit einer Lithiumbatterie, dieses nur durch ein Modul desselben Typs und von demselben Hersteller ersetzen. Die Batterie enthält Lithium und kann bei unsachgemäßer Verwendung, Handhabung oder Entsorgung explodieren.

Die Batterie nicht:

- mit Wasser in Berührung bringen.
- über 100 °C erhitzen.
- reparieren oder zerlegen.

Die örtlichen Bestimmungen für die Entsorgung von Sondermüll beachten.



ACHTUNG:

Bei der Installation von Lasergeräten (wie CD-ROM-Laufwerken, DVD-Laufwerken, Einheiten mit Lichtwellenleitertechnik oder Sendern) Folgendes beachten:

- Die Abdeckungen nicht entfernen. Durch Entfernen der Abdeckungen des Lasergeräts können gefährliche Laserstrahlungen freigesetzt werden. Das Gerät enthält keine zu wartenden Teile.
- Werden Steuerelemente, Einstellungen oder Durchführungen von Prozeduren anders als hier angegeben verwendet, kann gefährliche Laserstrahlung auftreten.



VORSICHT

Einige Lasergeräte enthalten eine Laserdiode der Klasse 3A oder 3B. Beachten Sie Folgendes:
Laserstrahlung bei geöffneter Verkleidung. Nicht in den Strahl blicken. Keine Lupen oder Spiegel verwenden. Strahlungsbereich meiden.



ACHTUNG:

Arbeitsschutzrichtlinien beim Anheben der Maschine beachten.



≥ 18 kg



≥ 32 kg

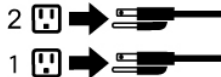


≥ 55 kg



ACHTUNG:

Mit dem Netzschalter an der Einheit und am Netzteil wird die Stromversorgung für die Einheit nicht unterbrochen. Die Einheit kann auch mit mehreren Netzkabeln ausgestattet sein. Um die Stromversorgung für die Einheit vollständig zu unterbrechen, müssen alle zum Gerät führenden Netzkabel vom Netz getrennt werden.



Hebrew



זרם חשמלי המועבר בכבלי חשמל, טלפון ותקשורת הוא מסוכן.

כדי להימנע מסכנת התחשמלות:

- אל תחברו או תנתקו כבלים, ואל תבצעו פעולת התקנה, תחזוקה או שינוי תצורה במוצר זה במהלך סופת ברקים.
- חברו את כל כבלי החשמל לשקע חשמל מחווט ומוארק כהלכה.
- חברו כל ציוד שיחובר למוצר זה לשקעי חשמל מחוטים כהלכה.
- במידת האפשר, השתמשו ביד אחת בלבד לחיבור או לניתוק של כבלי אותות.
- לעולם אל תפעילו ציוד כלשהו כאשר יש עדות לנזק מבני או לנזק כתוצאה מאש או ממים.
- נתקו את כבלי החשמל, מערכות התקשורת, התקני הרשת והמודמים המחוברים לפני פתיחת כיסויי ההתקן, אלא אם הליכי ההתקנה וקביעת התצורה מורים אחרת.
- בעת התקנה, העברה או פתיחת כיסויים במוצר זה או בהתקנים המחוברים, חברו ונתקו את הכבלים כמתואר בטבלה שלהלן.

כדי לחבר	כדי לנתק
1. כבו הכל.	1. כבו הכל.
2. ראשית, חברו את כל הכבלים להתקנים.	2. ראשית, נתקו את כבלי החשמל מהשקעים.
3. חברו את כבלי האותות למחברים.	3. נתקו את כבלי האותות מהמחברים.
4. חברו את כבלי החשמל לשקעים.	4. הסירו את כל הכבלים מההתקנים.
5. הפעילו את ההתקן.	



זהירות:

אם המערכת כוללת מודול המכיל סוללת ליתיום, החליפו אותו רק במודול מאותו סוג ומתוצרת אותו יצרן. הסוללה מכילה ליתיום, ועלולה להתפוצץ אם לא משתמשים ומטפלים בה או משליכים אותה כיאות.

לעולם:

- אל תטבלו במים

- אל תחממו לטמפרטורה הגבוהה מ-100°C (212°F)

- אל תתקנו או תפרקו

השליכו את הסוללה כנדרש לפי התקנות והחוקים המקומיים.



זהירות:

בעת התקנת מוצרי ליזר (כגון כונני תקליטורים ו-DVD, התקני סיב אופטי או משדרים), שימו לב לאזהרות הבאות:

- אל תסירו את הכיסויים. הסרת הכיסויים של מוצר הלייזר עלולה לגרום לחשיפה לקרינת לייזר מסוכנת. אין חלקים ברי טיפול בתוך ההתקן.
- שינויים, שימוש בבקורות או ביצוע הליכים אחרים מאלה המתוארים כאן, עלולים לגרום לחשיפה לקרינה מסוכנת.



סכנה

מוצרי לייזר מסוימים מכילים דיודת לייזר מסוג Class 3A או Class 3B. שימו לב לאזהרה הבאה:

כאשר הוא פתוח, המוצר פולט קרינת לייזר. אל תביטו ישירות בקרן, אל תביטו ישירות בעזרת ציוד אופטי, והימנעו מחשיפה לקרן.



זהירות:
השתמשו בהליכים
הנאותים בעת
הרמת הציוד.



≤ 18 ק"ג (37 ליב')



≤ 32 ק"ג (70.5 ליב')

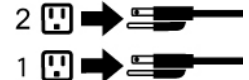


≤ 55 ק"ג (121.2 ליב')



זהירות:

לחצן ההפעלה של ההתקן ומתג ההפעלה של ספק החשמל אינם מפסיקים את זרם החשמל המסופק להתקן. בנוסף, ההתקן עשוי לכלול יותר מכבל חשמל אחד. כדי לסלק את כל הזרם החשמלי מההתקן, ודאו שכל כבלי החשמל מנותקים ממקור החשמל.



Italian



PERICOLO

La corrente elettrica proveniente dai cavi di alimentazione, del telefono e di comunicazione può essere pericolosa.

Per evitare il rischio di scosse elettriche:

- Non collegare o scollegare qualsiasi cavo oppure effettuare l'installazione, la manutenzione o la riconfigurazione del prodotto durante un temporale.
- Collegare tutti i fili elettrici a una presa di alimentazione correttamente cablata e dotata di messa a terra.
- Collegare alle prese elettriche appropriate tutte le apparecchiature che verranno utilizzate per questo prodotto.
- Se possibile, utilizzare solo una mano per collegare o scollegare i cavi di segnale.
- Non accendere assolutamente apparecchiature in presenza di incendi, perdite d'acqua o danno strutturale.
- Scollegare i cavi di alimentazione, i sistemi di telecomunicazione, le reti e il modem prima di aprire i coperchi del dispositivo, salvo istruzioni contrarie relative alle procedure di installazione e configurazione.

- Collegare e scollegare i cavi come descritto nella seguente tabella quando vengono effettuate operazioni di installazione, spostamento o apertura dei coperchi di questo prodotto o delle unità collegate.

Per collegarsi	Per scollegarsi
1. SPEGNERE le apparecchiature. 2. Innanzitutto, collegare tutti i cavi alle unità. 3. Collegare i cavi di segnale ai connettori. 4. Collegare i cavi di alimentazione alla presa. 5. Accendere l'unità.	1. SPEGNERE le apparecchiature. 2. Innanzitutto, rimuovere i cavi di alimentazione dalla presa. 3. Rimuovere i cavi di segnale dai connettori. 4. Rimuovere tutti i cavi dalle unità.



ATTENZIONE:

Se sul sistema è presente un modulo che contiene una batteria al litio, sostituirlo solo con un tipo di modulo dello stesso tipo della stessa casa di produzione. La batteria contiene litio e può esplodere se usata, maneggiata o smaltita in modo non corretto.

Non:

- Gettare o immergere la batteria nell'acqua
- Riscaldarla ad una temperatura superiore ai 100 gradi C (212 gradi F)
- Smontarla, ricaricarla o tentare di ripararla

Le batterie usate vanno smaltite in accordo alla normativa in vigore (DPR 915/82 e successive disposizioni e disposizioni locali).



ATTENZIONE:

Quando vengono installati prodotti laser (quali CD-ROM, unità DVD-ROM, unità a fibre ottiche o trasmettenti), tener presente quanto segue:

- Non rimuovere gli sportelli. L'apertura di un'unità laser può determinare l'esposizione a radiazioni laser pericolose. All'interno dell'unità non vi sono parti su cui effettuare l'assistenza tecnica.
- L'utilizzo di controlli, regolazioni o l'esecuzione di procedure non descritti nel presente manuale possono provocare l'esposizione a radiazioni pericolose.



PERICOLO

Alcune unità laser contengono un diodo laser di Classe 3A o Classe 3B. Tener presente quanto segue:

Aperto l'unità vengono emesse radiazioni laser. Non fissare il fascio, non guardarlo direttamente con strumenti ottici ed evitare l'esposizione al fascio.



ATTENZIONE:

Prestare attenzione nel sollevare l'apparecchiatura.



≥ 18 kg



≥ 32 kg



≥ 55 kg



ATTENZIONE:

Il pulsante di controllo dell'alimentazione presente sull'unità e l'interruttore dell'alimentatore non disattivano l'alimentazione corrente fornita all'unità. E' possibile che l'unità disponga di più cavi di alimentazione. Per disattivare l'alimentazione dall'unità, accertarsi che tutti i cavi di alimentazione siano scollegati dalla fonte di alimentazione.



Korean



위험

전원, 전화, 통신 케이블의 전류는 위험합니다.

감전의 위험을 피하려면 다음과 같이 하십시오.

- 번개가 치는 날에는 케이블을 연결 또는 분리하거나 본 제품을 설치, 보수, 재구성하지 마십시오.
- 모든 전원 코드는 올바르게 접지된 전기 콘센트에 연결하십시오.
- 본 제품에 연결될 장치는 올바르게 배선된 콘센트에 연결하십시오.
- 신호 케이블을 연결 또는 분리할 때 가능하면 한 손만을 사용하십시오.
- 불 또는 물로 인한 손상이나 구조적인 손상이 있을 경우 장치의 전원을 절대 켜지 마십시오.
- 설치 및 구성 과정에 별도의 지시 사항이 없는 경우, 장치의 덮개를 열기 전에 연결된 전원 코드, 원격 통신 시스템, 네트워크, 모뎀을 분리하십시오.
- 본 제품이나 연결된 장치를 설치, 이동하거나 덮개를 열 때 다음 표와 같은 순서로 케이블을 연결하거나 분리하십시오.

연결할 때:	분리할 때:
1. 모든 장치의 전원을 끄십시오. 2. 먼저 모든 케이블을 장치에 연결하십시오. 3. 커넥터에 신호 케이블을 연결하십시오. 4. 콘센트에 전원 코드를 연결하십시오. 5. 장치의 전원을 켜십시오.	1. 모든 장치의 전원을 끄십시오. 2. 먼저 콘센트에서 전원 코드를 분리하십시오. 3. 커넥터에서 신호 케이블을 분리하십시오. 4. 장치에서 모든 케이블을 분리하십시오.



주의:

사용자의 시스템이 리튬 배터리를 포함하는 모듈일 경우, 동일한 제조업체에서 동일한 모듈 유형으로 생산된 제품으로 교체하십시오. 배터리에는 리튬이 함유되어 있어 잘못 사용, 취급 또는 폐기할 경우 폭발의 위험이 있습니다.

사고를 방지하려면 다음 사항을 준수하십시오.

- 배터리를 물 속에 던지거나 침수시키지 마십시오.
- 100℃ (212°F) 이상 가열하지 마십시오.
- 수리하거나 분해하지 마십시오.

배터리를 폐기할 때는 법령 또는 회사의 안전 수칙에 따라 폐기하십시오.



주의:

CD-ROM, DVD-ROM 장치, 광섬유 장치 또는 송신 장치와 같은 레이저 제품을 설치할 때, 다음과 같은 취급 주의사항을 참고하십시오.

- 덮개를 열지 마십시오. 덮개를 열면 레이저 복사 에너지에 노출될 위험이 있습니다. 장치 내부에는 사용자가 조정하거나 수리할 수 있는 부품이 없습니다.
- 규정된 것 이외의 절차 수행, 제어 조정 등의 행위로 인해 해로운 레이저 복사에 노출될 수 있습니다.



위험

일부 장비에는 임베디드 클래스 3A 또는 클래스 3B 레이저 다이오드가 있습니다. 다음 주의사항에 유의하십시오.

드라이브가 열리면 레이저 복사 에너지가 방출됩니다. 광선이 눈에 직접 쏘이지 않도록 하십시오. 나안 또는 광학 기구를 착용한 상태에서 광선을 직접 바라보지 않도록 하십시오.



주의:
제품을 들어 올릴 때
안전 규제를 따르십시오.



≥ 18 kg (37 lbs)



≥ 32 kg (70.5 lbs)



≥ 55 kg (121.2 lbs)



주의:
장치의 전원 제어 버튼 및 전원 공급 장치의 전원 스위치를 사용하여 장치에 공급되는 전기를 차단하지 마십시오.
장치는 둘 이상의 코드를 가지고 있을 수 있습니다. 장치에서 모든 전원을 차단하려면 콘센트에서 코드가 모두
분리되어 있는지 확인하십시오.



Spanish



PELIGRO

La corriente eléctrica procedente de cables de alimentación, teléfonos y cables de comunicación puede ser peligrosa.

Para evitar el riesgo de descarga eléctrica:

- No conecte ni desconecte los cables ni realice ninguna tarea de instalación, mantenimiento o reconfiguración de este producto durante una tormenta eléctrica.
- Conecte todos los cables de alimentación a tomas de corriente debidamente cableadas y conectadas a tierra.
- Cualquier equipo que se conecte a este producto también debe conectarse a tomas de corriente debidamente cableadas.
- Siempre que sea posible, utilice una sola mano para conectar o desconectar los cables de señal.
- No encienda nunca un equipo cuando hay señales de fuego, agua o daños estructurales.
- Desconecte los cables de alimentación, los sistemas de telecomunicaciones, las redes y los módems conectados antes de abrir las cubiertas de los dispositivos, a menos que se indique lo contrario en los procedimientos de instalación y configuración.
- Conecte y desconecte los cables, como se describe en la tabla siguiente, cuando instale, mueva o abra las cubiertas de este producto o de los dispositivos conectados.

Para conectar	Para desconectar
1. APÁGUELO todo. 2. En primer lugar, conecte todos los cables a los dispositivos. 3. Conecte los cables de señal a los conectores. 4. Enchufe los cables de alimentación a las tomas de corriente. 5. Encienda el dispositivo.	1. APÁGUELO todo. 2. En primer lugar, desenchufe los cables de alimentación de las tomas de corriente. 3. Desconecte los cables de señal de los conectores. 4. Desconecte todos los cables de los dispositivos.



PRECAUCIÓN:

Si su sistema dispone de un módulo que contiene una batería de litio, reemplácelo sólo con el mismo tipo de módulo, del mismo fabricante. La batería contiene litio y puede explotar si no se utiliza, manipula o desecha correctamente.

No debe:

- Arrojarla al agua o sumergirla en ella
- Exponerla a temperaturas superiores a 100°C (212°F)
- Repararla o desmontarla

Deshágase de la batería según especifiquen las leyes o normas locales.



PRECAUCIÓN:

Cuando haya productos láser (como unidades de CD-ROM, unidades de DVD, dispositivos de fibra óptica o transmisores) instalados, tenga en cuenta lo siguiente:

- No quite las cubiertas. Si quita las cubiertas del producto láser, podría quedar expuesto a radiación láser peligrosa. Dentro del dispositivo no existe ninguna pieza que requiera servicio técnico.
- Si usa controles o ajustes o realiza procedimientos que no sean los especificados aquí, podría exponerse a radiaciones peligrosas.



PELIGRO

Algunos productos láser tienen incorporado un diodo láser de clase 3A o clase 3B. Tenga en cuenta lo siguiente:

Cuando se abre, queda expuesto a radiación láser. No mire directamente al rayo láser, ni siquiera con instrumentos ópticos, y evite exponerse directamente al rayo láser.



PRECAUCIÓN:

Adopte procedimientos seguros al levantar el equipo.



≥ 18 kg



≥ 32 kg



≥ 55 kg



PRECAUCIÓN:

El botón de control de alimentación del dispositivo y el interruptor de alimentación de la fuente de alimentación no desconectan la corriente eléctrica suministrada al dispositivo. Además, el dispositivo podría tener más de un cable de alimentación. Para suprimir toda la corriente eléctrica del dispositivo, asegúrese de que todos los cables de alimentación estén desconectados de la toma de corriente.



Chapter 4 Diagnostics and troubleshooting

Overall procedure

Use the following procedures as a guide in identifying and correcting problems.

1. Quick diagnostics and troubleshooting:
 - a. If a general error is reported by a program or operating system (OS), check the software documentation (like error messages, readme, or help guides) for instructions.
 - b. Use an antivirus program to see if the computer has been infected by a virus. If the program detects a virus, remove the virus.
 - c. Check if any necessary fixes or updates for software, OS, drivers, or UEFI BIOS are available. If yes, install them.
 - d. Check all cable, power cord, and device connections.
 - e. Check and ensure that all connected devices are enabled in the UEFI BIOS.
 - f. Set all display controls to the middle position.
 - g. Restart the computer and all connected devices.
2. Further diagnostics and troubleshooting:
 - a. Use diagnostic tools to narrow down the issue. See [Diagnostic tools](#) on page 42.
 - b. Recover the OS if you suspect an OS issue. See [Self-help resource](#) on page 128.
 - c. Determine if any action or hardware replacement is required based on the symptoms in [Symptom-to-CRU/FRU index](#) on page 45
Turn to [Hardware replacement](#) on page 54 for detailed replacement instructions.
 - d. For undetermined problems, see [Undetermined problems](#) on page 51.
3. If the diagnosing procedures above cannot help you isolate and repair the problems, save and print the log files and contact Lenovo for support. See [Call Lenovo](#) on page 51.

Note:

- The diagnostic tests are intended to test only Lenovo products. The use of non-Lenovo products, prototype cards, or modified options can lead to false indications of errors and invalid system responses.
- The troubleshooting steps or the diagnostic tools might tell you that you need additional or updated device drivers or other software. For the latest drivers and technical updates, go to <https://support.lenovo.com>.
- **Be extremely careful during write operations such as copying, saving, or formatting.** The drives in the computer you are servicing might have been rearranged or the drive startup sequence changed. If you select an incorrect drive, data or programs might be overwritten.
- Due to the variety of hardware and software combinations that can be encountered, use the information listed in [Before contacting Lenovo support](#) on page 51 to assist you in problem determination.
- Comparing the configuration and software set-up between working and non-working systems will often lead to problem resolution. To eliminate confusion, identical systems are considered identical only if the following criteria are the same.
 - Same machine type and model
 - Same BIOS version
 - Same adapters/attachments in the same locations
 - Same address jumpers/terminators/cabling
 - Same software versions and levels
 - Same Diagnostic Diskette and version
 - Same configuration options set in the system
 - Same setup for OS control files

Diagnostic tools

The following table lists some common diagnostic tools for Lenovo computers, including their running environments and brief introductions.

Table 1: Diagnostic tools

Diagnostic tool	Running environment	Brief introduction
Hardware scan in Vantage on page 43	Run in the OS.	The hardware scan feature in the Vantage application allows you to have a quick test of key hardware modules on the computer.
ThinkStation Diagnostics solution on page 43	Run in the firmware.	ThinkStation products with this solution can automatically detect issues and report issues in Windows notification area or, for selected models, on the front diagnostic panel.
Lenovo UEFI diagnostic tool on page 44	Run in the UEFI BIOS.	The Lenovo UEFI diagnostic tool enables you to test hardware modules, view system information, and check and recover bad sectors on internal storage devices during system startup.

Diagnostic tool	Running environment	Brief introduction
Advanced diagnostic tools on page 45	Run in the OS or boot from USB.	If the computer does not have the diagnostic tools above, or if you want an extensive hardware test, you can download an advanced diagnostic tool from the Lenovo Support Web site.

Note:

Tool availability may vary by model.

Hardware scan in Vantage

To run the hardware scan in the Lenovo Vantage or Lenovo Commercial Vantage app (Vantage app), do the following:

1. Launch the Vantage app.
2. Select **Device diagnostics** from the expanded menu on the left.
3. Choose one of the following ways to run the hardware scan:
 - Select **Hardware scan > Quick scan > Scan** to test all detected components.
 - Select **Hardware scan > Quick scan > Custom** to choose one or more components to test.
 - Select **Hardware scan > Manual tests > Continue > Scan** to choose one or more components to test.
4. For any detected issues, the required action varies depending on the product's warranty status and your geographic location. Follow the on-screen instructions to resolve the issue.

Note:

The Vantage app makes periodic updates to keep improving your experience. Features and interface details may vary; refer to your actual app interface for the most accurate information.

ThinkStation Diagnostics solution

Systems with the ThinkStation Diagnostics solution can automatically detect issues and display error messages in the Windows notification area or, for some products, four-digit error codes on the front diagnostic panel.

To decode the errors, do one of the following.

- If the ThinkStation Diagnostics application can be launched in Windows properly:
 1. Launch the ThinkStation Diagnostics application by clicking the error message or application icon.
 2. Locate the related event and view the event log to find possible solutions.
 3. Record the four-digit error code in the application or on the diagnostic panel, then decode the error at <https://www.thinkworkstationsoftware.com/?view=codes>.

Note:

You can download the ThinkStation Diagnostics application at: <https://pcsupport.lenovo.com/lenovodiagnosticssolutions/downloads>.

- If the display does not function:

1. Scan the QR code on the diagnostic panel using a smartphone or manually access: <https://www.thinkworkstationsoftware.com/?view=codes>.
2. Record the four-digit error code on the diagnostic panel, then decode the error at the website above.

For more information, go to <https://www.thinkworkstationsoftware.com/?view=diags>.

Lenovo UEFI diagnostic tool

The preloaded Lenovo UEFI diagnostic tool enables you to test and diagnose hardware modules in the computer during system startup.

To use the Lenovo UEFI diagnostic tool:

1. Turn on the computer.
2. When the logo screen is displayed, repeatedly press and release the F10 key.
3. When the home screen of the diagnostic tool appears, select a specific hardware module for targeted testing or select **RUN ALL** for a full test.

Note:

Some tests may require user interaction. Follow the prompts carefully.

Table 2: Options on the home screen of the UEFI diagnostic tool

Category	Items
Tests	• Storage • Memory • CPU • Display • Motherboard • RAID • Optical
Tools	• System Information • Bad Block Recovery • Smart Information

Note:

The options on the home screen might vary, depending on the hardware configuration and the corresponding protocol the BIOS supports.

Prepare a USB flash drive formatted in FAT32. After testing, select **View Log** > **Export Log** and save the log to the USB drive. You can view the log to find possible solutions or send the log to Lenovo for helps.

Advanced diagnostic tools

The advanced diagnostic tools is a suite of downloadable packages that can be run in different operating environments. These tools offer extended tests over various hardware modules. Depending on whether you can boot the Windows OS, select either of the following for diagnostics.

Use the advanced diagnostic tool (Windows version)

1. Go to <https://www.lenovo.com/diags>.
2. Select a Windows package that fits your scenario for download.
3. Double-click the downloaded file and complete the installation.
4. Launch the application and follow the on-screen instructions for diagnostics.

After testing, select **Export Log** to save the diagnostic result. You can view the log to find possible solutions or send the log to Lenovo for helps.

Use the advanced diagnostic tool (bootable versions for Linux/UEFI)

1. Prepare a USB flash drive (more than 2 GB) formatted in FAT32.

Note:

Back up any important data on the USB drive, as it will be erased during the process.

2. Go to <https://support.lenovo.com/solutions/bootableusb>.
3. Follow the instructions to download a diagnostic package that fits your scenario, create the bootable USB drive, and run the diagnostic tool from the USB drive.

Note:

For diagnostic packages, UEFI offers both x64 and ARM versions, while Linux offers only an x64 version.

4. When the home screen of the diagnostic tool appears, select a specific hardware module for targeted testing or select **RUN ALL** for a full test.

Note:

Some tests may require user interaction. Follow the prompts carefully.

