

Linux User Guide

Lenovo
ThinkStation



Lenovo

ThinkStation P4

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Contents

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	9
I/O connector.	11
Cooling system	13

Chapter 3. Get started. 15

Connect to an external display	15
Get started with Ubuntu Desktop (24.04 LTS)	15
Access networks	15
Transfer data	16
Connect to a Bluetooth-enabled device (24.04 LTS) (for selected models)	16
Use the optical drive (for selected models)	16
Use a media card (for selected models).	17
Set the power plan	17
Smart power-on feature (for selected models)	17
Security solutions	18
Use physical locks	18
Use BIOS security solutions	20
UEFI BIOS passwords	21

Chapter 4. UEFI BIOS 23

Enter the UEFI BIOS menu	23
Navigate the UEFI BIOS menu	23
Map UEFI BIOS USB ports to physical connectors	23
Update the UEFI BIOS	24
Using the built-in software update service.	24
From the Lenovo Support Web site	24

Chapter 5. RAID 25

What is RAID	25
Configure RAID with RAIDXpert2 Configuration Utility	25

Chapter 6. CRU replacement 29

Before CRU replacement	29
What is CRU	29

CRU list	30
System board illustration	31
Prerequisites for hardware replacement	32
Left side cover	34
Storage	34
On-board M.2 SSD, heat sink kit, thermal pad, and holder	34
3.5-inch HDD	37
HDD and slim-ODD cages	40
Storage installation rule	43
Slim ODD and slim-ODD latch	45
Front I/O bracket and SD card reader	45
Fans	46
Side fan with bracket	47
Front top fan	47
Rear fan	48
Front bezel.	49
Front-access-HDD-cage bezel	50
Flex-bay dummy bezel	51
PCIe card	52
PCIe card replacement rule	52
PCIe card bracket	53
PCIe adapter card	53
Graphics card.	54
Flexible I/O port card.	59
Chassis beam	60
Cover presence switch	62
Internal speaker.	63
Wi-Fi antenna cover	64
Smart cable clip.	65
Memory module	65
E-lock	67
Chassis rubber foot	68

Chapter 7. Help and support 69

Find your serial number.	69
Lenovo diagnostic tools	69
Call Lenovo	69
Before you contact Lenovo	69
Lenovo Customer Support Center.	70
Self-help resources	70
Purchase accessories or additional services	71
Accessibility features.	71
Supplemental information about the Ubuntu operating system	71

**Appendix A. Important notice for
Quebec consumers 73**

**Appendix B. Notice for USB
connector name update 74**

**Appendix C. Notices and
trademarks. 75**

About this documentation

This documentation applies to the ThinkStation® product models listed below.

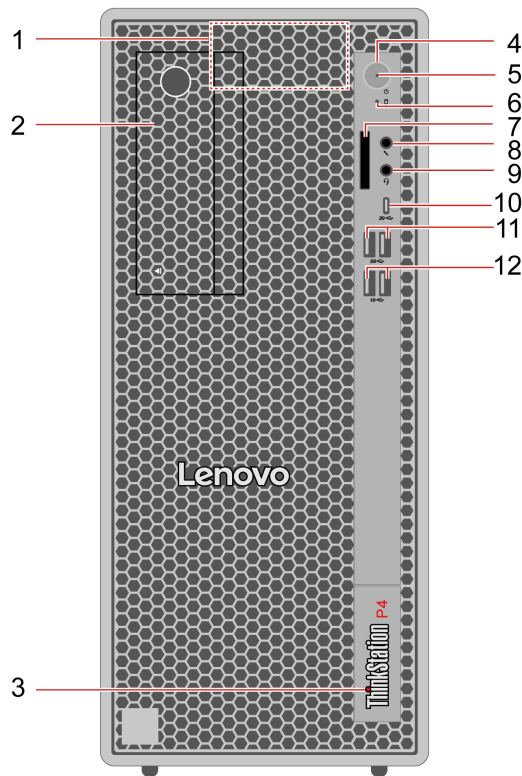
Model name	Machine types (MT)
ThinkStation P4	30KN, 30KQ, 30KR

Before using this documentation, please read the following information:

- *Setup Guide* (printed)
- *Safety and Warranty Guide* (printed)
- Compliance information available at the following links:
 - *Generic Safety and Compliance Notices*: https://pcsupport.lenovo.com/docs/generic_notices
 - *Regulatory Notice*: https://support.lenovo.com/docs/common_commercial_rn
 - Additional compliance information: <https://www.lenovo.com/compliance>
- Illustrations in this documentation might look different from your product.
- Depending on the model, some optional accessories, features, software programs, and user interface instructions might not be applicable to your computer.
- Depending on the version of operating systems and programs, some user interface instructions might not be applicable to your computer.
- Documentation content is subject to change without notice. To get the latest documentation, go to <https://support.lenovo.com/documentation>.