After testing, select **View Log** > **Export Log** and save the log to the USB drive. You can view the log to find possible solutions or send the log to Lenovo for helps.

For more information, go to <https://www.lenovo.com/diags>.

Symptom-to-CRU/FRU index

The Symptom-to-CRU/FRU index lists error symptoms and possible causes. The most likely cause is listed first. This index can also be used to help you decide which CRUs/FRUs are likely to need replacing next. If you are unable to correct the problem using this index, go to [Undetermined problems](#) on page 51.

Note:

- The Symptom-to-CRU/FRU index is not specific to any machine type and is applicable to all computers.
- If you have both an error message and an incorrect audio response, diagnose the error message first.
- If you cannot run the diagnostic tests or you get a diagnostic error code when running a test, but did receive a POST error message, diagnose the POST error message first.
- If you did not receive any error message, look for a description of the error symptoms in this index.

POST error codes

Each time you turn on the system, it performs a series of tests that check the operation of the system and some options. This series of tests are called the *Power-On Self-Test*, or *POST*. POST checks the following operations:

- Some basic system-board operations
- Memory operation
- Video operation
- Whether the boot drive is working

If the POST detects a problem, an error code appears on the screen. If more than one error code is displayed, begin the diagnosis with the first error code. Whatever causes the first error code might also cause false error codes.

POST error code	POST error message	Description	Action
0135	• CPU fan failure • System fan failure • Power fan failure • Front fan failure • Rear fan failure • Auxiliary fan failure • ODD fan failure	This error message is displayed when a fan fails and the system might be overheating.	Press F10 to exit.
0162	Setup data integrity check failure	This error indicates the checksum of BIOS Setup data in NVRAM is bad.	In BIOS Setup, the "Save Changes and Exit" operation is needed in order to clear this error.
0164	Memory configuration change has occurred	This error message is displayed when the memory size is changed.	Press F10 to exit.
1762	Storage device configuration change has occurred	This error message is displayed when a hard disk drive change or an optical drive change has been made.	Press F10 to exit.

POST error code	POST error message	Description	Action
8998	Not enough shadow RAM resources for OPTION ROM, not all devices initialized. Suggest to remove some add-on cards, or change to UEFI mode in BIOS setup.	This error message is displayed when the shadow RAM resources for option ROM are insufficient.	If the legacy option ROM is insufficient, remove some add-in cards. For the system that supports UEFI, set UEFI as the first priority.
8999	Not enough PCIe/PCI MMIO resources. Currently only one video card is enabled. Remove some PCIe cards.	This error message is displayed when the PCIe/PCI MMIO (memory mapped input/output) resources are insufficient.	Remove some add-in cards.

Beep symptoms

Beep symptoms are tones or a series of tones separated by pauses (intervals without sound) during POST. The following table describes the beep symptoms.

Beep symptom	Error	CRU/FRU or Action
2 short beeps	Common POST error	See the detailed failure information in POST error codes on page 46.
3 short and 1 long beeps	DRAM memory error	Perform the following actions in order: 1. Make sure that the memory modules are properly seated in the memory slots. 2. Replace the memory modules. 3. Replace the system board.
4 long beeps	Insufficient shadow RAM resources for option ROM (error code: 8998) or PCIe/PCI MMIO (memory mapped input/output) resources (error code: 8999)	See the detailed failure information in POST error codes on page 46.
2 long and 3 short beeps	Graphics card error	Perform the following actions in order: 1. Make sure that the graphics cards are properly seated in the slots. 2. Replace the graphics cards. 3. Replace the system board.

Storage drive boot error

A storage drive boot error can have the following causes.

Possible cause	CRU/FRU or Action
The start-up drive is not in the boot sequence in configuration.	Check the configuration and ensure that the start-up drive is in the boot sequence.
No operating system is installed on the boot drive.	Install an operating system on the boot drive.
The boot sector on the startup drive is corrupted.	The drive must be formatted. Do the following: 1. Attempt to back up the data on the failing storage drive. 2. Using the operating system programs, format the storage drive.
The drive is defective.	Replace the storage drive.

Power supply problems

If you suspect a power problem, use the following procedures.

Check/Verify	CRU/FRU or Action
Check the following for proper installation. • Power cord • On/Off switch connector • On/Off switch power supply connector • System board power supply connectors • CPU connection	Reseat connectors.
Check the power cord for continuity.	Power cord
Check the power-on switch for continuity.	Power-on switch

Miscellaneous error conditions

Message/Symptom	CRU/FRU or Action
Changing display colors	Display/Monitor
The computer will <i>not</i> power-off. See Storage drive boot error on page 47.	1. Power switch 2. System board 3. Riser card, if installed.
The computer will <i>not</i> RPL from server	1. Ensure that the network is in startup sequence as the first device or the first device after diskette. 2. Ensure that the network adapter is enabled for RPL. 3. Network adapter (Advise network administrator of new MAC address)

Message/Symptom	CRU/FRU or Action
The computer will <i>not</i> perform a Wake On LAN® (if applicable)	1. Check the power supply and signal cable connections to the network adapter. 2. Ensure that the operating system settings are set to enable Wake on LAN. 3. Ensure that the Wake On LAN feature is enabled in Setup/Configuration. 4. Ensure that the network administrator is using the correct MAC address. 5. Ensure no interrupt or I/O address conflicts. 6. Network adapter (advise network administrator of new MAC address)
Dead computer. See Storage drive boot error on page 47.	1. Power supply 2. System board
Diskette drive in-use light remains on or does not light when drive is active.	1. Diskette drive 2. System board 3. Diskette drive cable
Blank screen except for flashing cursor.	1. System board 2. Primary hard disk drive 3. Hard disk drive cable
Incorrect memory size during POST	1. Run the memory tests. 2. Memory module 3. System board
"Insert a Diskette" icon appears with a known-good diagnostics diskette in the first 3.5-inch diskette drive.	1. System board 2. Diskette drive cable 3. Network adapter
Intensity or color varies from left to right of characters and color bars	1. Display 2. Video adapter (if present) 3. System board
No power or fan not running	1. See Storage drive boot error on page 47.
Non-system disk or disk error-type message with a known-good diagnostic diskette.	1. Diskette drive 2. System board 3. Diskette drive cable
Other display symptoms not listed above (including blank or illegible display)	1. Display

Message/Symptom	CRU/FRU or Action
	2. System board
Power-on indicator or hard disk drive in-use light not on, but computer works correctly	1. Power switch/LED assembly 2. System board
Printer problems	1. Printer 2. System board
Program loads from the hard disk with a known-good diagnostics diskette in the first 3.5-inch diskette drive	1. Run the Setup Utility program and check the startup sequence. 2. Diskette drive 3. Diskette drive cable 4. System board 5. Power supply
RPL computer cannot access programs from its own hard disk.	1. If the network administrator is using LCCM Hybrid RPL, check the startup sequence: a. First device - network b. Second device - hard disk 2. Hard disk drive
RPL computer does not RPL from server	1. Check the startup sequence. 2. Check the network adapter LED status.
Serial or parallel connector device failure (system board connector)	1. External device self-test OK? 2. External device 3. Cable 4. System board
Serial or parallel connector device failure (adapter connector)	1. External device self-test OK? 2. External device 3. Cable 4. Alternate adapter 5. System board
Some or all keys on the keyboard do not work	1. Keyboard 2. Keyboard cable 3. System board

Undetermined problems

It is recommended that you take the steps below to isolate the failing CRU/FRU (if any) in the following situations:

- The diagnostic procedures above did not identify the device that has failed.
 - The wrong devices are installed.
 - The system simply is not operating.
1. Verify that all attached devices are supported by the computer.
 2. Turn off the computer.
 3. Visually check each CRU/FRU for damage. Replace any damaged CRU/FRU.
 4. Remove or disconnect all of the following devices (if present).
 - a. External devices (modem, printer, or mouse)
 - b. Any adapters
 - c. Memory modules
 - d. Extended video memory
 - e. External Cache
 - f. External Cache RAM
 - g. Solid-state drive
 - h. Hard disk drive
 - i. Diskette drive
 5. Turn on the computer to see whether the problem has been solved.
 6. If the problem does not recur, reconnect the removed devices one at a time until you find the failing FRU/CRU.
 7. If the problem remains, replace the following FRUs one at a time (do not replace a nondefective FRU):
 - a. System board
 - b. Display assembly (if present)

Call Lenovo

If you have tried to correct the problem yourself and still need help, you can call Lenovo Customer Support Center.

Before contacting Lenovo support

Prepare the following information (especially those shown in **bold**) as much as possible before requesting assistance from Lenovo Service Support and Engineering functions.

- **Product name, machine type and model (MTM), and serial number (SN)**
- Failure symptom
 - **What is the problem?**
 - When and where does it happen (e.g., on single or multiple systems)?
 - **Is the problem continuous or intermittent?**
 - **Are there any error messages or codes?**
 - **Can the problem be reproduced? If yes, describe how.**
 - Has the current configuration ever worked before?
 - If it was working, what changed before the failure occurred?
 - Is this the original reported issue, or has it evolved?

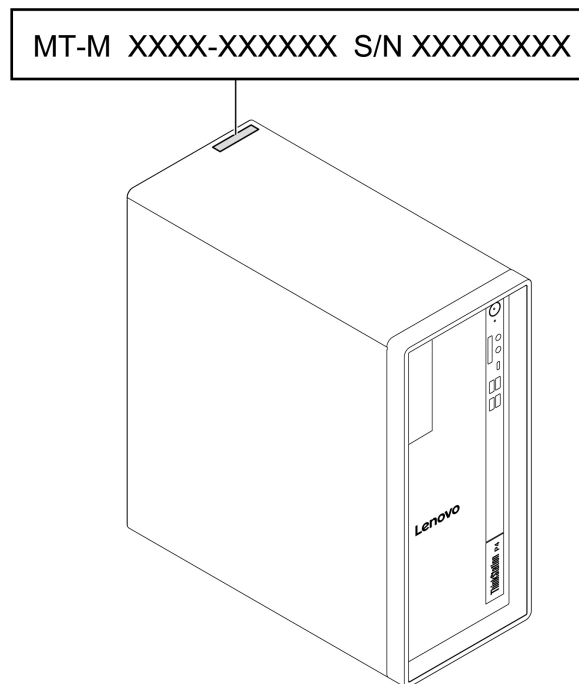
- Software information
 - **Operating system type and version**
 - **Software applications running at the time of failure (name and version)**
- Hardware information
 - BIOS version
 - Processor or hard disk drive upgrades information
 - Hardware configuration currently in use
- Diagnostics information
 - Did diagnostics indicate a failure?
 - What is the diagnostics type and version used?

Find your serial number

This topic helps you find the computer serial number.

You can find your serial number via:

- **Dashboard** or **Device** in the **Vantage** app
- Machine-type and serial-number label of your computer (shown as below illustration)



Lenovo Customer Support Center

Telephone numbers

During the warranty period, you can call Lenovo Customer Support Center for help.

For a list of the Lenovo Support phone numbers for your country or region, go to:

<https://pcsupport.lenovo.com/supportphonenumberlist>

 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.

Chapter 5 Hardware replacement

Before hardware replacement

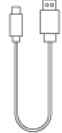
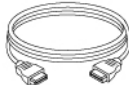
Carefully read this section before replacing or installing any hardware component.

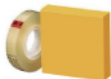
Service tools

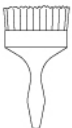
The following table lists all tools for servicing Lenovo products. Tools required to service a part are listed in the specific part disassembly topic. Prepare them before you service the product.

Table 3: Service tools

No.	Reference image	Tool name	Specification	Tool type
1		Screwdriver set	• PH0, PH00, PH1, PH01, PH02 • T5, T15, T20, T30 • SL3.0 (for ThinkEdge) Note: Use a screwdriver with the shank length more than 6 inches for desktop, workstation, smart device, and ThinkEdge products.	Common tool
2		Pry tool	N/A	Common tool
3		Tweezers	• Conductive • Isolated	Common tool
4		Suction cup	N/A	Common tool

No.	Reference image	Tool name	Specification	Tool type
5		Hexagonal socket	- For VGA: H5 mm or H4.8 mm - For Tiny antenna: H8 mm - For ThinkEdge: H10 mm	Common tool
6		Adjustable torque screwdriver	0.2 Nm to 4.0 Nm, Threadripper CPU, CAMM, etc.	Common tool
7		ESD mat	N/A	Common tool
8		USB flash drive	For Golden Key, Chrome Reloads, AutoPilot, etc	Common tool
9		USB-C to USB-A converter	N/A	Common tool
10		HDMI to HDMI cable	For systems with HDMI connector	Common tool
11		SIM card pin	For systems with 4G/5G WWAN SIM card	Common tool
12		Thermal pad	Thermal pads are typically used under the SSD/WWAN/IC in different thickness, the most common being 0.5 mm.	Consumable tool
13		Thermal interface materials	- Silicon grease - Recommended thermal conductivity > 6W/mK, such as	Consumable tool

No.	Reference image	Tool name	Specification	Tool type
			TC5888/TC5550/PTM7950/ PTM7958. Thermal gel/putty/gum Recommended type: XPG-0001/TC7006 Follow HMM-specific guidance.	
14		Acetate tape	N/A	Consumable tool
15		Polyimide tape	N/A	Consumable tool
16		Mylar tape	N/A	Consumable tool
17		Electrical tape	N/A	Consumable tool
18		Double-sided tape	N/A	Consumable tool
19		Conductive tape	N/A	Consumable tool
20		Eraser	N/A	Consumable tool

No.	Reference image	Tool name	Specification	Tool type
21		Cleaning wipes	N/A	Consumable tool
22		Touchpad jig (this might come with touchpad)	N/A	Consumable tool
23		Heat gun	N/A	Special tool
24		Brown brush	25 mm to 35 mm wide	Special tool
25		Contact cleaner spray	WD-40 Contact cleaner for battery connector	Special tool
26		Hexagonal socket	For Yoga AIO 7 27ACH6/Yoga AIO 7 27ARH6: H17 mm	Special tool

CRU/FRU definition

Your computer contains the following types of “Customer Replaceable Unit” (CRU)s and “Field Replaceable Unit” (FRU)s:

- **Self-service CRUs:** Refer to parts that can be replaced easily by customers themselves or by trained service technicians at an additional cost.
- **Optional-service CRUs:** Refer to parts that can be replaced by customers with a greater skill level. Trained service technicians can also provide service to replace the parts under the type of warranty designated for the customer's product.
- **FRUs:** Refer to parts that are more complicated to replace and it is recommended that these parts should be replaced by trained service technicians. If customers elect to replace the FRU by themselves, we recommend that you ensure the correct instructions are carefully followed.

Important notes:

- **CRU/FRU statement:**
 - Each CRU/FRU is available for all types or models, unless otherwise specified.

- **Replace a CRU/FRU only with another CRU/FRU of the correct model.** When you replace a CRU/FRU, ensure that the model of the product and the CRU/FRU part number are correct.
- **A CRU/FRU should not be replaced because of a single unreproducible failure.** Single failures can occur for a variety of reasons that have nothing to do with a hardware defect, such as cosmic radiation, ESD, or software errors. Consider replacing a CRU/FRU only when a problem recurs. If you suspect that a CRU/FRU is defective, clear the error log and run the test again. If the error does not recur, do not replace the CRU/FRU.
- **Be careful not to replace a nondefective CRU/FRU.**
- When you need to return a CRU/FRU after servicing a computer, include the following information in the parts exchange form or parts return form that you attach to it:
 1. Name and phone number of service technician
 2. Date of service
 3. Date on which the machine failed
 4. Date of purchase
 5. Failure symptoms, error codes appearing on the display, and beep symptoms
 6. Procedure index and page number in which the failing CRU/FRU was detected
 7. Failing CRU/FRU name and part number
 8. Machine type, model number, and serial number
 9. Customer's name and address
- **CRU/FRU replacement strategy:**

Use the following strategy to prevent unnecessary expense for replacing and servicing parts:

 - If you are instructed to replace a part but the replacement does not correct the problem, reinstall the original part before you continue.
 - Some computers have both a processor board and a system board. If you are instructed to replace either the processor board or the system board, and replacing one of them does not correct the problem, reinstall that board, and then replace the other one.
 - If an adapter or a device consists of more than one part, any of the parts may be the cause of the error. Before replacing the adapter or device, remove the parts one by one to see if the symptoms change. Replace only the part that changed the symptoms.
- **CRU statement for customers:**
 - You can resolve some problems with your product by replacing a CRU. *For self-service CRUs, installation is your responsibility. For optional-service CRUs, you can either install the CRU yourself or you can request that a Service Provider install the CRU according to the warranty service for your product.*

❗ Important:

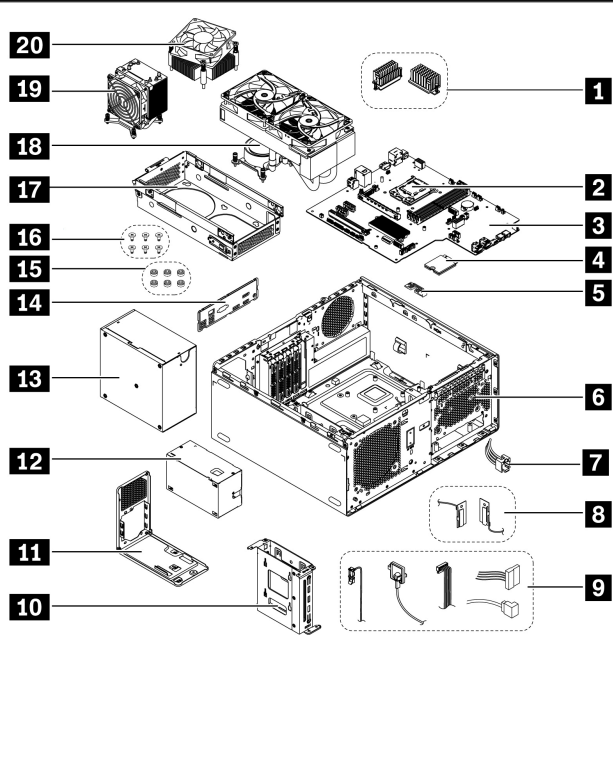
For users in mainland China, users shall not perform maintenance on their own. Any faults or damage due to improper operation, modification, or failure to use parts provided by Lenovo are not covered by the warranty for this product. For product warranty information, refer to the warranty document provided with the product or go to the official Lenovo website at <https://newsupport.lenovo.com.cn>.

- If you intend on installing the CRU, Lenovo will ship the CRU to you. CRU information and replacement instructions are shipped with your product and are available from Lenovo at any time upon request.
- When you are required to return the defective CRU, (1) return instructions, a prepaid shipping label, and a container will be included with the replacement CRU; and (2) you might be charged for the replacement CRU if Lenovo does not receive the defective CRU within thirty (30) days of your receipt of the replacement CRU. See your Lenovo Limited Warranty documentation for full details.

CRU list

Exploded view	Part list
	Self-service CRUs: 1 Left side cover 2 Cover presence switch* 3 Chassis beam 4 Side fan with bracket* 5 Front fan 6 HDD tray 7 3.5-inch HDD* 8 Front-access HDD cage* 9 Front-access-HDD-cage bezel* 10 Slim-ODD bezel, cage, and front cover assembly* 11 Slim-ODD latch* 12 Slim ODD* 13 Flex-bay dummy bezel* 14 Front bezel 18 Keyboard* 19 Mouse* 20 Power cord 29 Memory module 32 M.2 SSD* 33 Thermal pad for on-board M.2 SSD slot 2* 34 On-board M.2 SSD heat sink kit* 35 3rd HDD cage* 36 Rear fan* 37 PCIe card bracket* 40 Smart cable clip* 41 Wi-Fi antenna cover 42 Chassis rubber feet
	Optional-service CRUs: 15 Internal speaker 16 SD card reader* 17 Front I/O bracket 21 Graphics card, extender, and holder* 22 23 24 Graphics card and extender* 25 Extender for certain graphics card* 26 E-lock* 27 Retainer for certain graphics card* 28 Cable holder for certain graphics card* 30 Flexible I/O port card with bracket* 31 On-board M.2 SSD holder* 38 Fiber modules of Ethernet PCIe adapter card* 39 PCIe adapter card*

FRU list

Exploded view	Part list
	FRUs: 1 VRM heatsink* 2 CPU 3 Systemboard and coin-cell battery assembly 4 Wi-Fi card* 5 Wi-Fi card cover* 6 Chassis 7 Power button and power indicator 8 Wi-Fi antenna 9 Cables* 10 2nd or 4th HDD cage* 11 Bracket for 500 W power supply assembly* 12 500 W power supply assembly* 13 750 W or 1100 W power supply assembly* 14 Rear I/O shielding 15 Liquid cooler rubbers* 16 Liquid cooler screws* 17 Liquid cooler bracket* 18 CPU liquid cooler* 19 120 W CPU air cooler 20 65 W CPU air cooler

* for selected models

Look up a part

1. For more detailed CRU/FRU information, including part numbers, descriptions, and substitution part numbers, go to <https://support.lenovo.com/partslookup>.
2. Type the product name, the machine type or the serial number in the corresponding field to get a general CRU/FRU list.

Prerequisites for hardware replacement

General prerequisites

Read [Generic Safety and Compliance Notices](#).

Prerequisites for opening left side cover of the computer

•



During operation, some components become hot enough to burn the skin. Before you open the computer cover, remove any media from the drives, turn off the computer and connected devices, disconnect power, remove all cables and locking devices, and wait approximately 10 minutes until the computer is cool.

- Unlock any locking device that secures the computer.
- Lay down the computer to place the left side cover facing up.

- Before reaching parts with cables, record the cable routing for future reference and then disconnect its cable from the system board.

Prerequisites for replacing storage drives



Attention:

The internal storage drives are sensitive. Inappropriate handling might cause damage and loss of data. When handling the internal storage drives observe the following guidelines:

- Replace the internal storage drives only for repair. The internal storage drive is not designed for frequent changes or replacement.
- Before replacing the internal storage drives, make backup copy of all the data that you want to keep and safely eject the old storage drives from the operating system. For more information, see the operating system help system.
- Do not touch the contact edge of the internal storage drives. Otherwise, the internal storage drives might get damaged.
- Do not apply pressure to the internal storage drives.
- Do not make the internal storage drives subject to physical shocks or vibration. Put the internal storage drives on soft material, such as a cloth, to absorb physical shocks.

Prerequisites for replacing hot-swappable HDD in the front-access HDD cage

The HDD in the front-access HDD cage can be hot-swappable when certain requirements are met. It means that you can open the front-access HDD cage bezel to install or replace the HDD inside without even turning off your computer. Therefore, lock the cage to prevent any unexpected removal or data loss. The keys are attached at the rear panel of the computer. Store the keys in a secure place.



Attention:

The HDD in the front-access HDD cage is hot-swappable only when the following requirements are met. If any of the requirements are not met, do not install or replace the HDD when the computer is turned on. Otherwise, data on the HDD might get damaged.

- The eSATA mode of the SATA header 4 is enabled in BIOS by doing the following:
 1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
 2. Select **Devices > Storage Setup > SATA Drive 4 Hot-Plug Support** and press Enter.
 3. Select **Enabled** and press Enter.
 4. Press F10 or Fn+F10 to save the changes and exit.
- The SATA cable of the front-access HDD cage is connected to the SATA header 4 on the system board.
- The operating system of your computer does not reside on the HDD in the front-access HDD cage.

Prerequisites for replacing power supply assembly

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

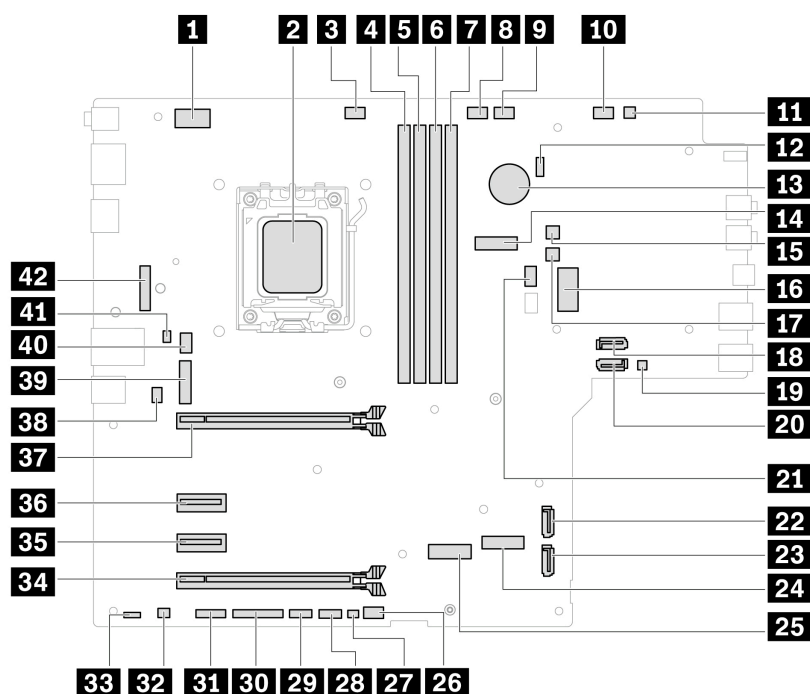


Keep fingers and other parts of your body away from hazardous, moving parts. If you suffer an injury, seek medical care immediately. Never remove the cover on a power supply or any part that has the following label attached.



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.

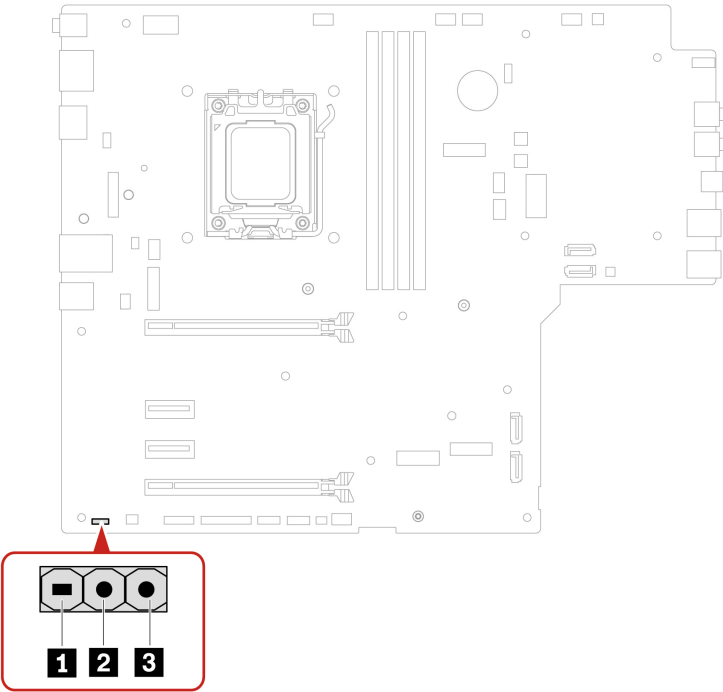
System board illustration



Item	Item
1 8-pin microprocessor power connector	2 CPU socket
3 CPU fan or pump of liquid cooler header	4 Memory slot (DIMM1)
5 Memory slot (DIMM2)	6 Memory slot (DIMM3)
7 Memory slot (DIMM4)	8 Auxiliary fan header 1 (Liquid cooler fan)
9 Auxiliary fan header 2 (Liquid cooler fan)	10 Auxiliary fan header 5 (Front top fan)
11 Internal speaker header	12 Power button and power indicator header
13 Coin-cell battery	14 M.2 SSD slot 3 (Gen 4)
15 SATA power header 2	16 10-pin system board power connector
17 SATA power header 1	18 SATA header 4
19 ThinkStation LED header	20 SATA header 3
21 Auxiliary fan header 4 (Side fan)	22 SATA header 1
23 SATA header 2	24 M.2 SSD slot 1 (Gen 5)
25 Wi-Fi card slot	26 Auxiliary fan header 6 (Front bottom fan)
27 Thermal sensor header	28 Front USB header 2

Item	Item
29 Front USB header 1 (Card reader connector)	30 Line printer terminal (LPT) header
31 Serial (COM) header	32 Thunderbolt header 1
33 Clear CMOS (Complementary Metal Oxide Semiconductor)/Recovery jumper	34 PCIe x4 Gen 4 slot (physical link width x16 and negotiable link width x4)
35 PCIe x1 slot (open ended)	36 PCIe x1 slot (open ended)
37 PCIe x16 Gen 5 slot	38 E-lock header
39 M.2 SSD slot 2 (Gen 5)	40 System fan header (Rear fan)
41 Cover presence switch header	42 Flexible I/O port card header

Clear CMOS position



Item	Description	Item	Description
1 and 2	Standard position	2 and 3	Clear CMOS position

Handling thermal interface materials

Thermal interface materials (TIMs) are applied at key thermal interfaces, such as between the processor and the heat sink or between the system board bottom and a structural cover, to eliminate air gaps and maximize thermal conductivity. Proper handling of TIMs is essential during servicing procedures like heat sink or processor replacement.

Before installing a part involving a TIM:

- 1. Remove all residual TIMs from both contact surfaces.
- 2. Apply new TIMs following the specifications below.



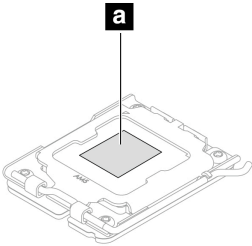
Note:

Some replacement parts may have factory-applied TIMs. If present, check if the TIMs are intact and free of defects. If damaged or dried, clean and apply fresh TIMs per specifications below.

TIM specifications

The table below outlines the recommended TIM type, quantity, and application area.

Type	Quantity	Area
- For CPU liquid cooler: TC5888 - For CPU air cooler: TC5622	0.6 grams (26 mm × 26 mm × 0.2 mm)	a



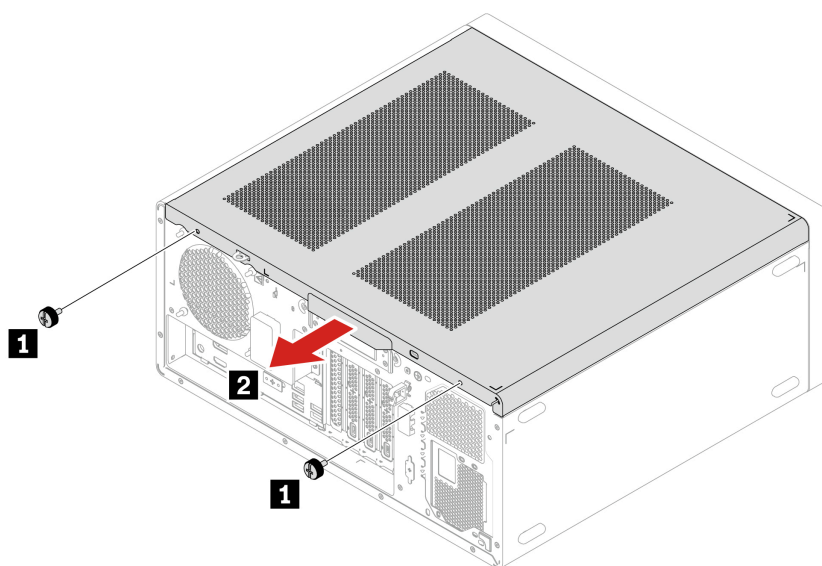
Left side cover

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

Remove the left side cover.



Step	Screw	Quantity	Torque
1	#6-32 × 7.5 mm (0.3 inches), Nickel coated	2	3 ± 0.5 in-lb (3.46 ± 0.58 kgf-cm)

Installation notice

If a locking device is available, use it to lock the computer after installing the left side cover.

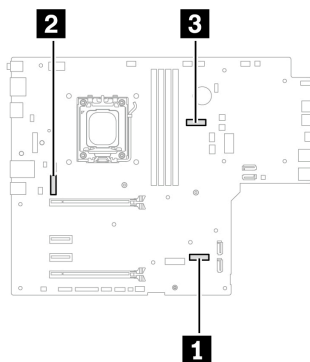
Storage

This section provides the replacement procedures and rules for storage devices and their supporting components, including M.2 SSD, HDD, slim ODD, storage drive cages, and the SD card reader.

On-board M.2 SSD, heat sink kit, thermal pad, and holder

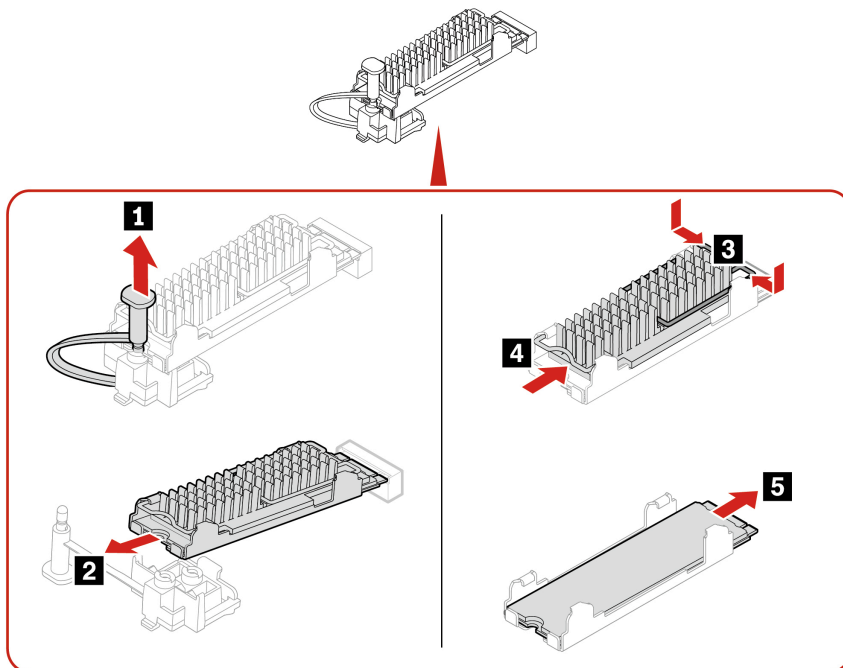
Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

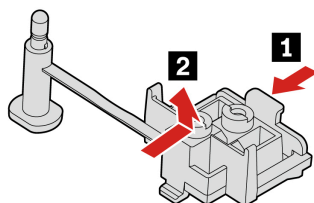


Removal steps of the M.2 SSD, heat sink kit, and holder of slot **1**

1. Remove the [Left side cover](#) on page 65.
2. Remove the M.2 SSD and heat sink kit

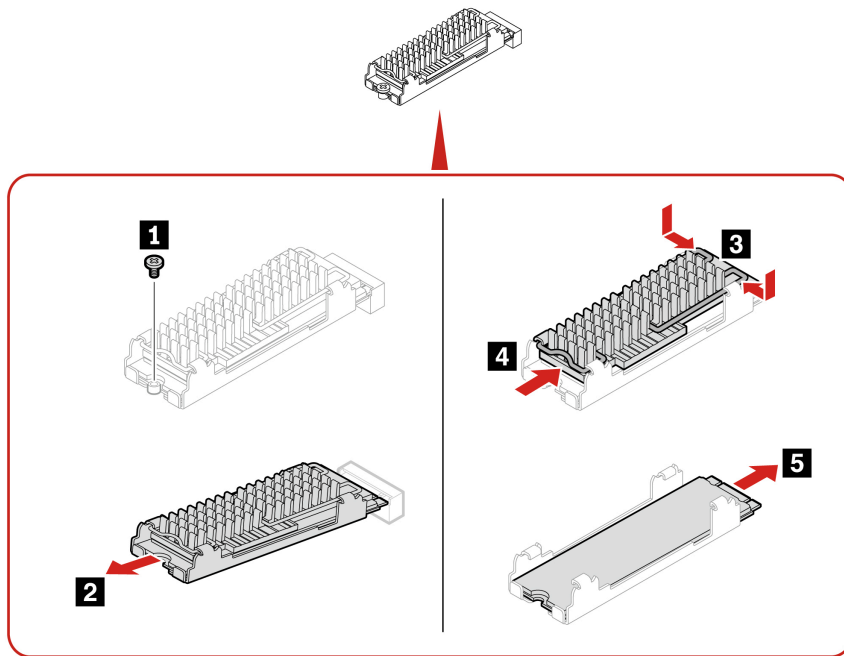


3. Remove the M.2 SSD holder.



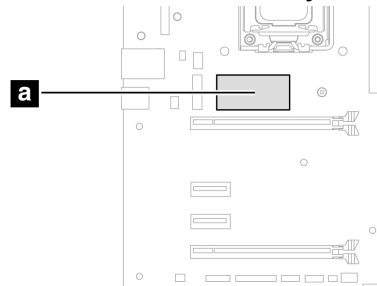
Removal steps of the on-board M.2 SSD, heat sink kit, and thermal pad of slot **2** or slot **3**

1. Remove the following parts, if any:
 - [Left side cover](#) on page 65
 - [Slim ODD and slim-ODD latch](#) on page 78
 - [3.5-inch HDD](#) on page 68
 - [HDD and slim-ODD cages](#) on page 72
 - [Side fan with bracket](#) on page 80
 - [PCIe card](#) on page 84
 - [Chassis beam](#) on page 93
2. Remove the on-board M.2 SSD and heat sink kit.



Step	Screw	Quantity	Torque
1	M2 × 4 mm (0.16 inches), Nickel coated	1	1.5 ± 0.5 in-lb (1.73 ± 0.58 kgf-cm)

3. For slot **2**, another thermal pad (**a**) may be attached to the system board beneath the heat sink. After removing the on-board M.2 SSD and heat sink kit, you can gently peel off the thermal pad.



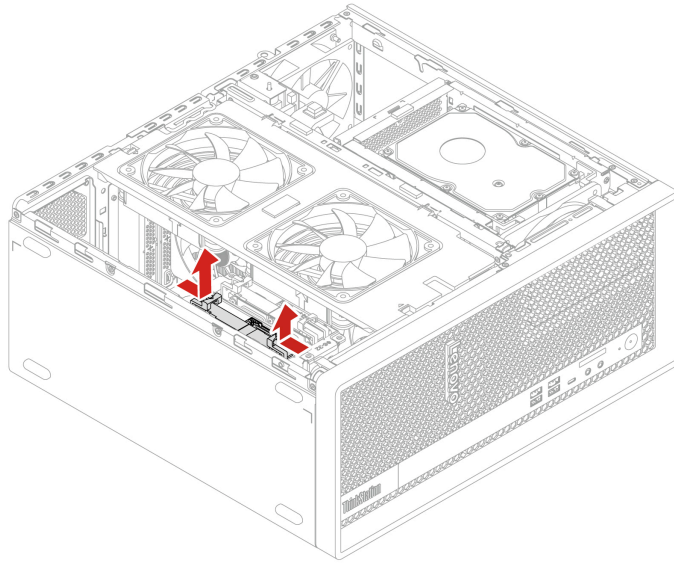
3.5-inch HDD

Prerequisite

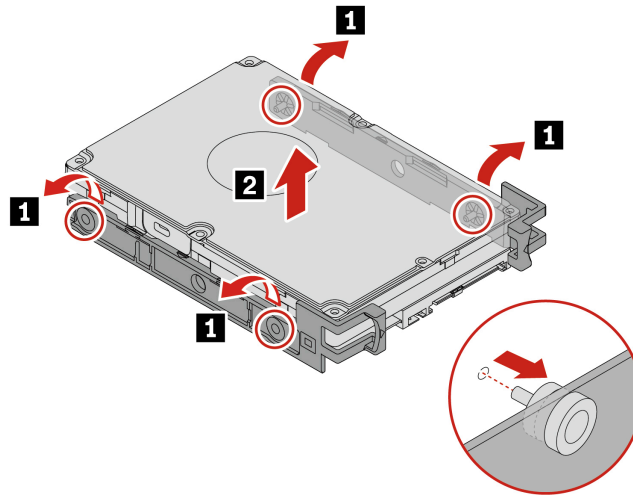
Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps of 3.5-inch HDD in the 1st, 2nd, or 4th HDD cage

1. Remove the [Left side cover](#) on page 65.
2. Remove the 3.5-inch HDD with tray from the HDD cage.



3. Remove the 3.5-inch HDD from the tray.



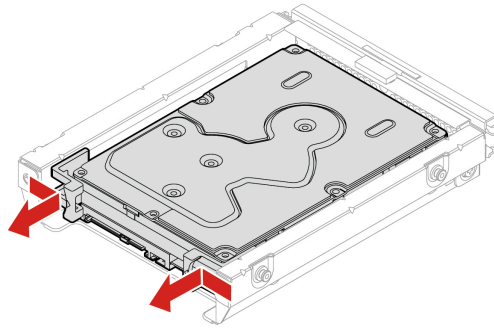
Removal steps of 3.5-inch HDD in the 3rd HDD cage

1. Remove the following parts:

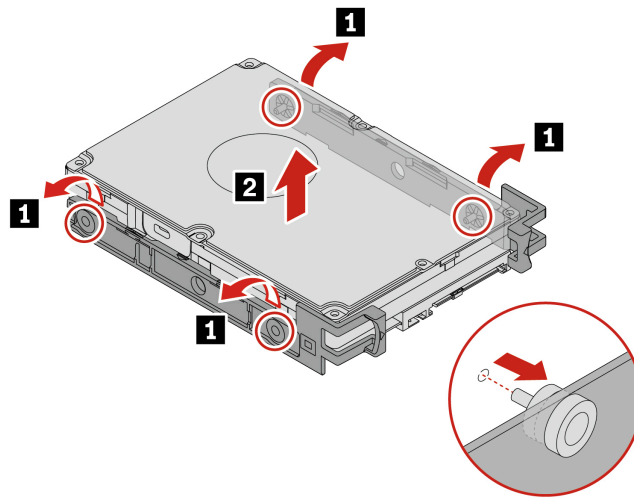
a. [Left side cover](#) on page 65

b. [3rd HDD cage](#) on page 74

2. Remove the 3.5-inch HDD with tray from the 3rd HDD cage.

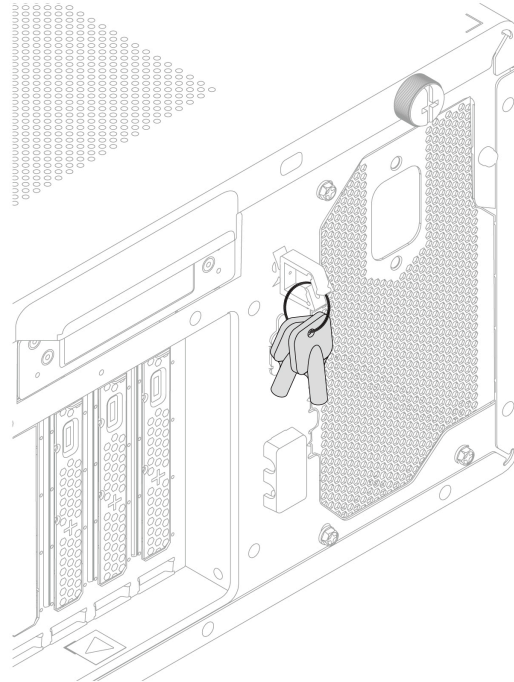


3. Remove the 3.5-inch HDD from the tray.

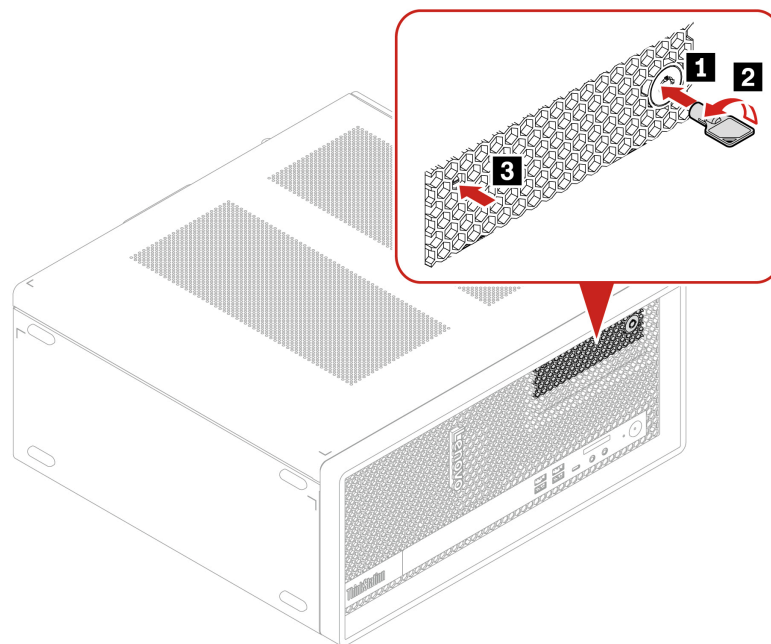


Removal steps of 3.5-inch HDD in the front-access HDD cage

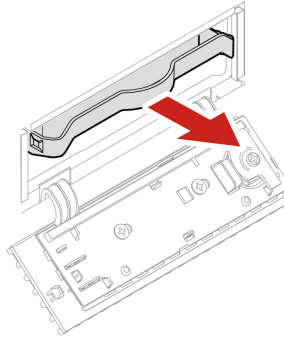
1. Find the key attached at the rear panel of the computer.



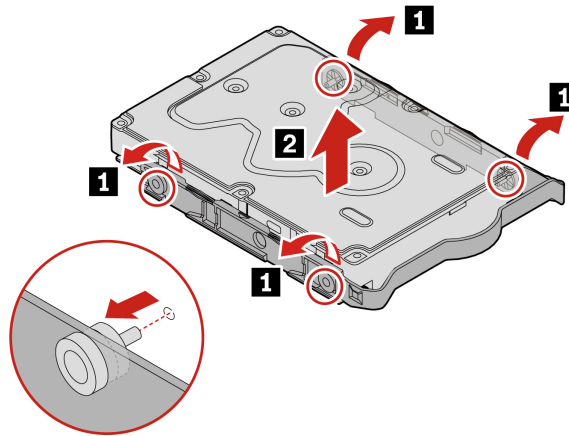
2. Open the front-access-HDD-cage bezel with the key.



3. Pull out the 3.5-inch HDD with tray.



4. Remove the 3.5-inch HDD from the tray.



HDD and slim-ODD cages

By reading this section, you will learn to replace HDD and slim-ODD cages.

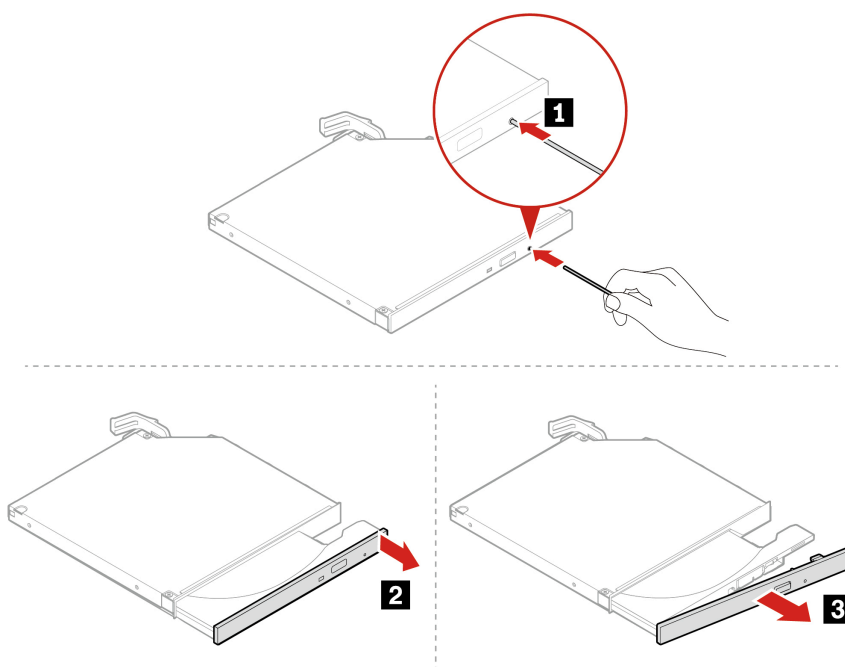
Slim-ODD bezel, cage, and front cover assembly

Prerequisite

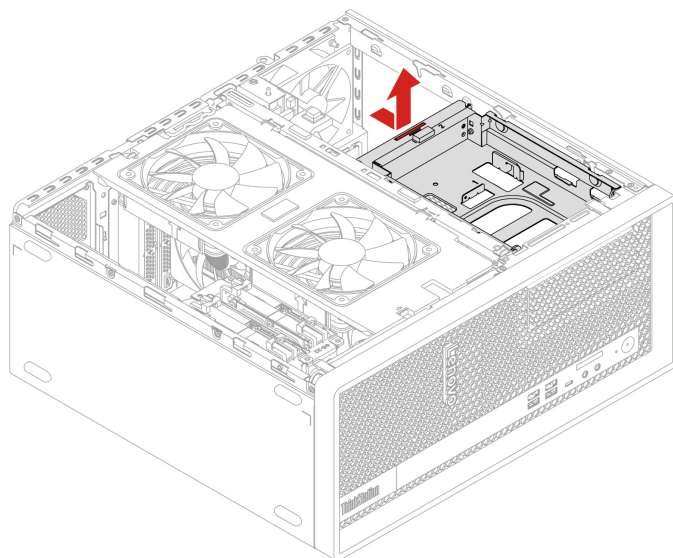
Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts:
 - a. [Left side cover](#) on page 65
 - b. [Slim ODD and slim-ODD latch](#) on page 78
2. Remove the slim-ODD bezel.