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)

Note: For more information about the USB connector name update, see Appendix B “Notice for USB connector name update” on page 74.

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 9.

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 9.

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

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

USB Charge in Hibernate or Power-off mode

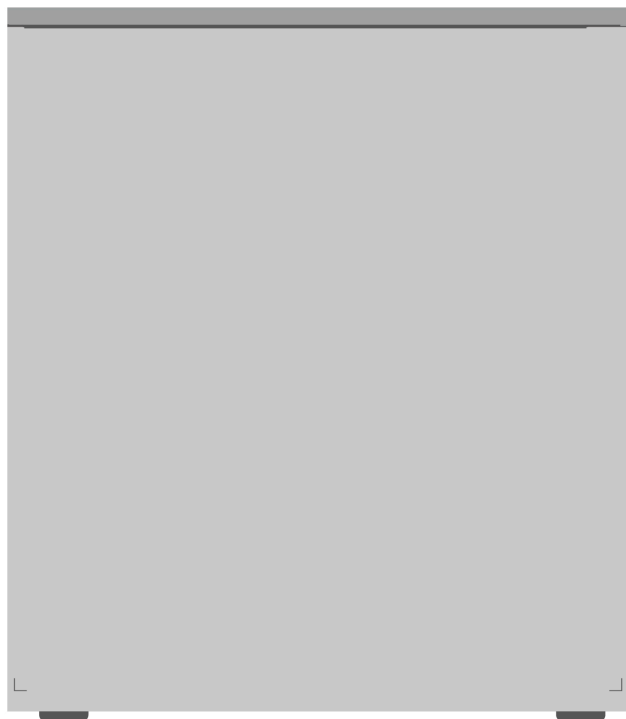
The USB-C connector (USB 20Gbps) on the front panel can charge a USB-compatible device when the system is in hibernate or power-off state when the feature is enabled. When disabled, power is available only when the computer is on.

To enable or disable the feature, do the following:

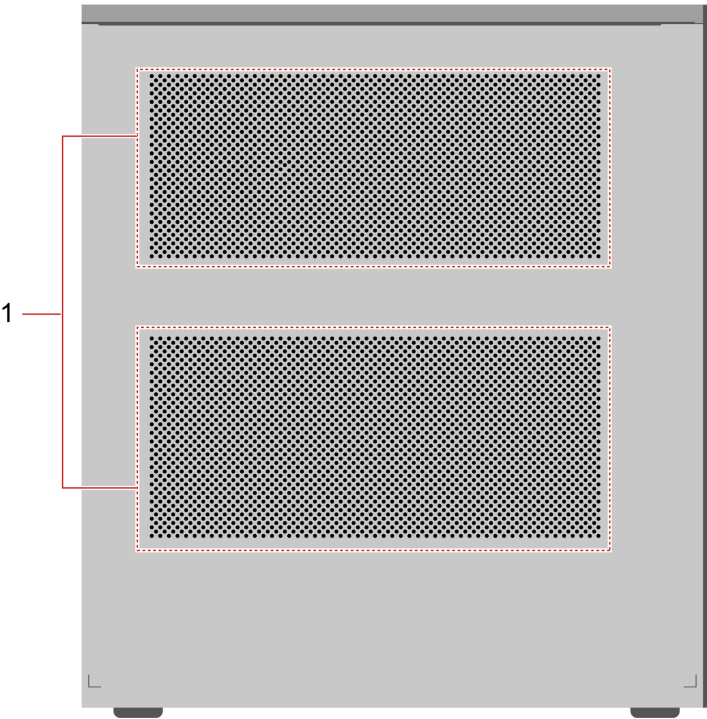
1. Turn on or restart the computer. When the logo screen is displayed, press F1 or Fn+F1 to enter the UEFI BIOS menu.
2. Click **Power** and select **Enabled** or **Disabled** under the **USB Charge in Hibernate/Power-off**.

Left

For models with 500-watt power supply



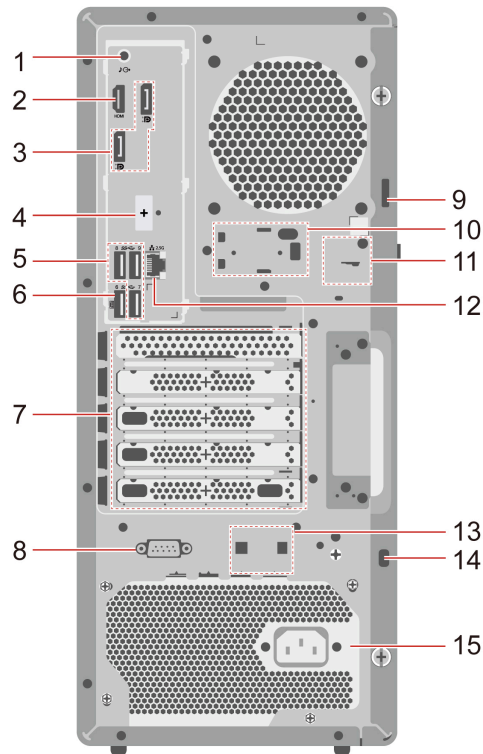
For models with 750-watt or 1100-watt power supply



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

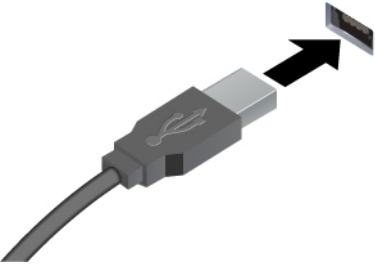
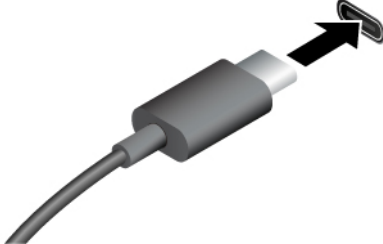
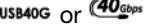
The flexible I/O connector and the PCIe card I/O connectors support multiple configurations depending on the cards installed in the system. For supported cards and corresponding I/O connectors, see “I/O connector” on page 11.

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
	Connect USB-A compatible devices, such as a USB-A keyboard, USB-A mouse, USB-A storage device, or USB-A printer. •  USB-A connector (Hi-Speed USB) •  USB-A connector (USB 5Gbps) •  USB-A connector (USB 10Gbps)
	• 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. •  USB-C connector (USB 20Gbps) •  USB-C connector (USB4 40Gbps)

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

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:

1. Open the system menu from the top-right corner and click .
2. Click **System** → **About**.

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

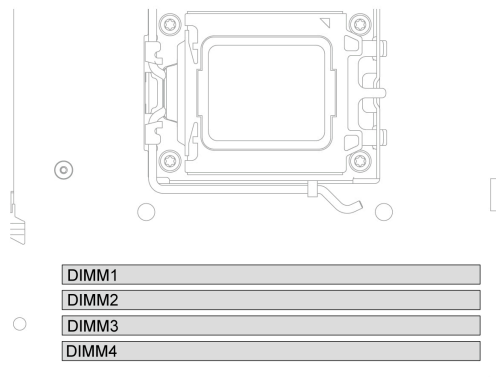
- Processor family: AMD® Ryzen™ 5 / 7 / 9 PRO 9000 Series, with up to 16 cores, 5.5 GHz, and 170W TDP
- Integrated graphics: AMD Radeon™ Graphics

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 11.