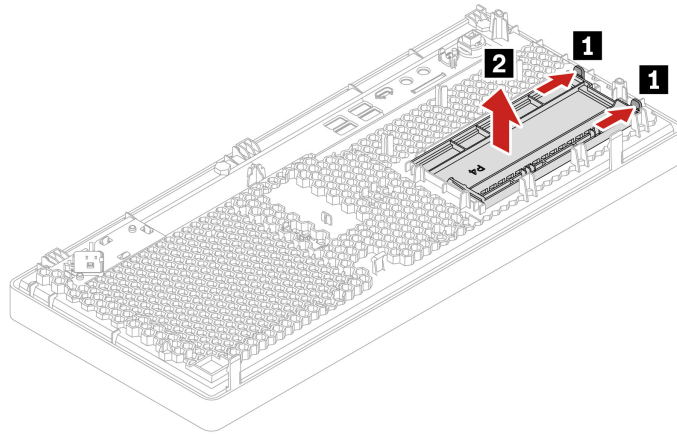


3. Remove the slim-ODD cage.



4. Remove the [Front bezel](#) on page 82.

5. Remove the slim-ODD front cover.



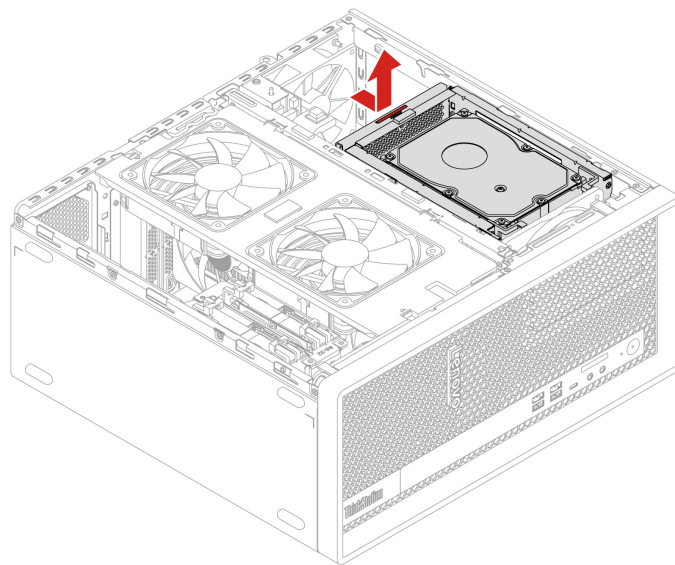
3rd HDD cage

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - [Left side cover](#) on page 65
 - [3.5-inch HDD](#) on page 68
2. Remove the 3rd HDD cage.



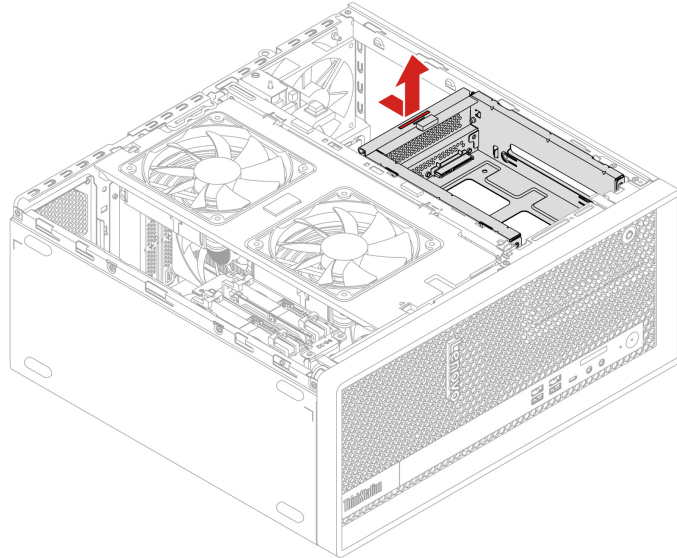
Front-access HDD cage

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - [Left side cover](#) on page 65
 - [3.5-inch HDD](#) on page 68
2. Remove the front-access HDD cage.



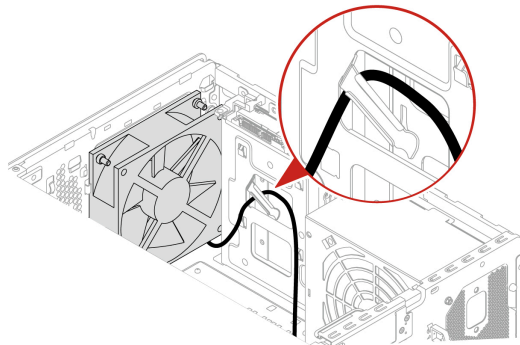
2nd or 4th HDD cage

Prerequisite

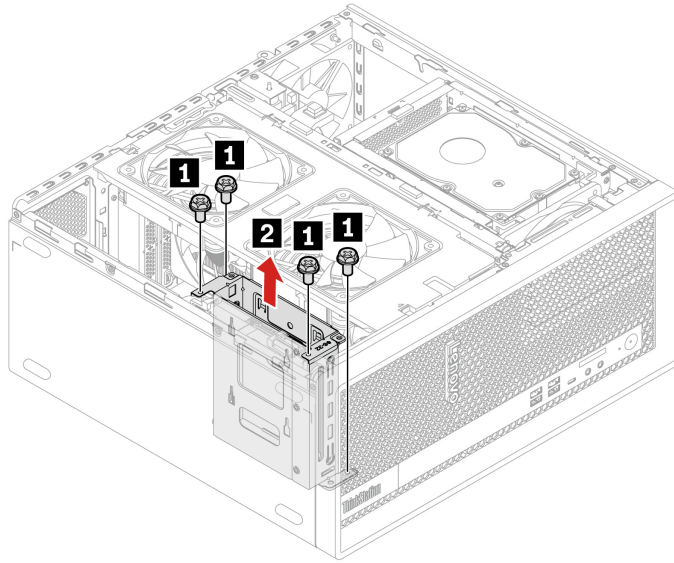
Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Side fan with bracket](#) on page 80
 - c. [3.5-inch HDD](#) on page 68
2. Remove the cable of front bottom fan from the hook on the HDD cage.

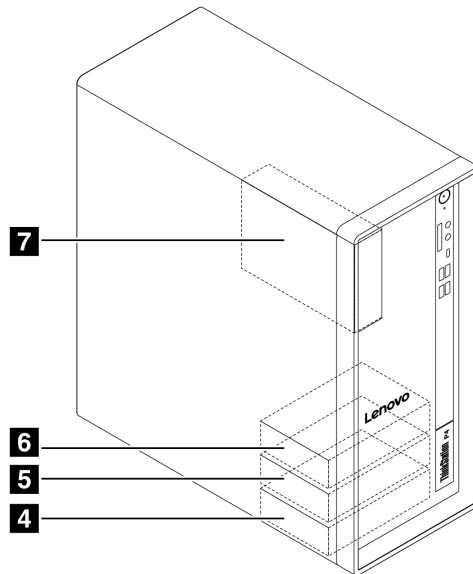


3. Remove the HDD cage.



Step	Screw	Quantity	Torque
1	#6-32 × 5 mm (0.2 inches), Nickel 4 coated		5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

Storage installation rule



Follow these overall rules to install any storage cage:

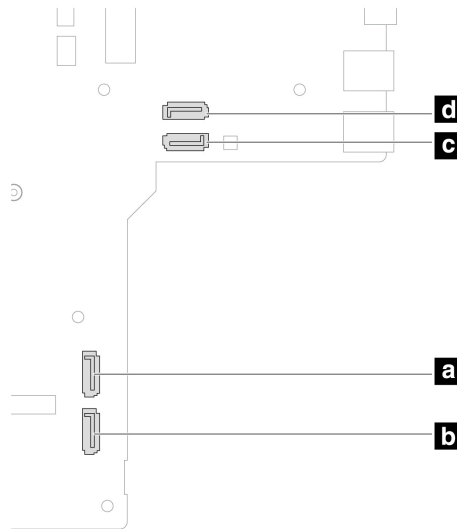
- Bay **4**: 1st HDD cage
- Bay **5**: 2nd HDD cage
- Bay **6**: 4th HDD cage (only when the power supply is 500-watt and the M.2 SSD slot **1** is empty)
- Bay **7**: 3rd HDD cage, front-access HDD cage, or slim-ODD cage
 - The bay **7** has to be empty when there is a liquid cooler.
 - Only the 3rd HDD cage can be installed in the bay **7** when there is a front top fan.

- Only the slim-ODD cage can be installed in the bay 7 when there is an NVIDIA RTX PRO 6000 Blackwell Workstation Edition graphics card.

Based on the quantity, install the HDDs in HDD cages as below:

HDD Quantity	Where to install
One	1st HDD cage or front-access HDD cage
Two	- Option 1: 1st and 2nd HDD cage - Option 2: 1st and front-access HDD cage - Option 3: 1st and 3rd HDD cage
Three	- Option 1: 1st, 2nd, and 3rd HDD cage - Option 2: 1st, 2nd, and front-access HDD cage - Option 3 (only when there is a slim-ODD cage): 1st, 2nd, and 4th HDD cage
Four	- Option 1: 1st, 2nd, 4th, and front-access HDD cage - Option 2: 1st, 2nd, 3rd, and 4th HDD cage

SATA header assignments for each HDD cage are as follows:



HDD cage	SATA header assignment
1st HDD cage	a
2nd HDD cage	b
3rd HDD cage	c
Front-access HDD cage	d

HDD cage	SATA header assignment
4th HDD cage	- When there is a front-access HDD cage: c - Otherwise: d

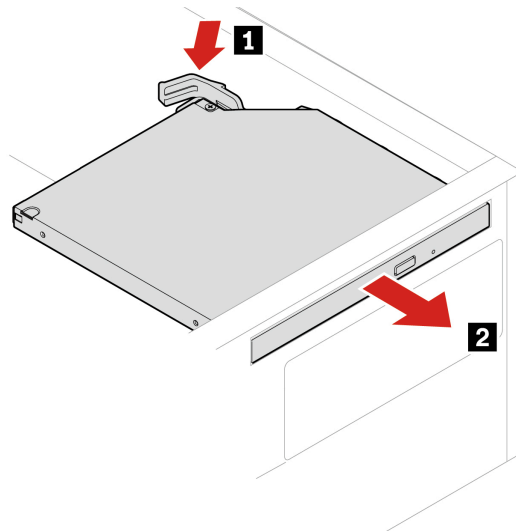
Slim ODD and slim-ODD latch

Prerequisite

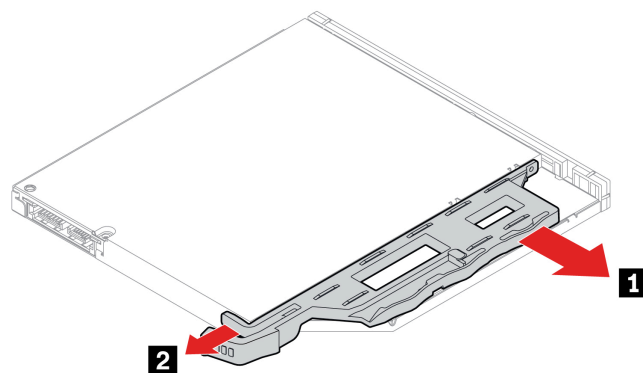
Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the [Left side cover](#) on page 65.
2. Remove the slim ODD.



3. Remove the slim-ODD latch.



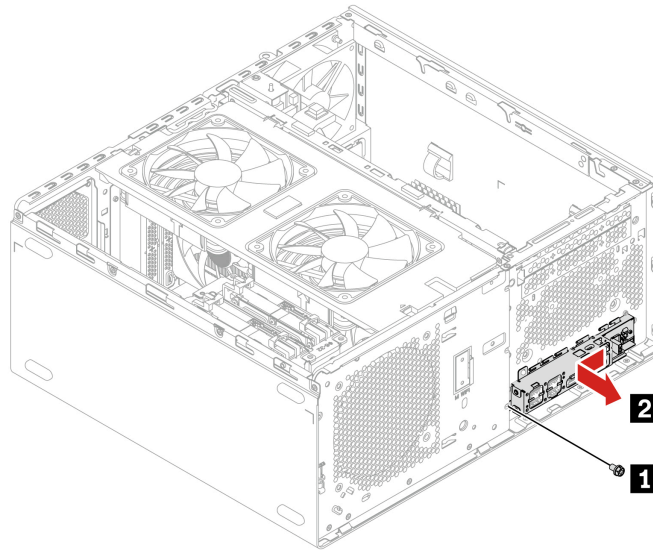
Front I/O bracket and SD card reader

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

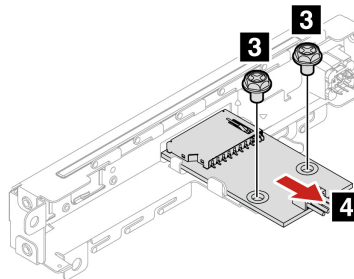
Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Slim ODD and slim-ODD latch](#) on page 78
 - c. [3.5-inch HDD](#) on page 68
 - d. [HDD and slim-ODD cages](#) on page 72
2. Remove the front I/O bracket.



Step	Screw	Quantity	Torque
1	#6-32 × 5 mm (0.2 inches), Nickel coated	1	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

3. Remove the SD card reader.



Step	Screw	Quantity	Torque
3	M3 × 5 mm (0.2 inches), Zn coated	2	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

Fans

By reading this section, you will learn to replace the fans in your computer.

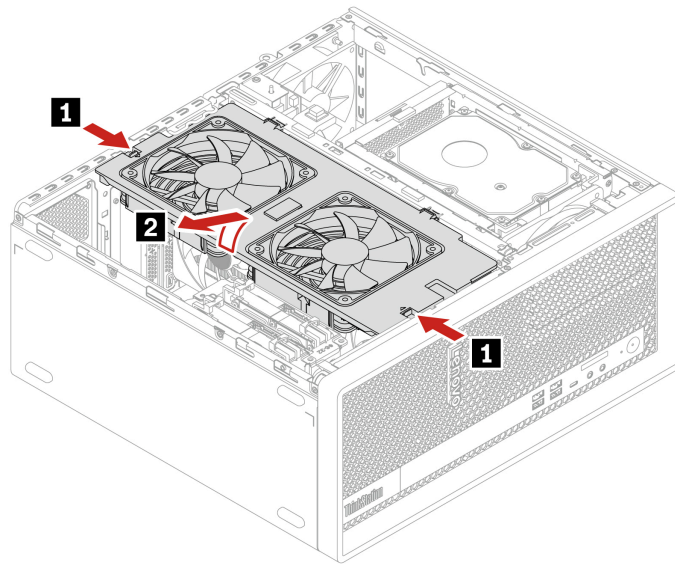
Side fan with bracket

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the [Left side cover](#) on page 65.
2. Remove the side fan with bracket (for selected models).



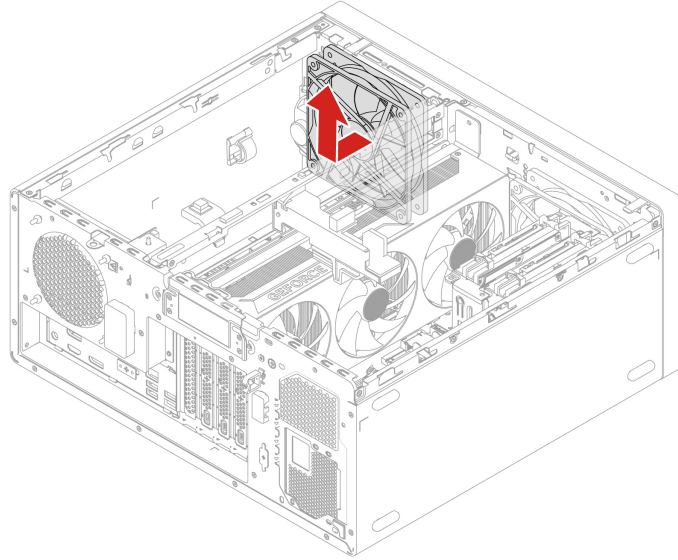
Front top fan

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts:
 - a. [Left side cover](#) on page 65
 - b. [Slim ODD and slim-ODD latch](#) on page 78
 - c. [3.5-inch HDD](#) on page 68
 - d. [HDD and slim-ODD cages](#) on page 72
 - e. [Side fan with bracket](#) on page 80
2. Pull to remove the front top fan.



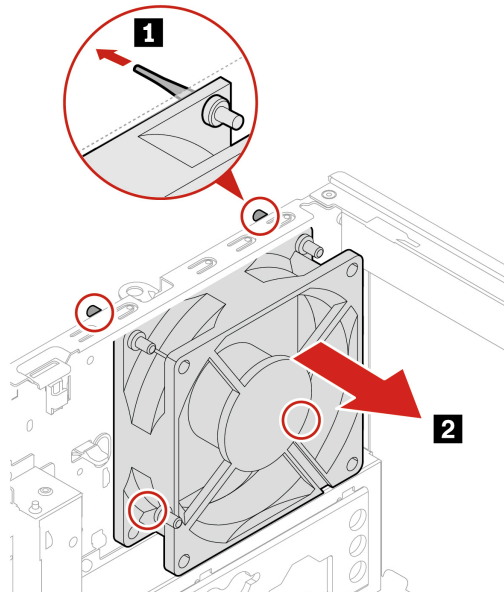
Rear fan

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

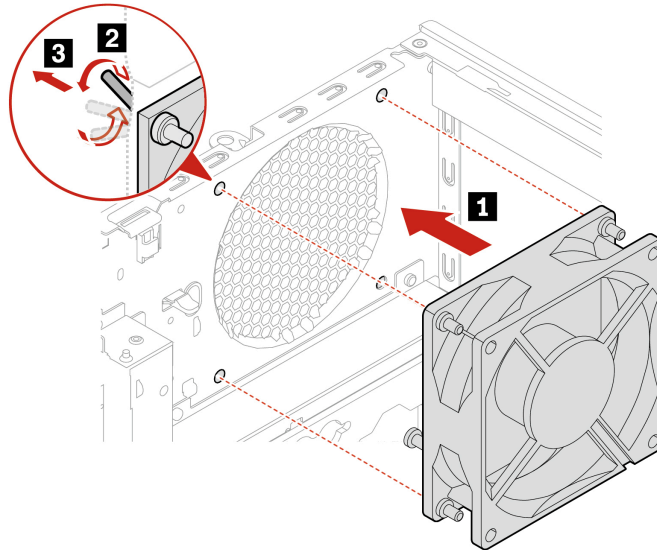
Removal steps

1. Remove the [Left side cover](#) on page 65.
2. The rear fan is attached to the chassis by four rubber mounts. Stretch the tips of the rubber mounts and gently pull the rear fan assembly out of the chassis.



Installation steps

Align the rubber mounts with the corresponding holes in the chassis and push the rubber mounts through the holes. Rotate and pull the tips of the rubber mounts until the rear fan assembly is secured.



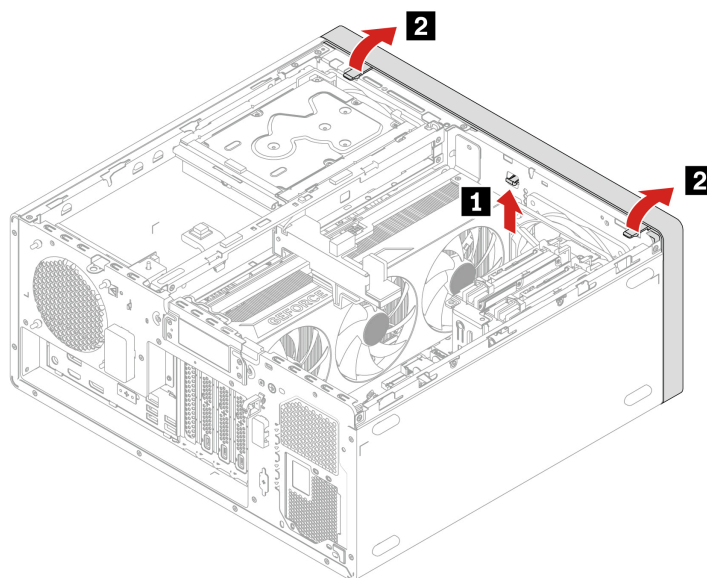
Front bezel

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Slim ODD and slim-ODD latch](#) on page 78
 - c. [Slim-ODD bezel, cage, and front cover assembly](#) on page 72
 - d. [Side fan with bracket](#) on page 80
2. Press the hook and remove the front bezel.



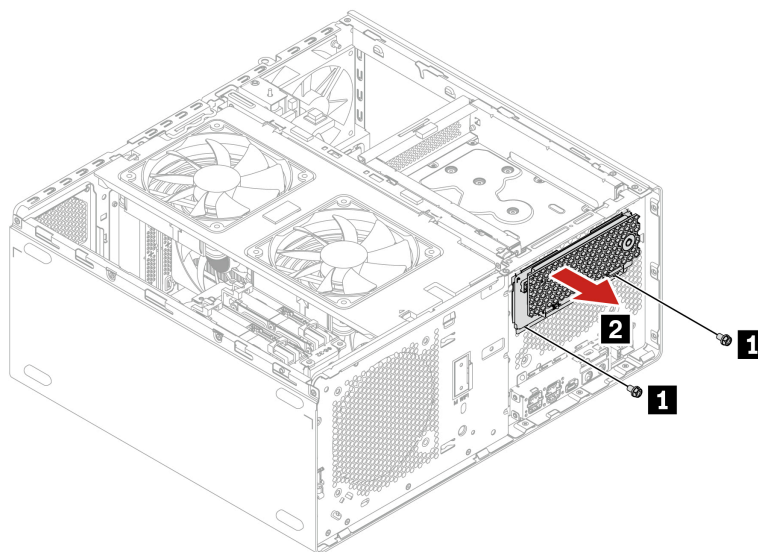
Front-access-HDD-cage bezel

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts:
 - a. [Left side cover](#) on page 65
 - b. [Side fan with bracket](#) on page 80
 - c. [Front bezel](#) on page 82
2. Remove the front-access-HDD-cage bezel.



Step	Screw	Quantity	Torque
1	#6-32 × 5 mm (0.2 inches), Nickle coated	2	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

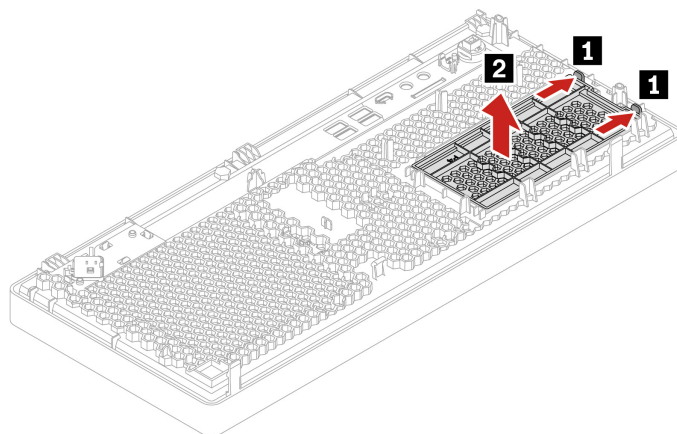
Flex-bay dummy bezel

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts:
 - a. [Left side cover](#) on page 65
 - b. [Side fan with bracket](#) on page 80
 - c. [Front bezel](#) on page 82
2. Remove the flex-bay dummy bezel.