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

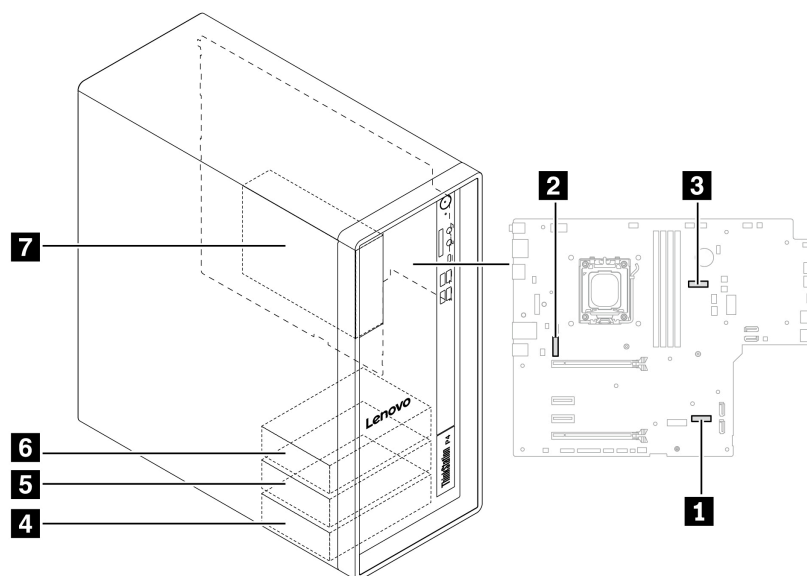
Notes:

- 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 65 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.

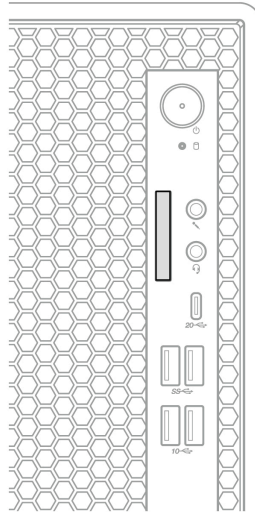
HDD and ODD

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 4 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

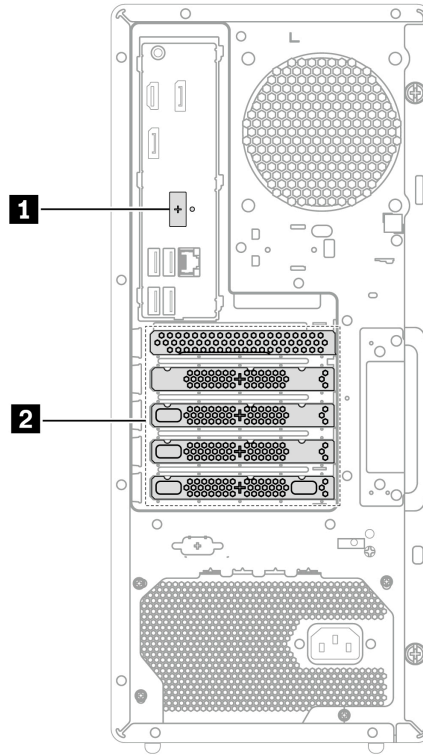
Insert a compatible SD card into the SD card reader. The card can then be accessed through the operating system for file transfer and storage. To install or remove an SD card, see “Use a media card (for selected models)” on page 17.

Replacement steps and rules of storage devices

To add or replace the storage devices, see “Storage” on page 34 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

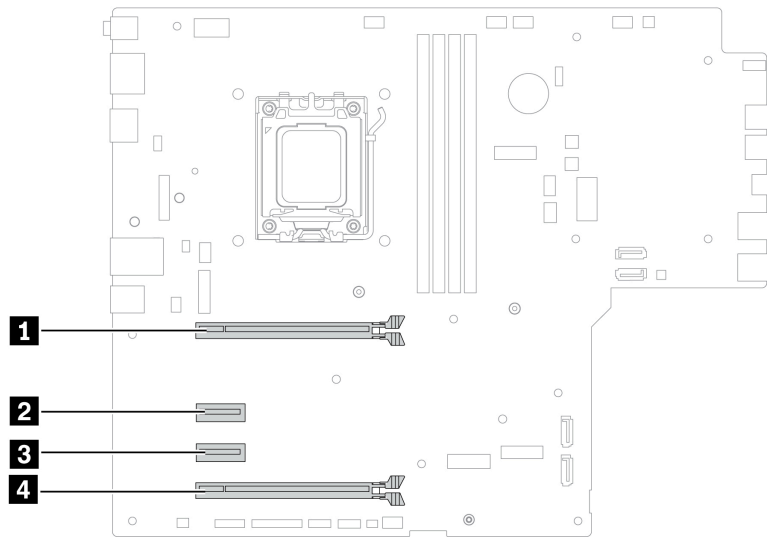
To install or replace a flexible I/O port card, see “Flexible I/O port card” on page 59 for replacement steps.