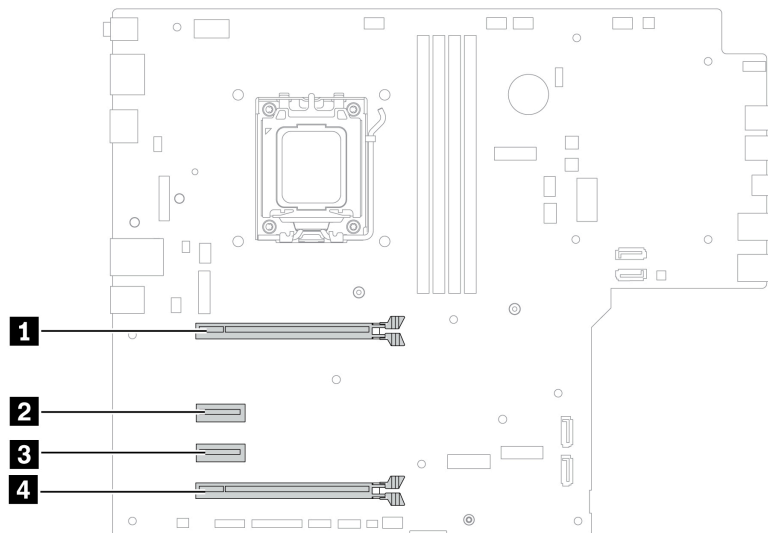
PCIe card

By reading this section, you will learn to replace PCIe cards in your computer, including graphics cards and other kinds of PCIe adapter cards.

i Note:

The illustrations in this section highlight the replacement steps. The PCIe cards and related parts may look different from how they appear in your computer.

PCIe card replacement rule



- If there is only one graphics card, install it in the slot **1**.
- When there are two graphics cards,
 - the two graphics cards should be the same.
 - install the graphics cards in the slot **1** first and then in the slot **4**.
 - remove the graphics cards from the slot **4** first and then from the slot **1**.
- Install the following PCIe cards in the slot **4**, if any:
 - USB-C connector (USB4 40Gbps) PCIe card
 - USB-C connector (USB 20Gbps) PCIe card
 - Intel® Ethernet Network Adapter I350-T4
 - Intel Ethernet Network Adapter E810
 - Intel Ethernet Network Adapter E610-XT2
- An NVIDIA RTX PRO 6000 Blackwell Workstation Edition graphics card cannot be installed when there is a 3rd HDD cage or a front-access HDD cage.
- Before installing a PCIe card, you need to remove [PCIe card bracket](#) on page 85.

PCIe card bracket



Note:

Some computer models might not be shipped with PCIe card. In this case, the PCIe card bracket in the following illustration is removable.

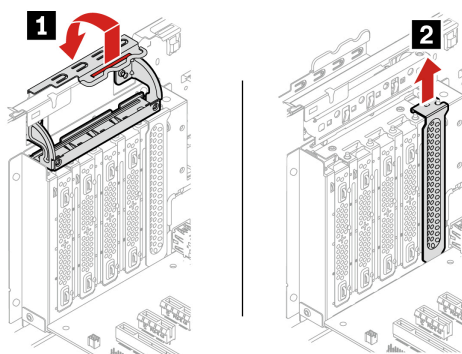
Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - [Left side cover](#) on page 65
 - [Side fan with bracket](#) on page 80

2. Remove the PCIe card bracket.



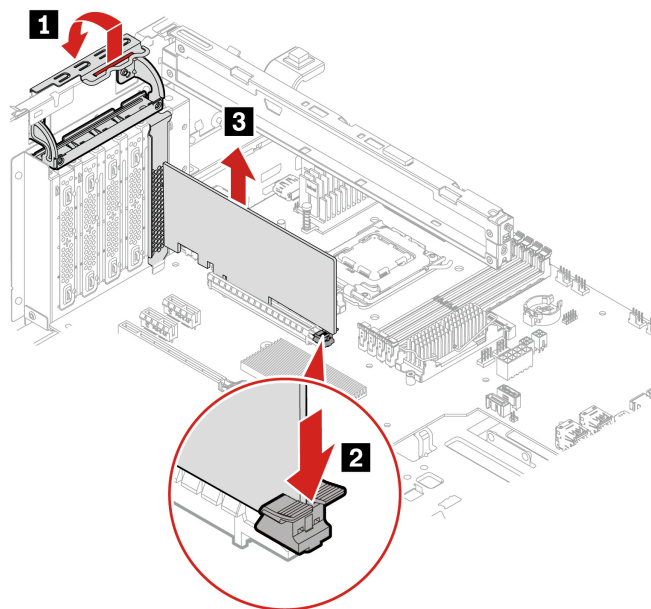
PCIe adapter card

Prerequisite

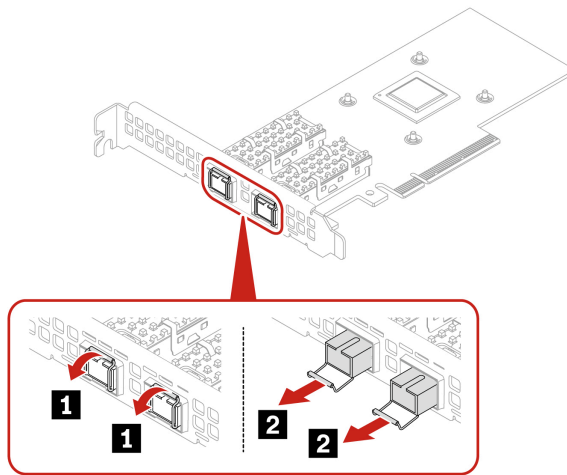
Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Side fan with bracket](#) on page 80
2. Remove the PCIe adapter card.



3. For some Ethernet PCIe adapter cards, the following fiber modules can be removed.



Graphics card

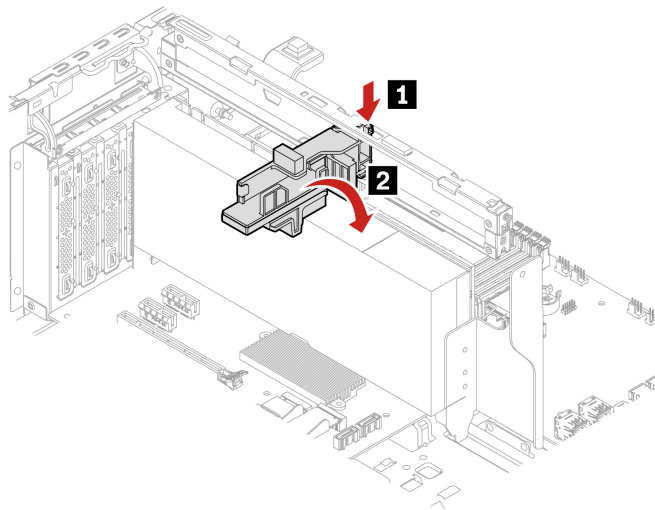
Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

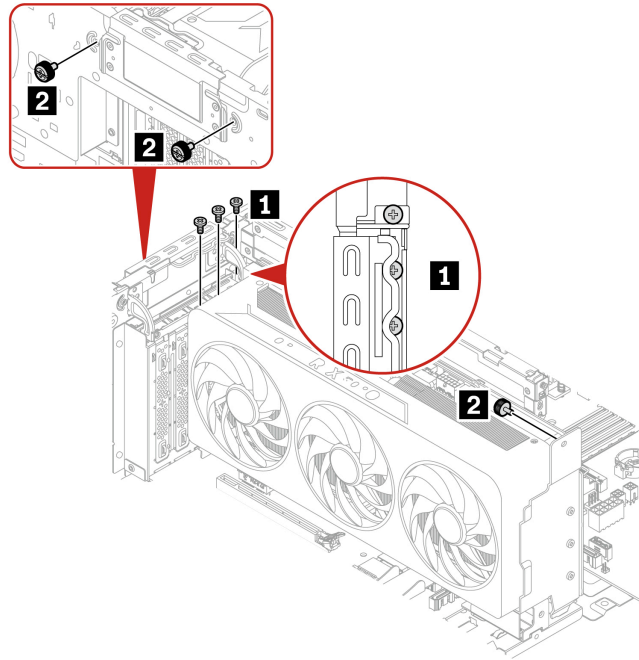
Removal steps of type-1 graphics card

1. Remove the following parts, if any:

- [Left side cover](#) on page 65
- [Side fan with bracket](#) on page 80
- Graphics card retainer

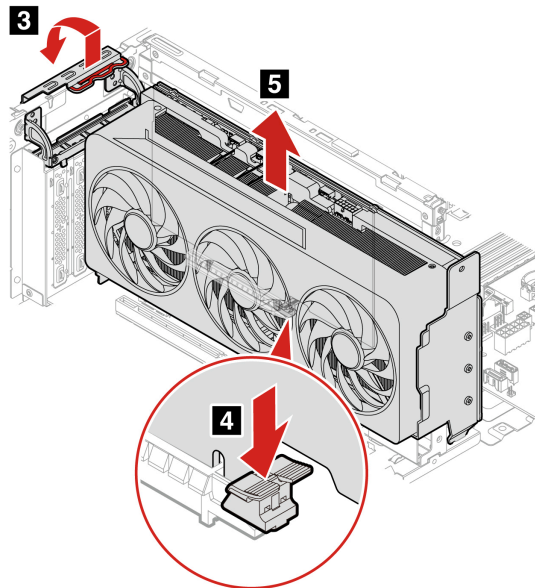


2. Remove the screws **1** and **2**, if any.



Step	Screw	Quantity	Torque
1	#6-32 × 7.5 mm (0.3 inches), Nickel coated	2 or 3 (for selected models)	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)
2	#6-32 × 7.5 mm (0.3 inches), Nickel coated	1 or 3 (for selected models)	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

3. Remove the graphics card with the extender, if any.



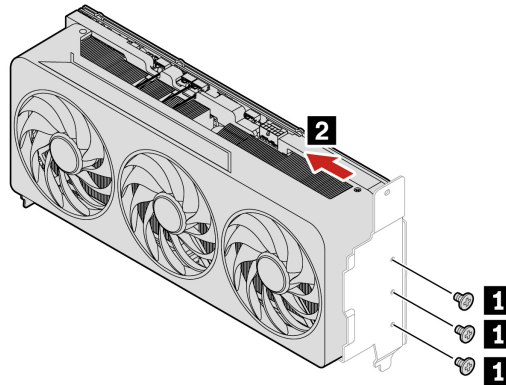
Note:

If the graphics card is too large and prevents you from reaching the PCIe slot retention latch **4**, remove the memory modules first (see [Memory module](#) on page 98).

4. Remove the graphics card from the extender, if any.

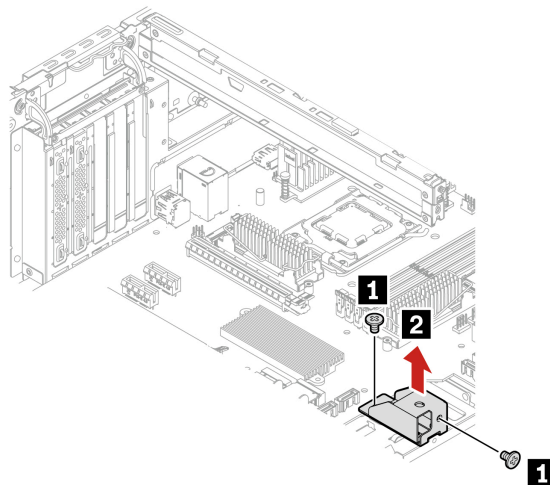
Note:

The extender may vary by models.



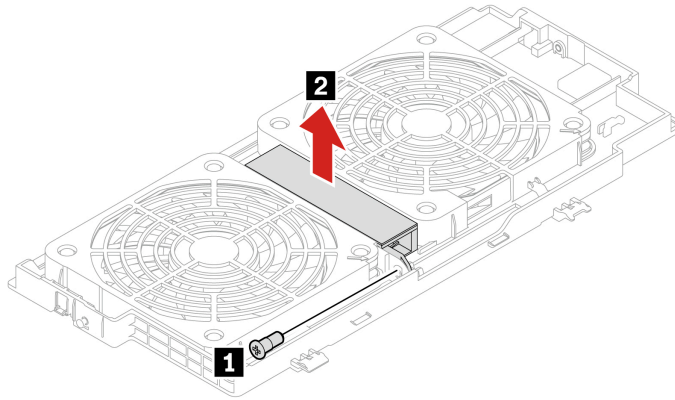
Step	Screw	Quantity	Torque
1	M3 × 5 mm (0.2 inches), Zn coated	2 or 3 (for selected models)	3 ± 0.5 in-lb (3.46 ± 0.58 kgf-cm)

5. Remove the graphics card holder, if any.



Step	Screw	Quantity	Torque
1	#6-32 × 7.5 mm (0.3 inches), Zn coated	2	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

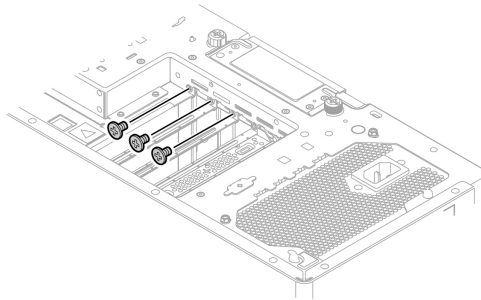
6. Remove the graphics card cable holder, if any.



Step	Screw	Quantity	Torque
1	M3 × 7 mm (0.3 inches), Zn coated	1	3 ± 0.5 in-lb (3.46 ± 0.58 kgf-cm)

Installation notice of type-1 graphics card

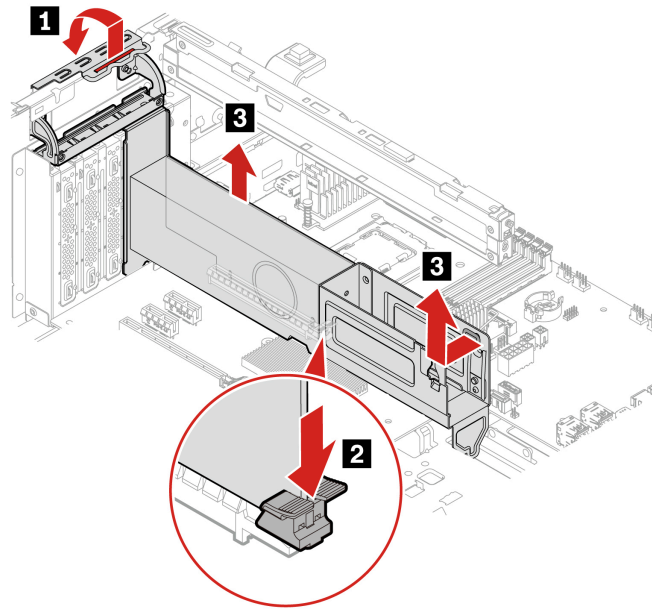
For certain models, remove the two or three screws on the rear panel (as shown) before installing the new graphics card.



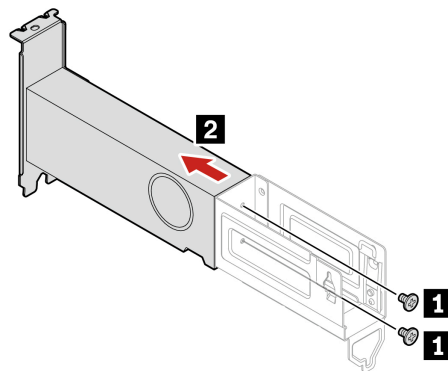
Screw	Quantity	Torque
#6-32 × 6mm (0.2 inches), Zn coated	2 or 3	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

Removal steps of type-2 graphics card

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Side fan with bracket](#) on page 80
2. Remove the graphics card with the extender.



3. Remove the graphics card from the extender.



Step	Screw	Quantity	Torque
1	M3 × 5 mm (0.2 inches), Zn coated	2	3 ± 0.5 in-lb (3.46 ± 0.58 kgf-cm)

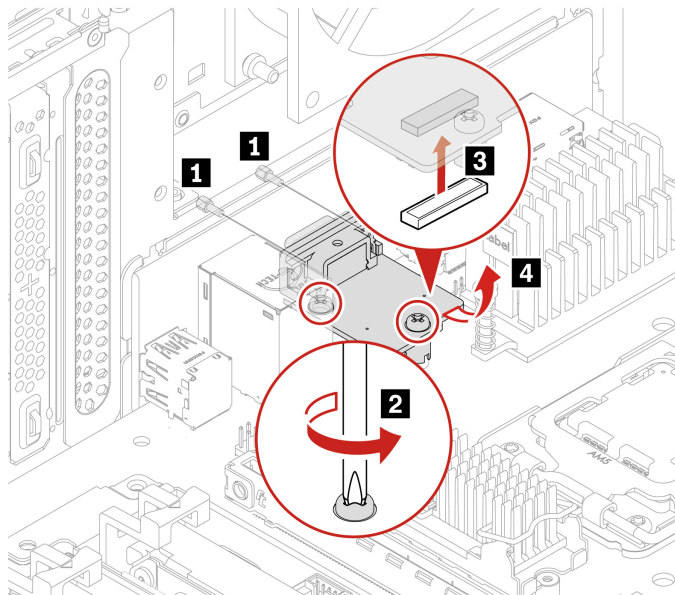
Flexible I/O port card

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

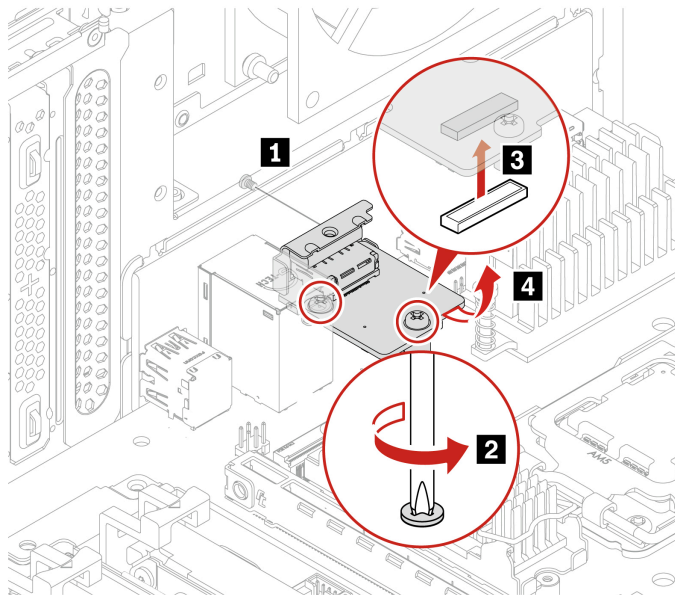
Removal steps

1. Remove the [Left side cover](#) on page 65.
2. Remove the flexible I/O port card.
 - Type 1 (VGA)



Step	Screw	Quantity	Torque
2	M3 × 5 mm (0.2 inches), Nickel coated	2	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

- Type 2



Step	Screw	Quantity	Torque
1	M2 × 3 mm (0.12 inches), Nickel coated	1	1.5 ± 0.5 in-lb (1.73 ± 0.58 kgf-cm)
2	M3 × 5 mm (0.2 inches), Nickel coated	2	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

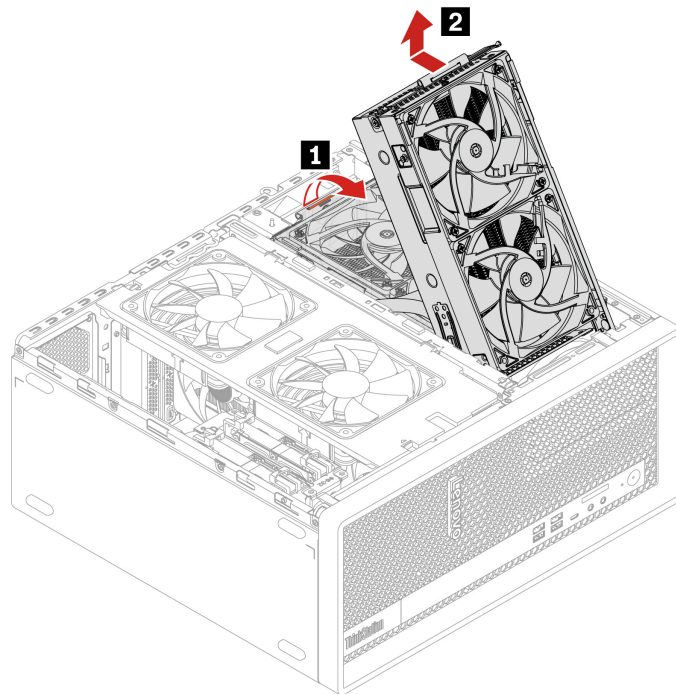
Chassis beam

Prerequisite

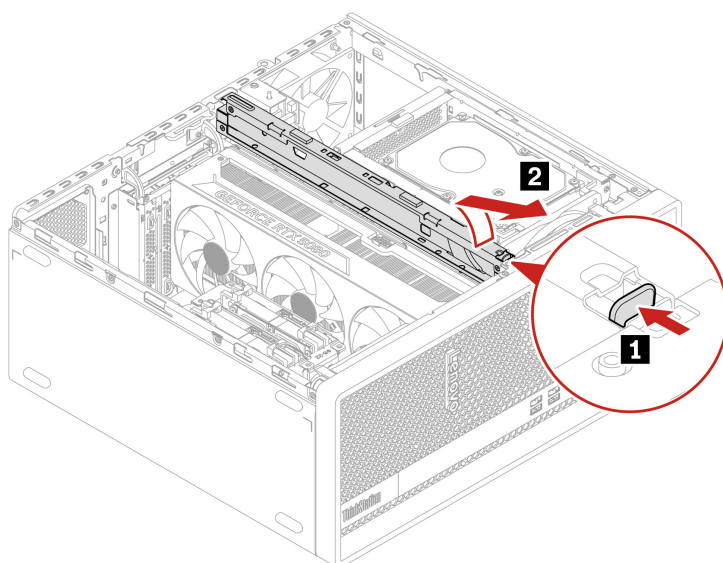
Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Side fan with bracket](#) on page 80
2. Rotate the liquid cooler to the angle shown in the figure below. Gently lift it without fully removing it.

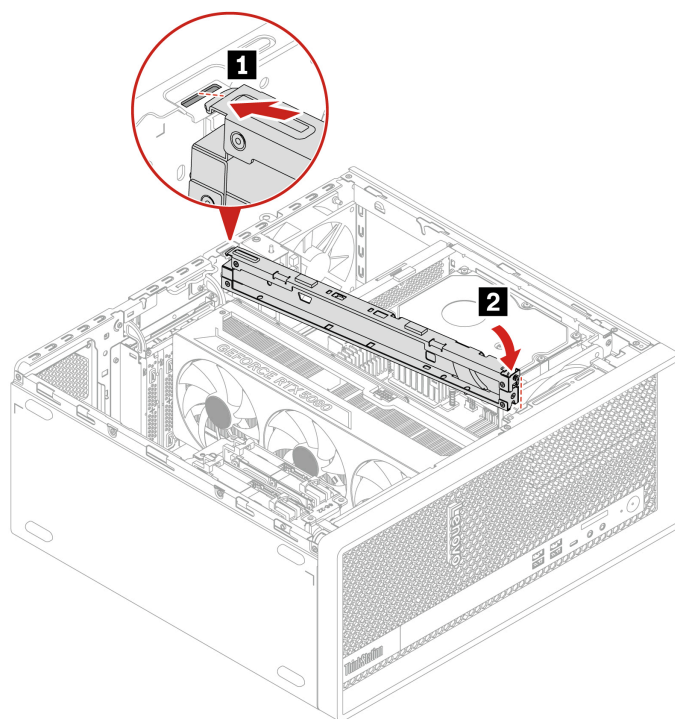


3. Remove the chassis beam.



Installation step

Install the chassis beam.



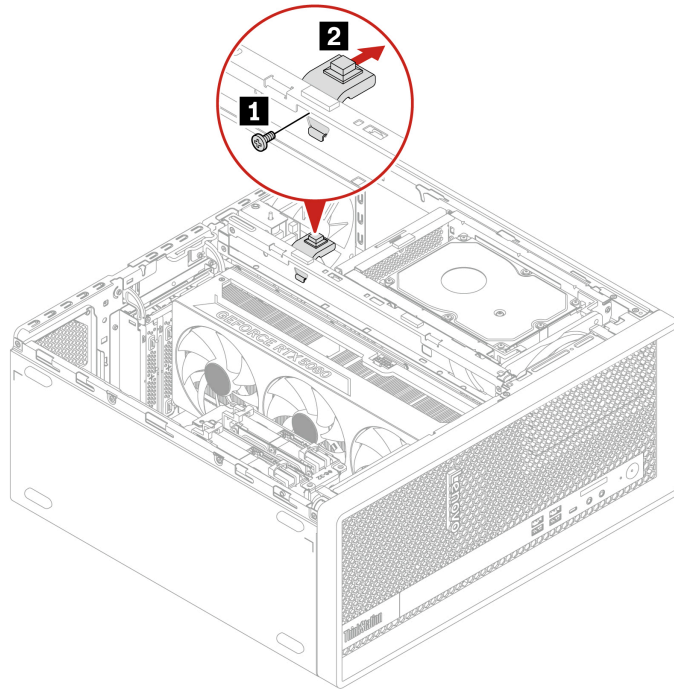
Cover presence switch

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Side fan with bracket](#) on page 80
 - c. [PCIe card](#) on page 84
 - d. [Chassis beam](#) on page 93
2. Remove the cover presence switch.



Step	Screw	Quantity	Torque
1	M3 × 5 mm (0.2 inches), Zn coated	1	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

Internal speaker

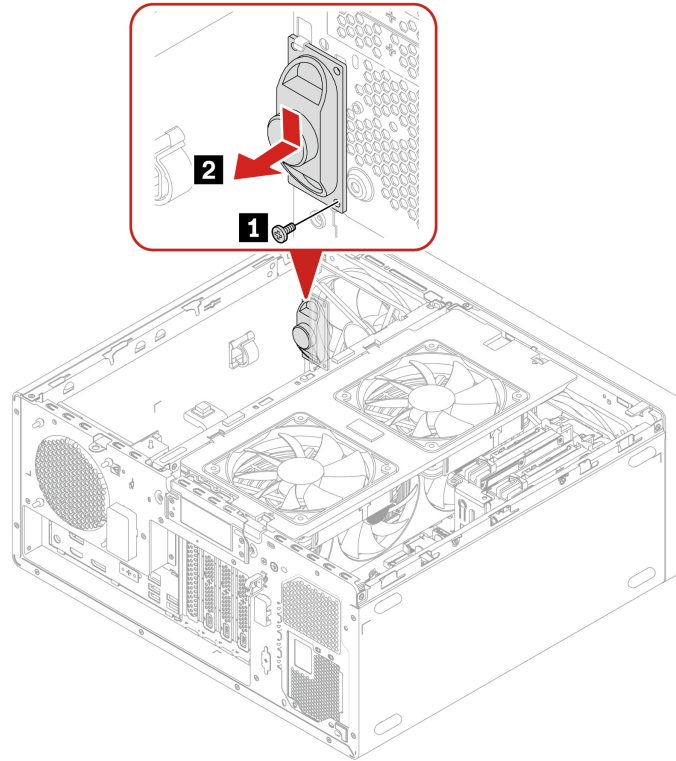
Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - [Left side cover](#) on page 65
 - [Slim ODD and slim-ODD latch](#) on page 78
 - [3.5-inch HDD](#) on page 68
 - [HDD and slim-ODD cages](#) on page 72
 - [Side fan with bracket](#) on page 80
 - [Front top fan](#) on page 80

2. Remove the internal speaker.



Step	Screw	Quantity	Torque
1	M3 × 5 mm (0.2 inches), Nickel coated		5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

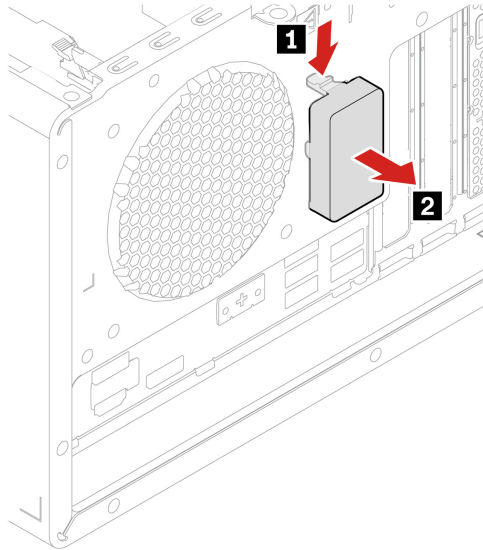
Wi-Fi antenna cover

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the [Left side cover](#) on page 65.
2. Remove the Wi-Fi antenna cover.

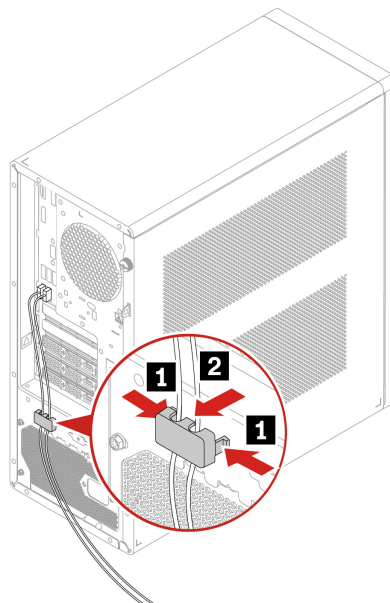


Smart cable clip

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps



Memory module

Prerequisite

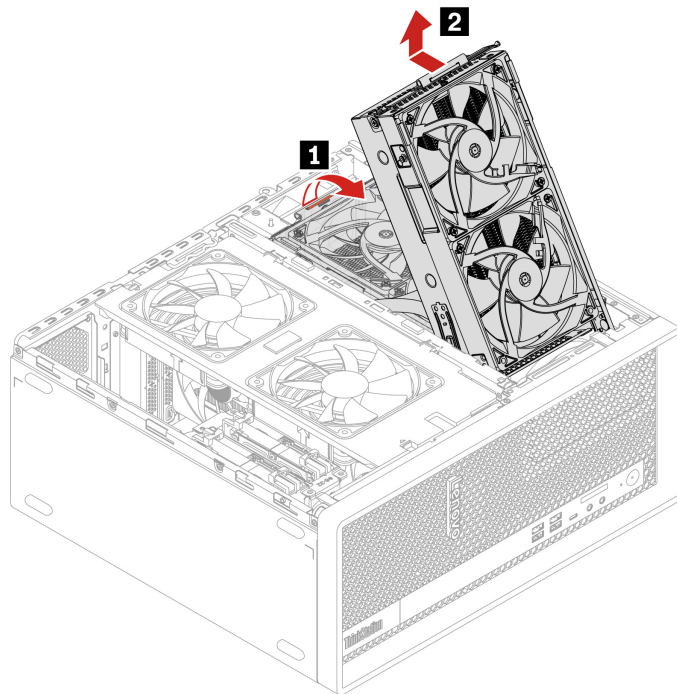
- Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.
- Ensure that you remove or install memory modules at least one minute after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory modules.

Removal steps

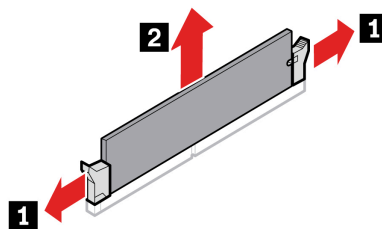
1. Remove the following parts, if any:

- [Left side cover](#) on page 65
- [Slim ODD and slim-ODD latch](#) on page 78
- [3.5-inch HDD](#) on page 68
- [HDD and slim-ODD cages](#) on page 72

2. Rotate the liquid cooler to the angle shown in the figure below. Gently lift it without fully removing it.



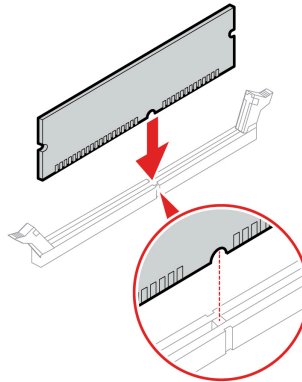
3. Remove the memory module.



Installation steps and rules

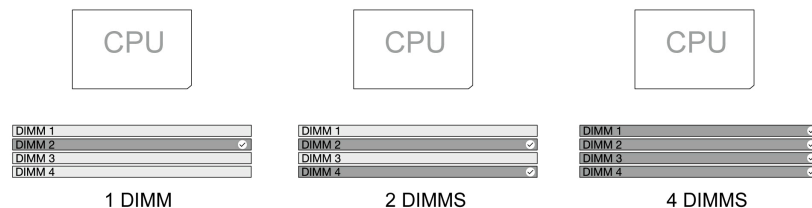
- **Installation step**

Align the memory module to the slot and press down on both ends until the latches are fully engaged with a click.



- **Installation rules**

- Install memory modules in the correct order shown in the following illustration.



- Install memory modules of the same type, the same capacity, and the same DRAM densities. For example, ECC UDIMMS and non-ECC UDIMMs can't be used together.
- The four memory slots support 2DPC (two DIMMs per channel). DIMM1 and DIMM2 are one channel. DIMM3 and DIMM4 are another channel. Symmetric configurations are required within one channel. Ensure that the two DIMMs installed in one channel are from the same manufacturer.

E-lock

Prerequisite

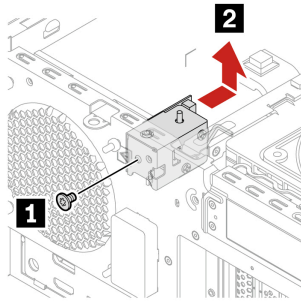
Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the [Left side cover](#) on page 65.
2. Remove the E-lock.

Note:

To remove the screws, you need a special tool (T15 star wrench).



Step	Screw	Quantity	Torque
1	M3 × 5 mm (0.2 inches), T15, Nickel 1 coated		5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

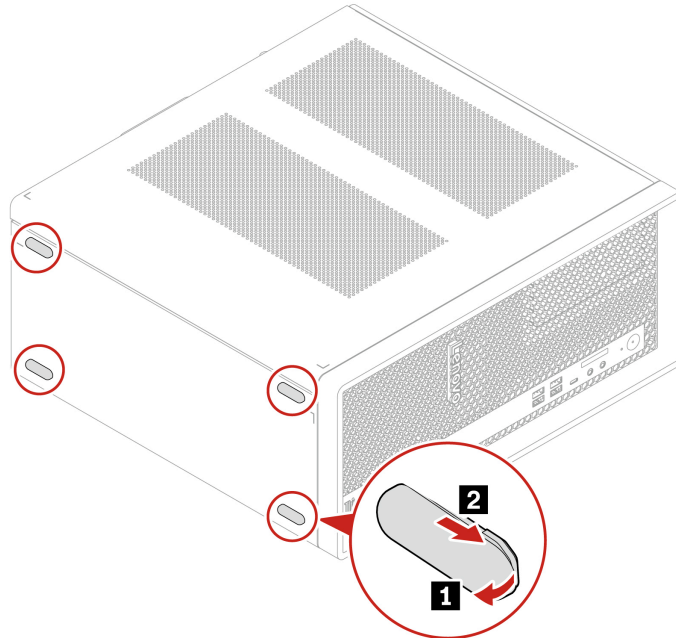
Chassis rubber foot

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

Remove the chassis rubber foot.



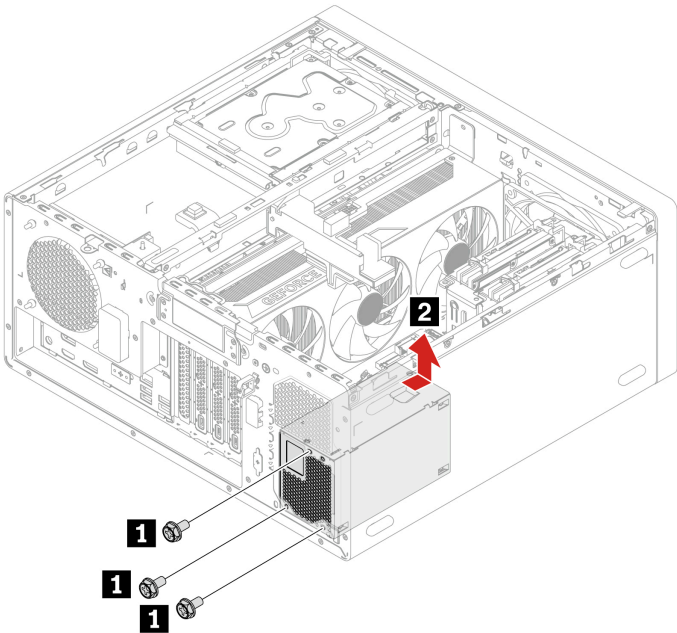
Power supply assembly

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

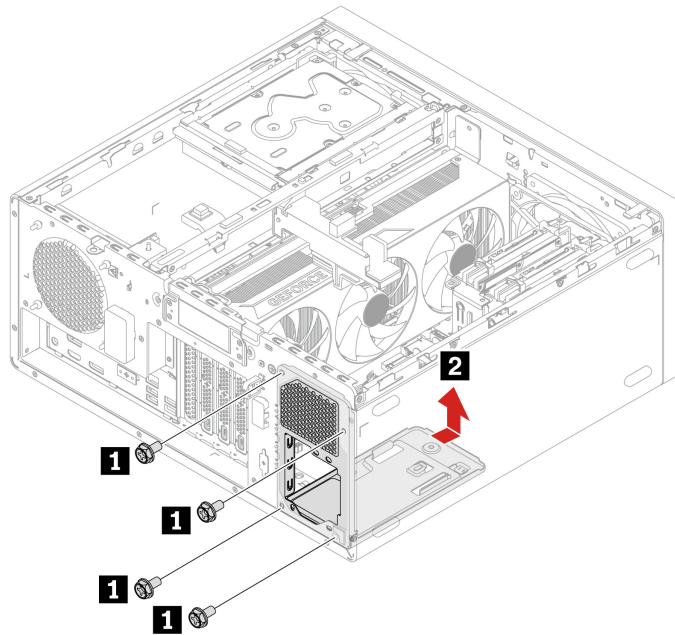
Removal steps of the 500-watt power supply assembly and the bracket for 500-watt power supply assembly

1. Remove the following parts, if any:
 - [Left side cover](#) on page 65
 - [Side fan with bracket](#) on page 80
2. Remove the power supply assembly.



Step	Screw	Quantity	Torque
1	#6-32 × 5 mm (0.2 inches), Nickel 3 coated	3	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

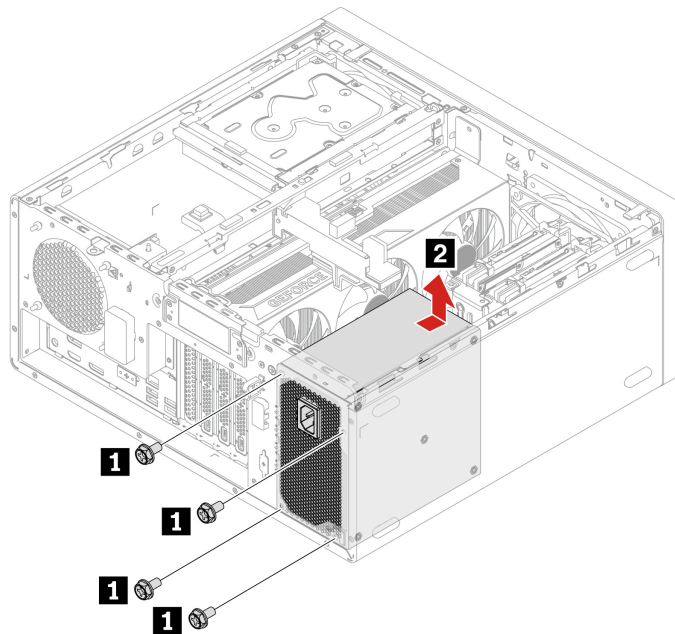
3. Remove the bracket for power supply assembly.



Step	Screw	Quantity	Torque
1	#6-32 × 5 mm (0.2 inches), Nickel coated	4	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

Removal steps the 750-watt or 1100-watt power supply assembly

1. Remove the following parts, if any:
 - [Left side cover](#) on page 65
 - [Side fan with bracket](#) on page 80
2. Remove the power supply assembly.



Step	Screw	Quantity	Torque
1	#6-32 × 5 mm (0.2 inches), Nickel coated	4	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

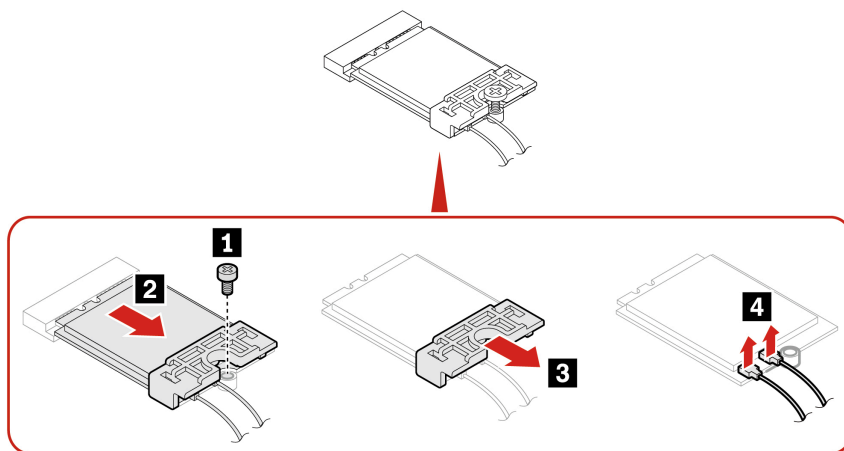
Wi-Fi card

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the [Left side cover](#) on page 65.
2. Remove the Wi-Fi card.



Step	Screw	Quantity	Torque
1	M2 × 3 mm (0.12 inches), Zn coated		1.5 ± 0.2 in-lb (1.73 ± 0.23 kgf-cm)

Installation notice

During installation, ensure that you connect the gray cable to the connector labeled AUX on the card, and the black cable to the connector labeled MAIN.

Front Wi-Fi antenna

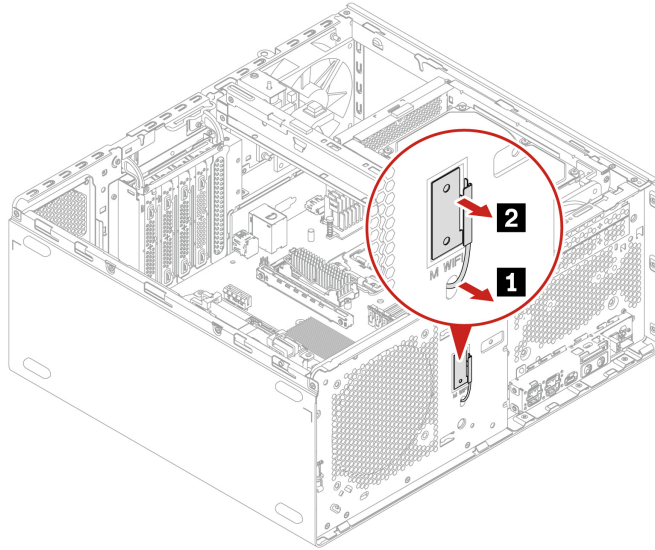
Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Slim ODD and slim-ODD latch](#) on page 78

- c. [3.5-inch HDD](#) on page 68
 - d. [HDD and slim-ODD cages](#) on page 72
 - e. [Side fan with bracket](#) on page 80
 - f. [Front top fan](#) on page 80
 - g. [Front bezel](#) on page 82
2. Remove the front Wi-Fi antenna.



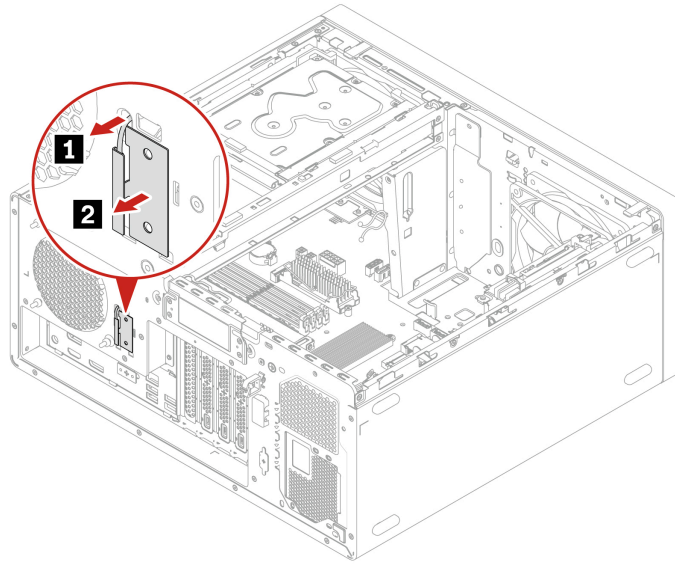
Rear Wi-Fi antenna

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Wi-Fi antenna cover](#) on page 96
 - c. [Wi-Fi card](#) on page 103
2. Remove the rear Wi-Fi antenna.



CPU cooler

CPU cooler availability varies by CPU model. Your computer is equipped with one of the following coolers: a 65 W CPU air cooler, a 120 W CPU air cooler, or a CPU liquid cooler. By reading this section, you will learn to replace the CPU cooler installed in your computer.

65 W CPU air cooler

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

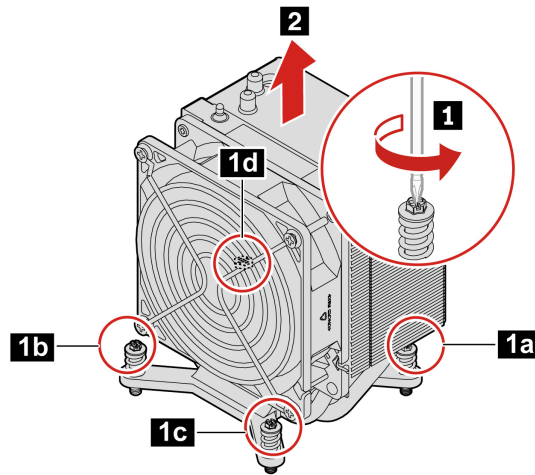
Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Slim ODD and slim-ODD latch](#) on page 78
 - c. [3.5-inch HDD](#) on page 68
 - d. [HDD and slim-ODD cages](#) on page 72
2. Follow the following sequence to loosen the four screws that secure the CPU air cooler to the system board.
 - a. Partially loosen screw **1a**, fully loosen screw **1b**, and then fully loosen screw **1a**.
 - b. Partially loosen screw **1c**, fully loosen screw **1d**, and then fully loosen screw **1c**.

Note:

- Carefully loosen the four screws to avoid any possible damage to the system board. The four screws cannot be removed from the CPU air cooler.
- You might have to gently twist the CPU air cooler to free it from the CPU.
- Do not touch the thermal grease while handling the CPU air cooler.

3. Lift the CPU air cooler off the system board.



Step	Screw	Quantity	Torque
1	#6-32 × 58 mm (2.3 inches), Nickel coated	4	5.0 ± 1.0 in-lb (5.75 ± 1.15 kgf-cm)

120 W CPU air cooler

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

- Remove the following parts, if any:
 - [Left side cover](#) on page 65
 - [Slim ODD and slim-ODD latch](#) on page 78
 - [3.5-inch HDD](#) on page 68
 - [HDD and slim-ODD cages](#) on page 72
- Follow the following sequence to loosen the four screws that secure the CPU air cooler to the system board.
 - Partially loosen screw **1a**, fully loosen screw **1b**, and then fully loosen screw **1a**.
 - Partially loosen screw **1c**, fully loosen screw **1d**, and then fully loosen screw **1c**.

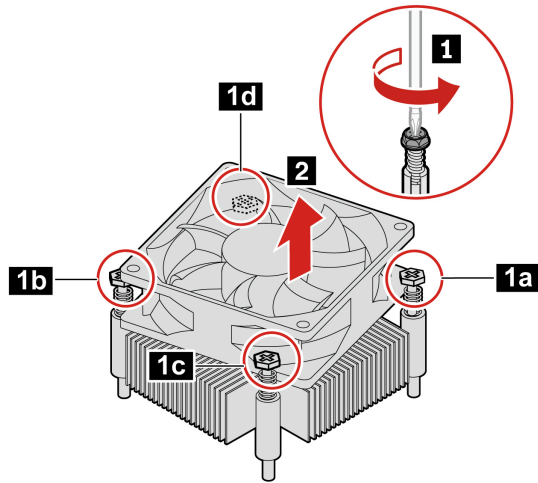
Note:

- Carefully loosen the four screws to avoid any possible damage to the system board. The four screws cannot be removed from the CPU air cooler.
- You might have to gently twist the CPU air cooler to free it from the CPU.
- Do not touch the thermal grease while handling the CPU air cooler.

- Lift the CPU air cooler off the system board.

Note:

Use screwdriver of Phillips Head 02 and with shank length greater than 6 inches to loosen the screws of 120 W CPU air cooler assembly.



Step	Screw	Quantity	Torque
1	#6-32 × 28 mm (1.1 inches), Nickel coated	4	5.0 ± 1.0 in-lb (5.75 ± 1.15 kgf-cm)

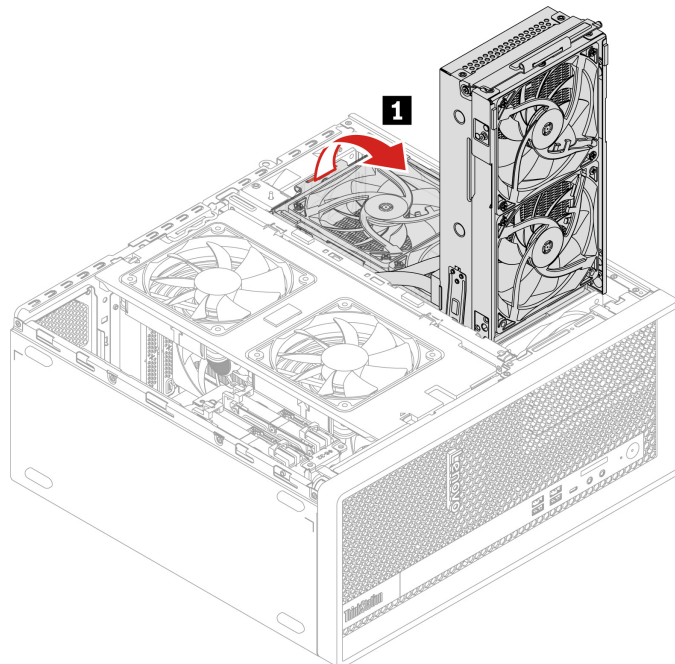
CPU liquid cooler

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

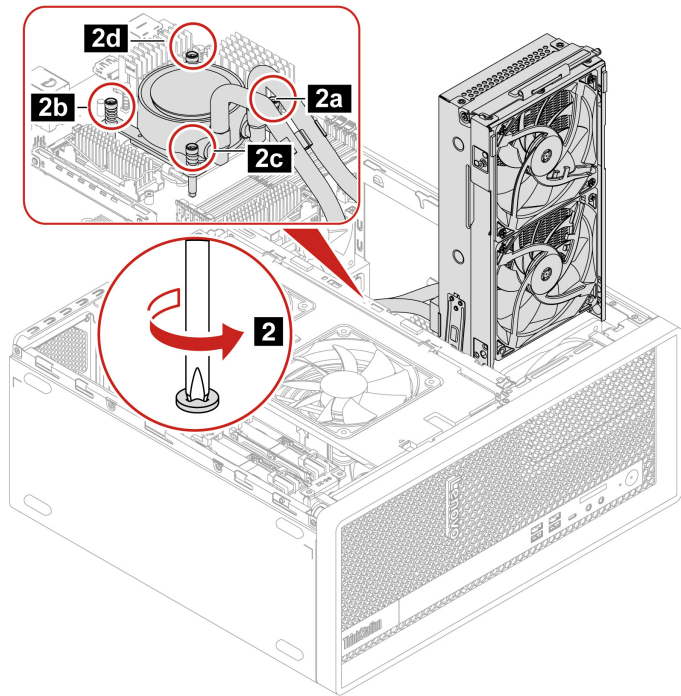
1. Remove the [Left side cover](#) on page 65.
2. Rotate the liquid cooler to the angle shown in the figure below.



3. Follow the following sequence to loosen the four screws that secure the CPU liquid cooler to the system board.
- a. Partially loosen screw **2a**, fully loosen screw **2b**, and then fully loosen screw **2a**.
 - b. Partially loosen screw **2c**, fully loosen screw **2d**, and then fully loosen screw **2c**.

Note:

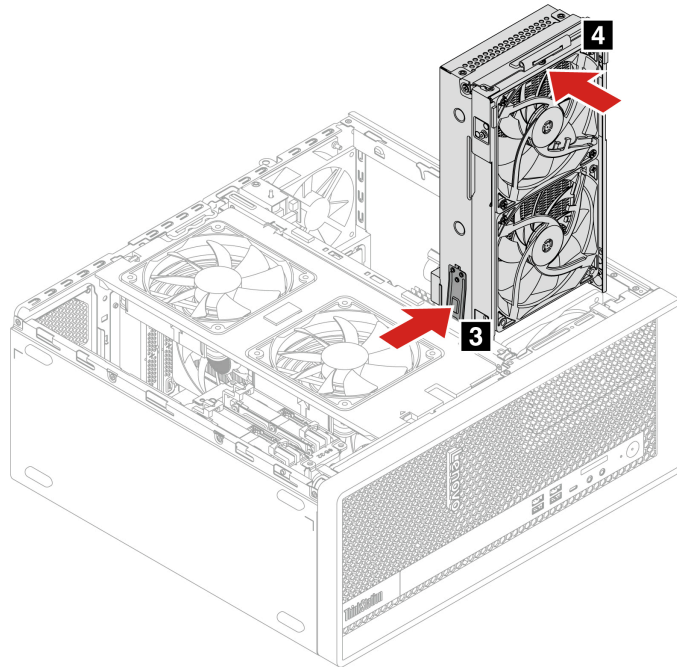
- Carefully loosen the four screws to avoid any possible damage to the system board. The four screws cannot be removed from the CPU liquid cooler.
- You might have to gently twist the CPU liquid cooler to free it from the CPU.
- Do not touch the thermal grease while handling the CPU liquid cooler.



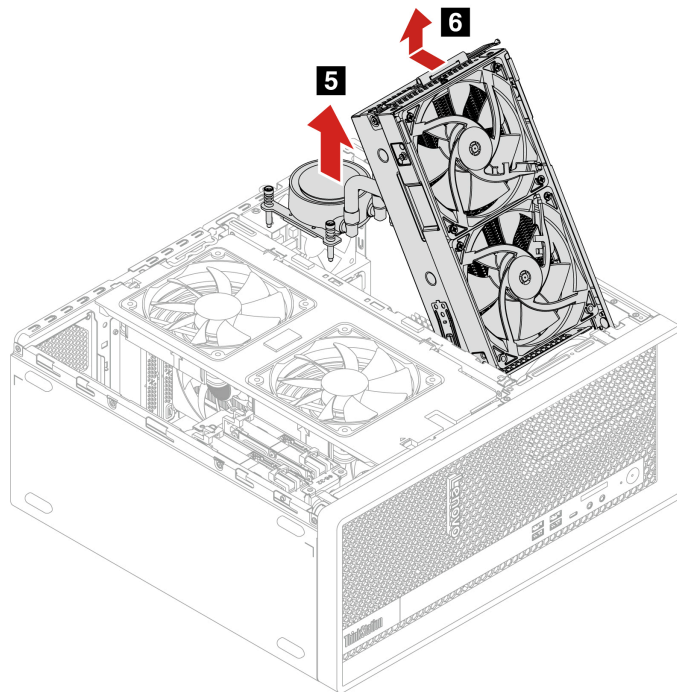
The screws can be one of the following two types:

Step	Screw	Quantity	Torque
2	Type 1: #6-32 × 36 mm (1.4 inches), Nickel coated	4	5.0 ± 1.0 in-lb (5.75 ± 1.15 kgf-cm)
2	Type 2: #6-32 × 34 mm (1.3 inches), Zn coated	4	5.0 ± 1.0 in-lb (5.75 ± 1.15 kgf-cm)

4. Press the latch on the side of the liquid cooler, then push the liquid cooler back from the upright position.

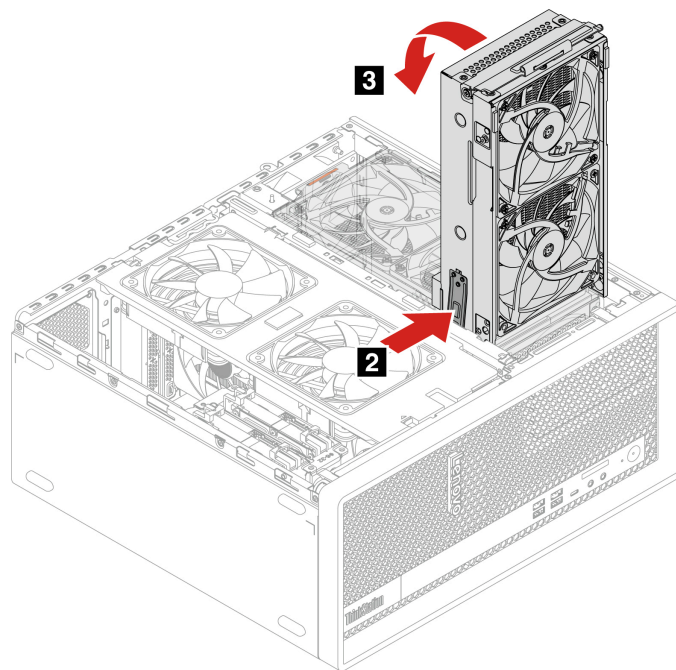
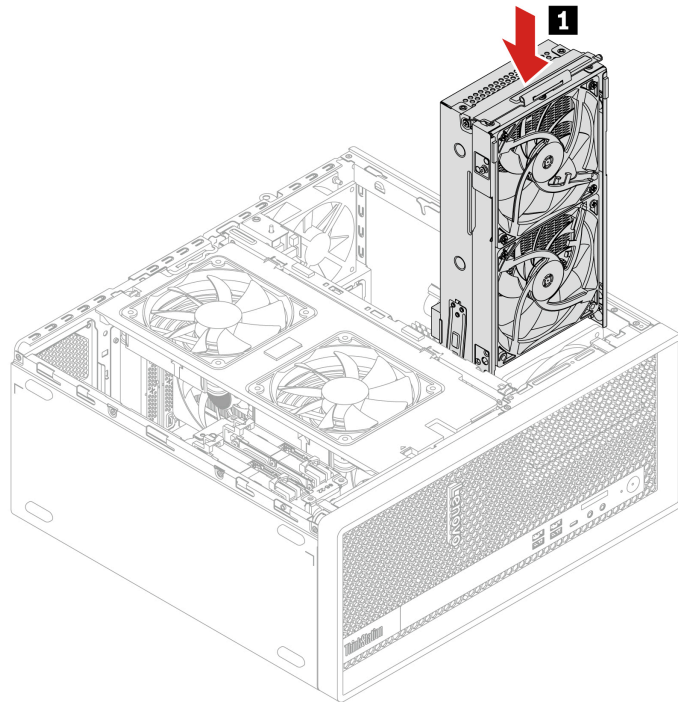


5. Lift the liquid cooler.



Installation notice

When installing the liquid cooler, press the latch on the side to secure it back into place.



Liquid cooler bracket

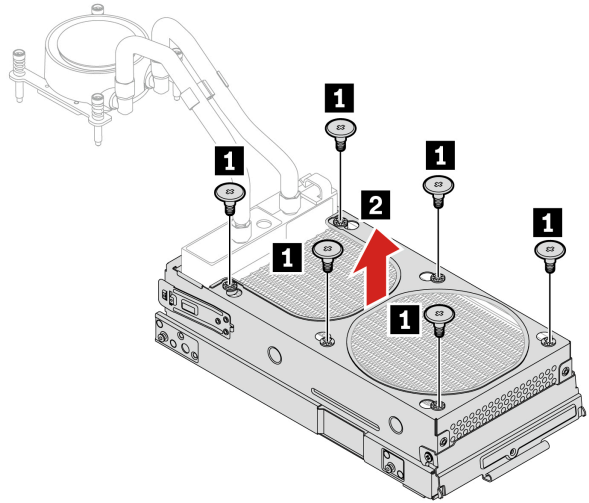
Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the [Left side cover](#) on page 65 and [CPU liquid cooler](#) on page 107.

2. Remove the liquid cooler bracket.



Step	Screw	Quantity	Torque
1	#6-32 × 8.5 mm (0.3 inches), Zn coated	6	3 ± 0.5 in-lb (3.46 ± 0.58 kgf-cm)

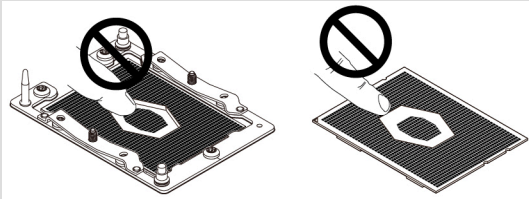
CPU

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Note:

- Touch only the edges of the CPU. Do not touch the pins on the CPU socket or the gold contacts on the CPU.



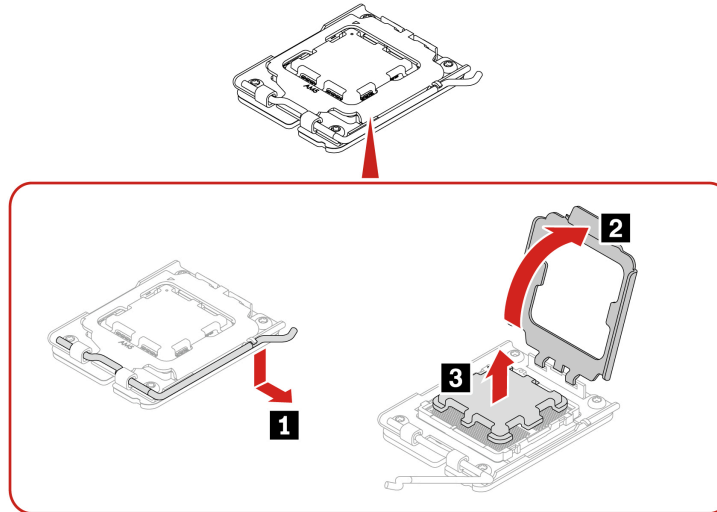
- Do not drop anything onto the CPU socket while it is exposed. The socket pins must be kept as clean as possible.
- Your CPU sockets and socket covers might look slightly different from the illustrations in this topic.

Removal steps

1. Remove the following parts, if any:

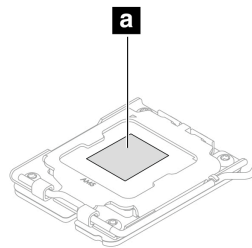
- a. [Left side cover](#) on page 65
- b. [Slim ODD and slim-ODD latch](#) on page 78
- c. [3.5-inch HDD](#) on page 68
- d. [HDD and slim-ODD cages](#) on page 72
- e. [CPU cooler](#) on page 105

2. Unlock and remove the CPU.

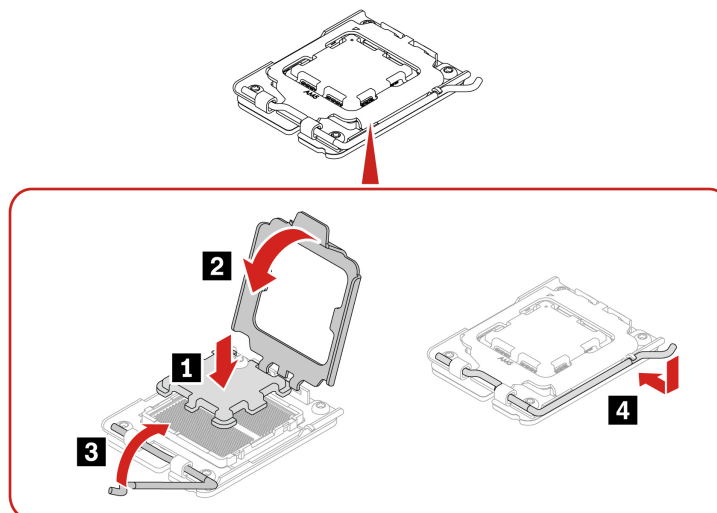


Installation steps

1. Clean all thermal grease that has been used and then apply new thermal grease. Apply new thermal grease according to [Handling thermal interface materials](#) on page 64. Either too much or too less application of grease can cause a thermal problem due to imperfect contact with a component.



2. Attach the CPU to the computer and lock the CPU.



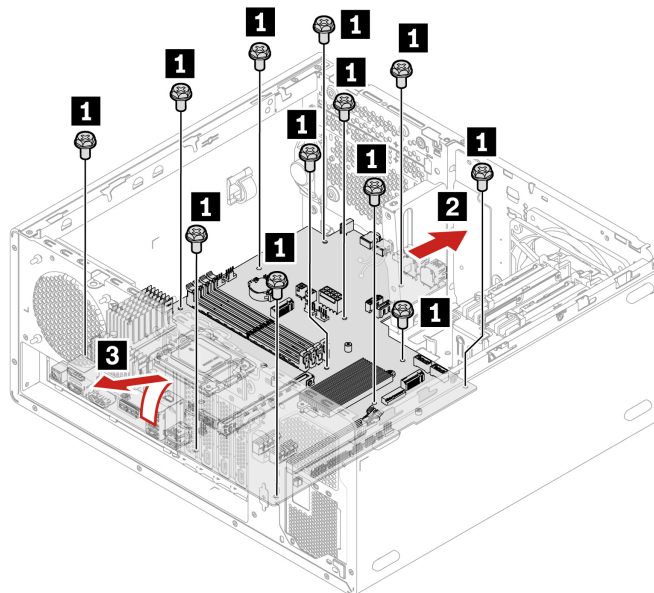
System board

Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Storage](#) on page 66
 - c. [Fans](#) on page 79
 - d. [Front bezel](#) on page 82
 - e. [PCIe card](#) on page 84
 - f. [Flexible I/O port card](#) on page 91
 - g. [Chassis beam](#) on page 93
 - h. [Cover presence switch](#) on page 94
 - i. [Internal speaker](#) on page 95
 - j. [Wi-Fi antenna cover](#) on page 96
 - k. [Smart cable clip](#) on page 97
 - l. [Memory module](#) on page 98
 - m. [E-lock](#) on page 99
 - n. [Power supply assembly](#) on page 101
 - o. [Wi-Fi card](#) on page 103
 - p. [Front Wi-Fi antenna](#) on page 103
 - q. [Rear Wi-Fi antenna](#) on page 104
 - r. [CPU cooler](#) on page 105
 - s. [CPU](#) on page 111
2. Remove the system board.



Step	Screw	Quantity	Torque
1	M3 × 5 mm (0.2 inches), Zn coated	12	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)



Note:

The failing system board must be returned with a CPU socket cover to protect the pins during shipping and handling.

CPU socket cover installation procedure

1. After you have removed the CPU from the failing system board, close the CPU retainer. Then, put the lever to the locked position to secure the retainer in place.
2. Note the orientation of the socket cover, and install one side of the socket cover into the CPU socket. Carefully press the other side of the socket cover downward until the socket cover snaps into position.



Note:

The CPU socket cover might look slightly different from the illustration.

3. Carefully check the four corners of the socket cover to ensure that the cover is seated securely.
4. Follow any additional instructions that are included with the replacement part you received.

Coin-cell battery

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

About the coin-cell battery

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

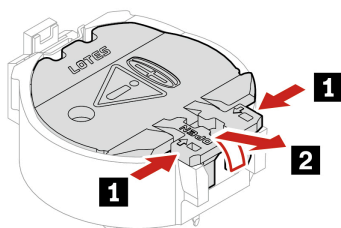
The coin-cell battery normally requires no charging or maintenance throughout its life; however, no coin-cell battery lasts forever. If the coin-cell battery fails, the date and time information is lost. An error message is displayed when you turn on the computer.

To dispose of the coin-cell battery, refer to the "Lithium coin-cell battery notice" in the *Safety and Warranty Guide*.

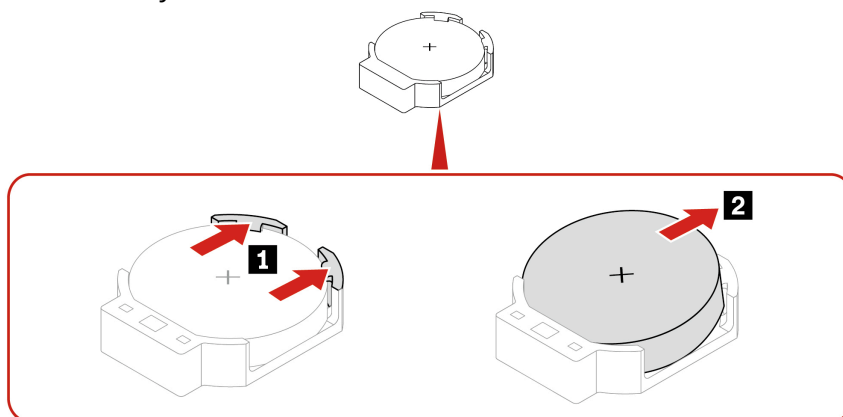
Replacement steps

1. Remove the following parts, if any, in order.
 - [Left side cover](#) on page 65
 - [Side fan with bracket](#) on page 80

- [PCIe card](#) on page 84
2. Locate the coin-cell battery based on the [System board illustration](#) on page 63.
 3. Remove the cover of coin-cell battery.



4. Remove the coin-cell battery from the holder.



5. When installing, tilt the coin-cell battery into the holder and press it down until it sits flat.

After replacement

After installing a new coin-cell battery, reset the system date and time in the UEFI BIOS menu.

Rear I/O shielding

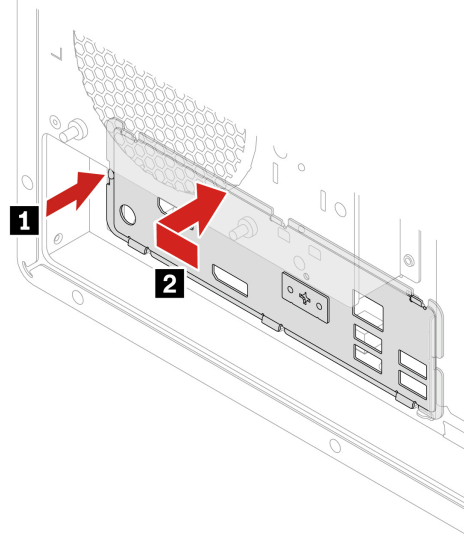
Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Storage](#) on page 66
 - c. [Fans](#) on page 79
 - d. [Front bezel](#) on page 82
 - e. [PCIe card](#) on page 84
 - f. [Flexible I/O port card](#) on page 91
 - g. [Chassis beam](#) on page 93
 - h. [Cover presence switch](#) on page 94
 - i. [Internal speaker](#) on page 95

- j. [Wi-Fi antenna cover](#) on page 96
 - k. [Smart cable clip](#) on page 97
 - l. [Memory module](#) on page 98
 - m. [E-lock](#) on page 99
 - n. [Power supply assembly](#) on page 101
 - o. [Wi-Fi card](#) on page 103
 - p. [Front Wi-Fi antenna](#) on page 103
 - q. [Rear Wi-Fi antenna](#) on page 104
 - r. [CPU cooler](#) on page 105
 - s. [CPU](#) on page 111
 - t. [System board](#) on page 113
2. Remove the rear I/O shielding.



Power button and power indicator

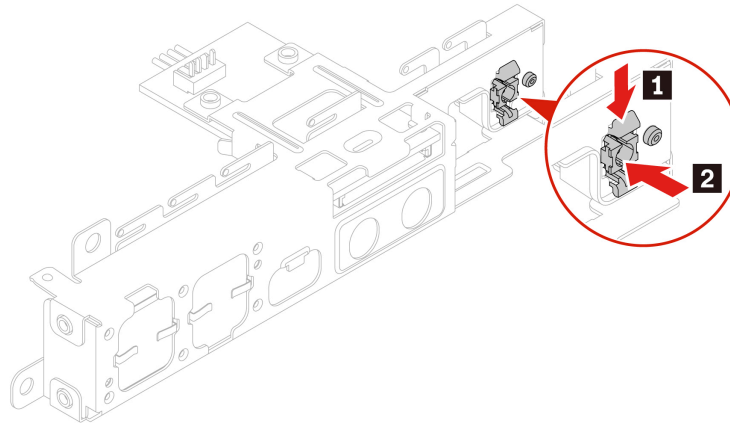
Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
- a. [Left side cover](#) on page 65
 - b. [Storage](#) on page 66
 - c. [Fans](#) on page 79
 - d. [Front bezel](#) on page 82
 - e. [PCIe card](#) on page 84
 - f. [Flexible I/O port card](#) on page 91
 - g. [Chassis beam](#) on page 93
 - h. [Cover presence switch](#) on page 94
 - i. [Internal speaker](#) on page 95
 - j. [Wi-Fi antenna cover](#) on page 96
 - k. [Smart cable clip](#) on page 97
 - l. [Memory module](#) on page 98

- m. [E-lock](#) on page 99
 - n. [Power supply assembly](#) on page 101
 - o. [Wi-Fi card](#) on page 103
 - p. [Front Wi-Fi antenna](#) on page 103
 - q. [Rear Wi-Fi antenna](#) on page 104
 - r. [CPU cooler](#) on page 105
 - s. [CPU](#) on page 111
 - t. [System board](#) on page 113
 - u. [Rear I/O shielding](#) on page 115
2. Remove the power button and power indicator.



VRM heat sink

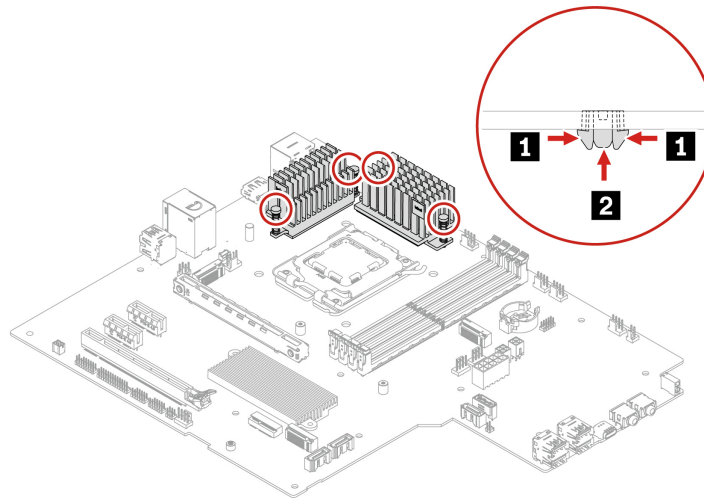
Prerequisite

Before you start, ensure that you have read [Prerequisites for hardware replacement](#) on page 60.

Removal steps

1. Remove the following parts, if any:
 - a. [Left side cover](#) on page 65
 - b. [Storage](#) on page 66
 - c. [Fans](#) on page 79
 - d. [Front bezel](#) on page 82
 - e. [PCIe card](#) on page 84
 - f. [Flexible I/O port card](#) on page 91
 - g. [Chassis beam](#) on page 93
 - h. [Cover presence switch](#) on page 94
 - i. [Internal speaker](#) on page 95
 - j. [Wi-Fi antenna cover](#) on page 96
 - k. [Smart cable clip](#) on page 97
 - l. [Memory module](#) on page 98
 - m. [E-lock](#) on page 99
 - n. [Power supply assembly](#) on page 101
 - o. [Wi-Fi card](#) on page 103
 - p. [Front Wi-Fi antenna](#) on page 103

- q. [Rear Wi-Fi antenna](#) on page 104
 - r. [CPU cooler](#) on page 105
 - s. [CPU](#) on page 111
 - t. [System board](#) on page 113
2. Remove the VRM heat sinks.



Chapter 6 Supplemental instructions

Use the SD card

If your computer has an SD-card reader, read the following information.

Install an SD card

1. Locate the SD-card reader.
2. Ensure that the metal contacts on the card are facing the ones in the SD-card reader. Insert the card firmly into the SD-card reader until it is secured in place.

Remove an SD card



Attention:

Before removing the card:

1. Click the triangular icon in the Windows notification area to show hidden icons. Right-click the icon prompting you to safely remove hardware and eject media.
2. Select the corresponding item to eject the card from the Windows operating system.
3. Press the card and remove it from your computer. Store the card safely for future use.

UEFI BIOS

UEFI BIOS is the first program that the computer runs. When the computer turns on, the UEFI BIOS performs a self test to make sure that various devices in the computer are functioning properly.

Enter the UEFI BIOS menu

Turn on or restart the computer. When the logo screen is displayed, press F1 or Fn+F1 to enter the UEFI BIOS menu.



Note:

If you have set UEFI BIOS passwords, enter the correct passwords when prompted. You also can select **No** or press Esc to skip the password prompt and enter the UEFI BIOS menu. However, you cannot change the system configurations that are protected by passwords.

Navigate the UEFI BIOS menu

Follow the on-screen instructions to navigate in the UEFI BIOS menu.

The table below introduces the available settings of the UEFI BIOS menu. You can follow the on-screen instruction to navigate in the UEFI BIOS menu.



Note:

The UEFI BIOS menu might vary depending on system configurations.

Menu	Introduction
Main	This category provides the general product-related and firmware information including system summary, machine type, product serial number, UUID number, etc.
Devices	This category introduces how to configure various devices such as USB ports and audio controllers.
Advanced	This category provides advanced information about the computer such as the CPU features.
Power	This category introduces power and thermal management solutions.
Security	This category introduces various passwords, locks, and software to protect your computer.
Startup	This category introduces how to set the boot priority order.
Exit	This category introduces how to exit as you prefer.

You can go to Lenovo BIOS Simulator Center <https://download.lenovo.com/bSCO/index.html> to explore the detailed settings by your product name.

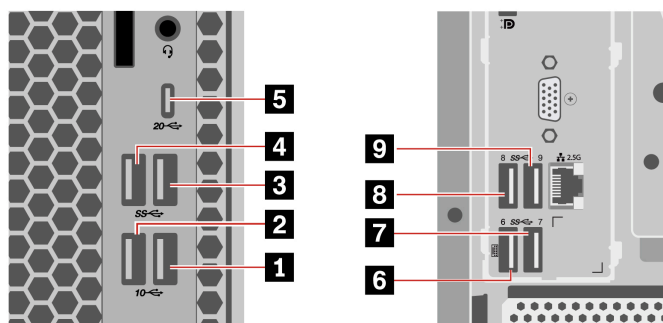


Note:

The Lenovo BIOS Simulator Center makes periodic updates of the settings. The UEFI BIOS simulator interface and description of settings might be different from that on your actual user interface.

Map UEFI BIOS USB ports to physical connectors

If you need to enable or disable any front or rear USB port UEFI BIOS, refer to below table to locate the corresponding USB port on your computer. You can find the settings in the UEFI BIOS menu (**Devices > USB Setup**):



USB connector on computer	USB port in UEFI BIOS
1	USB Port 1
2	USB Port 2

USB connector on computer	USB port in UEFI BIOS
3	USB Port 3
4	USB Port 4
5	USB Port 5
6	USB Port 6
7	USB Port 7
8	USB Port 8
9	USB Port 9

Update the UEFI BIOS

When you install a new program, device driver, or hardware component, you might need to update the UEFI BIOS.

Download and install the latest UEFI BIOS update package by one of the following methods:

From the Vantage app

Follow the instructions to update the UEFI BIOS from the Vantage app.

1. Open the Vantage app, and then click **Device > System Update**.
2. If the latest UEFI BIOS update package is available, follow the on-screen instructions to download and install the package.

From the Lenovo Support Web site

Follow the instructions to update the UEFI BIOS from the Lenovo Support Web site.

1. Go to <https://pcsupport.lenovo.com> and select the entry for your computer.
2. Click **Drivers & Software > Manual Update > BIOS/UEFI**.
3. Follow the on-screen instructions to download and install the latest UEFI BIOS update package.

From the Windows Update

Follow the instructions to update the UEFI BIOS from the Windows Update.

1. Type **Settings** in the Windows search box and press Enter.
2. Click **Windows Update > Check for Updates**.
3. If a BIOS update package appears in your update list, click **Download or Install** to initiate the update.

Remote update via Windows Remote Desktop

1. Establish a Remote Desktop Protocol (RDP) connection to the target computer.
2. Through the RDP interface, remotely update the UEFI BIOS using one of the following methods:
 - [From the Vantage app](#) on page 121
 - [From the Lenovo Support Web site](#) on page 121
 - [From the Windows Update](#) on page 121
3. After installation, the system will automatically reboot multiple times (around 20 minutes). The remote connection will terminate during reboots — reconnect after the final reboot to verify successful update.

BIOS recovery

Clear CMOS

1. Remove all media from the drives. Turn off all connected devices and the computer.
2. Unplug all power cords. Remove any parts blocking the Clear CMOS jumper.
3. Move the jumper from the standard to the Clear CMOS position.
4. Reconnect power to the computer and monitor.
5. Power on the system. When the computer beeps, the recovery process begins (which takes a few minutes).
6. Press and hold the power button for around four seconds to power off.
7. Unplug the power cords. Move the jumper back to the standard position.
8. Reinstall all removed parts and reconnect power.
9. Power on the system. When the logo screen is displayed, press F1 or Fn+F1.
10. Check if the BIOS is restored to its factory default settings.

 Note:

For some products, a small number of special items in BIOS may not be reset automatically.

Recover from a BIOS update failure

Before you start, ensure to save the "IMAGEXXX.ROM" or "IMAGEXXX.cap" file in the BIOS update package to the root directory of your USB drive or disc.

1. Remove all media from the drives. Turn off all connected devices.
2. Insert the prepared USB drive or disc. Turn off the computer.
3. Unplug all power cords. Remove any parts blocking the Clear CMOS jumper.
4. Move the jumper from the standard to the Clear CMOS position.
5. Reconnect power to the computer and monitor.
6. Power on the system. When the computer beeps, the recovery process begins. After a few minutes, the system will automatically shut down upon completion.
7. Unplug the power cords. Move the jumper back to the standard position.
8. Reinstall all removed parts and reconnect power.
9. Power on the system. When the logo screen is displayed, press F1 or Fn+F1.
10. Check if the BIOS is functioning properly and restored to its factory default settings.

 Note:

For some products, a small number of special items in BIOS may not be reset automatically.

RAID

What is RAID

Redundant Array of Independent Disks (RAID) is a technology that provides increased storage functions and reliability through redundancy. It also can improve data storage reliability and fault

tolerance compared with single-drive storage systems. Data loss resulting from a drive failure can be prevented by reconstructing missing data from the remaining drives.

When a group of independent physical storage drives is set up to use RAID technology, they are in a RAID array. This array distributes data across multiple storage drives, but the array appears to the host computer as one single storage unit. Creating and using RAID arrays provides high performance, such as the expedited I/O performance, because several drives can be accessed simultaneously.

Configure RAID with RAIDXpert2 Configuration Utility

If your computer comes with the RAIDXpert2 Configuration Utility, you can follow the sections below to configure RAID.

Select RAID mode

You can select the SATA RAID mode or NVMe RAID mode to configure RAID with RAIDXpert2 Configuration Utility.

1. Do the following to select AMD RAID mode:
 - a. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
 - b. Select **Devices** > **Storage Setup** > **Configure Storage as (AHCI/RAID)**.
 - c. Select **RAID**.
2. Press F10 or Fn+F10 to save the changes and exit.
3. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
4. Select **Devices** > **RAIDXpert2 Configuration Utility** to select drives and configure RAID.

Storage drive requirements for RAID levels



CAUTION:

Multiple operating systems are not supported on AMD-RAID Array. If the system is booted from an AMD-RAID bootable array, the first array in the Arrays section must be the bootable array. The system boots only from the first array in the Arrays section. Find the first array by viewing array details and checking the array number.



Note:

- To form a RAID array, the HDDs or the M.2 SSDs must be of the same capacity and size.
- HDDs assigned to the same RAID group must be installed in contiguous HDD cages (for example, the 1st and 2nd cages, the 1st through 3rd cages, or the 1st through 4th cages). Noncontiguous selections, such as the 1st and 3rd cages or the 1st and 4th cages, are not supported.

Your computer supports the following RAID levels:

- RAID 0: striped disk array
 - Provide the highest performance but no data redundancy. Data in the array is striped (distributed) across several disks.
 - Support 2, 3, or 4 HDDs, or 2 M.2 SSDs.
 - RAID 0 arrays are useful for holding information, such as the operating system paging file, where performance is extremely important but redundancy is not.
- RAID 1: mirrored disk array
 - Mirror data on a partition of one disk to another.
 - Support 2 HDDs, or 2 M.2 SSDs.

- RAID 1 arrays are useful when there are only two disks available and data integrity is more important than storage capacity.
- RAID 5: block-level striped disk array with distributed parity
 - Stripe data as well as parity, across all disks in the array.
 - Support 3 HDDs.
 - Offer exceptional read performance and redundancy.
- RAID 10: striped and mirrored disk array (a combination of RAID 0 and RAID 1)
 - Combine mirrors and stripe sets. RAID 10 allows multiple disk failures, up to 1 failure in each mirror that has been striped.
 - Support 4 HDDs.
 - Offer better performance than a simple mirror because of the extra disks. Require twice the disk space of RAID 1 to offer redundancy.
- Volume (JBOD):
 - RAIDxpert2 Configuration Utility treats one or more disks or the unused space on a disk as a single array.
 - Support 1-4 HDDs.
 - Provide the ability to link-together storage from one or several disks, regardless of the size of the space on those disks. It is useful in scavenging space on disks unused by other disks in the array. It does not provide performance benefits or data redundancy. Disk failure will result in data loss.

Initialize disks

New disks and legacy disks must be initialized before they can be used to create an AMD-RAID array. Initialization writes AMD-RAID configuration information (metadata) to a disk.



CAUTION:

- **If a disk is part of an AMD-RAID array, the disk cannot be selected for initialization. To initialize the disk anyway, delete the AMD-RAID array. Data on the disk is deleted during initialization so ensure the correct disks are chosen to initialize.**
- **A legacy disk can contain valid data. When a legacy array is deleted, all data on the disk is lost.**

1. Enter the **RAIDxpert2 Configuration Utility** menu. Then, use the arrow keys to select **Physical Disk Management** and press Enter.
2. Use the arrow keys to select **Select Physical Disk Operations** and press Enter.
3. Use the arrow keys to select **Initialize Disk** and press Enter.
4. Select the disk(s) to initialize:
 - a. Use the arrow keys to select a disk and press the Space Bar or Enter. Multiple disks can be selected using this method.
 - b. Use the arrow keys to select **OK** and press Enter.
 - c. Review the warning message. If you want to proceed, use the arrow keys to select **YES** and press Enter.

Note:

The Initialization process takes about 10 to 15 seconds. During initialization, a complete re-scan of all channels is done automatically.

Create arrays

Arrays can be created after the disks are initialized:

1. Enter the **RAIDXpert2 Configuration Utility** menu. Then, use the arrow keys to select **Array Management** and press Enter.
2. Use the arrow keys to select **Create Array** and press Enter.
3. Use the arrow keys to select **Select RAID Level > RAID Level** and press Enter.

Note:

Some of the RAID levels might not be displayed because the number of installed storage drives varies.

4. Select the disks with which to create the array:
 - a. Use the arrow keys to select **Physical Disks** and press Enter.
 - b. Use the arrow keys to select desired disks and press the Space Bar or Enter.
 - c. Use the arrow keys to select **Apply Changes** and press Enter.
5. Refer to the table below for the default cache tag size (CTS).

Array type	Default CTS
HDD Array	64k
SSD Array	64k
All NVMe Array	256k

6. Use the arrow keys to select **Read Cache Policy** and press Enter. Select the desired read cache policy and press Enter.
7. Use the arrow keys to select **Write Cache Policy** and press Enter. Select the desired write cache policy and press Enter.
8. Use the arrow keys to select **Create Array** and press Enter.

Delete arrays



CAUTION:

- Deleting an array permanently destroys all data that is on the array. This action cannot be recalled and it is very unlikely the data can be recovered.
- Do not delete the first array listed in the Arrays section, if it is the AMD-RAID bootable array. Doing this deletes the operating system and AMD-RAID files.

1. Enter the **RAIDXpert2 Configuration Utility** menu. Then, use the arrow keys to select **Array Management** and press Enter.
2. Use the arrow keys to select **Delete Arrays** and press Enter.
3. Select the array(s) to delete:
 - a. Use the arrow keys to select the desired array or multiple arrays, then press the Space Bar or Enter to change the option to **Enabled** for deletion.
 - b. If you want to select all of the arrays, use the arrow keys to select **Check all** and press Enter.
 - c. Use the arrow keys to select **Delete Array** and press the Space Bar or Enter.
 - d. Review the warning message. If you want to proceed, press the Space Bar or Enter.
 - e. Use the arrow keys to select **Yes** to delete arrays.

View array details

This option displays the details of an array. Nothing can be changed using this menu option. It is for informational purposes only.

1. Enter the **RAIDXpert2 Configuration Utility** menu. Then, use the arrow keys to select **Array Management** and press Enter.
2. Use the arrow keys to select **Select Manage Array Properties** and press Enter.
3. Use the arrow keys to select **Select Array** and press Enter. Select the desired array and press **Enter**.
4. Use the arrow keys to select **View Associated Physical Disks** and press Enter.
5. Press the Space Bar to select one of the members of the Array.
6. Use the arrow keys to select **View Physical Disk Properties** and press Enter.
7. Information about the array is displayed below **Select Array header**:
 - Array number
 - RAID level
 - State
 - Size
 - Cache Tag Size
 - Cache settings
 - Associated physical disks
8. To view another array, press ESC twice and perform steps 2 through 7 again.
9. Press ESC to exit the main menu.

Appendix A Important notice for Quebec consumers

In regard to section 79.18 of Quebec's Regulation respecting the application of the Consumer Protection Act, Lenovo in no way guarantees the availability of (a) replacement parts; (b) repair services; and (c) information necessary to maintain or repair the goods. For up-to-date information on the technical support and parts available for your purchase, please consult <https://support.lenovo.com/ca/en>.

En ce qui concerne l'article 79.18 du Règlement d'application de la Loi sur la protection du consommateur du Québec, Lenovo ne garantit en aucune façon la disponibilité des éléments suivants : (a) les pièces de rechange; (b) les services de réparation; et (c) les renseignements nécessaires à l'entretien à la réparation du bien. Pour obtenir des renseignements à jour sur le soutien technique et les pièces disponibles pour votre achat, veuillez consulter <https://support.lenovo.com/ca/fr>.

Appendix B Self-help resource

Find more information about your device through the following self-help resources.

Product information

- Product specifications: <https://psref.lenovo.com>
- Technical specifications for Lenovo workstations: <https://thinkstation-specs.com>

Lenovo Support resource

- Lenovo PC Technical Support web site: <https://pcsupport.lenovo.com>. You can obtain the following information and resources:
 - Drivers and software
 - Troubleshoot and diagnose
 - How to's
 - Guides and manuals
 - Warranty lookup
 - Parts lookup
 - Accessories
 - Contact us
 - Repair status check
 - Imaging and security resources
 - Glossary
- Lenovo Support phone numbers: <https://pcsupport.lenovo.com/supportphonenumberlist>
- Vantage app: Type **vantage** in the Windows search box. You can use the app to:
 - Configure device settings
 - Download and install UEFI BIOS, drivers, and firmware updates
 - Secure your device from outside threats
 - Diagnose hardware problems
 - Check the warranty status of your device
 - Access *User Guide* and helpful articles
- Lenovo communities:
 - Forums: <https://forums.lenovo.com>
 - Legion Gaming Community: <https://gaming.lenovo.com>
 - Lenovo EDU Community: <https://education.lenovo.com>
 - Lenovo Pro Community: <https://smbcommunity.lenovo.com>
- Troubleshooting tips: <https://www.lenovo.com/tips>

Service information

- Warranty lookup: <https://support.lenovo.com/warranty-lookup>. You can check the warranty status of your device.
- Repair status check: <https://support.lenovo.com/track-repair-status>. You can check the repair status of your device by repair ticket, serial number, or IMEI number.
- Parts lookup and purchase: <https://support.lenovo.com/parts-lookup>. You can find service parts by serial number or machine type.

- Lenovo BIOS Simulation Center: <https://download.lenovo.com/bSCO/index.html>. You can explore the BIOS settings of your device.
- Additional services purchase: <https://pcsupport.lenovo.com/warrantyupgrade>. You can protect your device with extended warranty, Accidental Damage Protection, Premium Care & Support, and Vantage Smart Performance.

Product documentation

Documentation title	Information included	How to Access
<i>Setup Guide</i>	Initial setup and overview information	• Access the printed version from the product package. • Go to https://pcsupport.lenovo.com and search by the product name or serial number. Then, click Guides & Manuals.
<i>User Guide</i>	Instructions, guidance, resources, and contact information	• Scan the QR code in <i>Setup Guide</i>. • In Windows Start menu, click . • Type vantage in the Windows search box and press Enter. Then, find the <i>User Guide</i> in the app. • Go to https://pcsupport.lenovo.com and search by the product name or serial number. Then, click Guides & Manuals.
<i>Hardware Maintenance Manual</i>	Hardware diagnostic and replacement information for technicians	Go to https://pcsupport.lenovo.com and Search by the product name or serial number. Then, click Guides & Manuals .

Operating system support resource

- Windows help information
 - Type **get help** in the Windows search box
 - Use Windows Search
 - Microsoft Support Web site: <https://support.microsoft.com>
- Reset or restore Windows
 - Use Lenovo recovery options: <https://support.lenovo.com/HowToCreateLenovoRecovery>
 - Use Windows recovery options: Go to <https://pcsupport.lenovo.com> and search by the product name or serial number. Then, navigate to the troubleshooting menu to diagnose the operating system for recovery instructions.

Accessory information

- Purchase accessories: <https://www.lenovo.com/accessories>
- Service recommendation and accessory configurator: <https://smartfind.lenovo.com>
- Accessories and option compatibility matrix: <https://www.lenovo.com/accessoriesguide>

Legal and compliance information

- Product compliance: <https://www.lenovo.com/compliance>
- Legal information: <https://www.lenovo.com/us/en/legal>
- Regulatory documentation: Go to <https://pcsupport.lenovo.com> and search by the product name or serial number. Then, click **Guides & Manuals**.
 - *Safety and Warranty Guide* : Safety, warranty, recycling, and other information
 - *Generic Safety and Compliance Notices* : Compliance, accessibility, RoHS, and other information
 - *Regulatory Notice* : Regulatory notices for wireless modules

Lenovo responsibility

- Accessibility information: <https://www.lenovo.com/accessibility>
- Environment information: <https://www.lenovo.com/us/en/sustainability-operational-impact>
- Product security: <https://www.lenovo.com/us/en/product-security/landing/>

Appendix C Notice for USB connector name update

The USB Implementers Forum published a revision of the guideline for USB connector names in September, 2022. Lenovo follows the revised guideline and updates USB connector names accordingly. You can refer to the table below for naming update details.

Current name	Previous name
USB-A connector (Hi-Speed USB)	USB-A 2.0 connector
USB-A connector (USB 5Gbps)	USB-A 3.2 Gen 1 connector
USB-A connector (USB 10Gbps)	USB-A 3.2 Gen 2 connector
USB-A connector (USB 5Gbps, Always On USB)	Always on USB-A 3.2 Gen 1 connector
USB-A connector (USB 10Gbps, Always On USB)	Always on USB-A 3.2 Gen 2 connector
USB-C connector (USB 5Gbps)	USB-C (3.2 Gen 1) connector
USB-C connector (USB 10Gbps)	USB-C (3.2 Gen 2) connector
USB-C connector (USB 20Gbps)	USB 3.2 Gen 2x2
USB-C connector (USB4 20Gbps)	USB 4 Gen 2x2
USB-C connector (USB4 40Gbps)	USB-C (USB 4) connector
USB-C connector (Thunderbolt 3)	USB-C (Thunderbolt 3) connector
USB-C connector (Thunderbolt 4)	USB-C (Thunderbolt 4) connector

Appendix D Notices and trademarks

Notices

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

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8001 Development Drive

Morrisville, NC 27560

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