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:

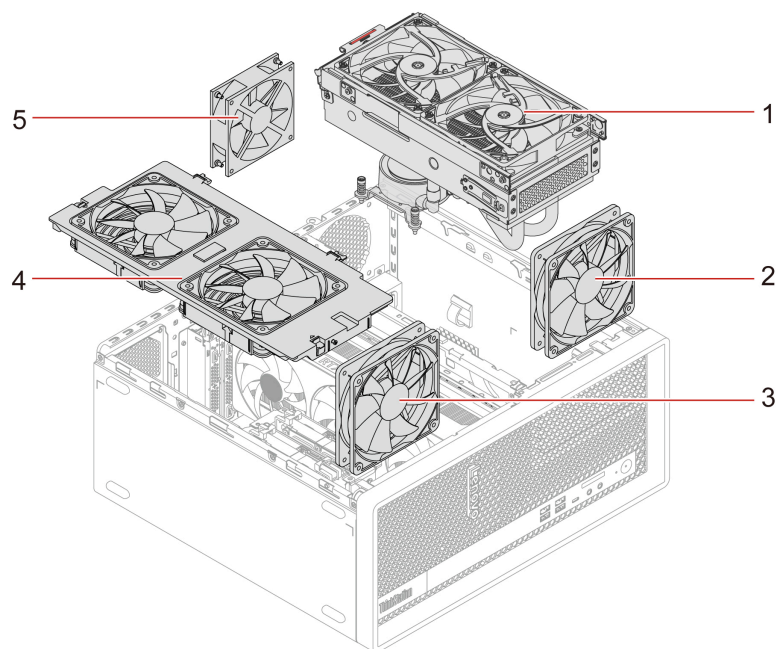


Slot	Type
1	PCIe Gen 5 x16 slot
2	PCIe x1 slot (open ended)
3	PCIe x1 slot (open ended)
4	PCIe Gen 4 x4 slot (physical link width x16 and negotiable link width x4)

To install or replace a PCIe card, see “PCIe card” on page 52 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 46 for replacement steps.

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

Chapter 3. Get started

Connect to an external display

Connect a projector or a monitor to your computer to give presentations or expand your workspace.

Connect to a wired display

1. Connect the external display to an appropriate video connector on your computer.
2. Connect the external display to an electrical outlet.
3. Turn on the external display.

Change display settings

1. Right-click a blank area on the desktop and select display settings.
2. Select the display that you want to configure and change display settings of your preference.

Get started with Ubuntu Desktop (24.04 LTS)

Learn the basics of Ubuntu and start working with it right away. For more information about Ubuntu, see the Ubuntu documentation site at: <https://help.ubuntu.com/lts/ubuntu-help/index.html>.

The Gnome desktop is installed by default and is designed to be simple and easy to use. Details on using Gnome are available by launching the Help application or online at <https://help.gnome.org/>.

Launch an app

- Press the Super key (with the Windows logo) or open the Activities menu on the top left and type in the name of the application you want to launch.
- Click the **Show Apps** button on the lower left, and select the application you want to launch.

Launch settings

Open the system menu from the top-right corner and click .

Access networks

This section helps you access networks through connecting to a wireless or wired network.

Connect to Wi-Fi networks (for selected models)

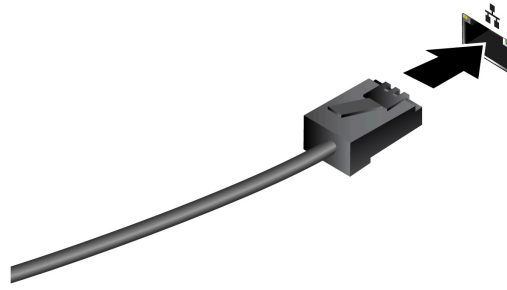
If your computer includes a wireless LAN module, you can connect your computer to Wi-Fi® networks.

1. Open the system menu from the top-right corner and turn on the Wi-Fi by clicking **Wi-Fi** button.
2. Click > to expand the Wi-Fi section of the menu. A list of available wireless networks is displayed. Click **All Networks** to see extra options.
3. Select an available network for connection. Provide required information if needed.

Note: The wireless LAN module on your computer may support different standards. For some countries or regions, the use of 802.11ax and 802.11be may be disabled according to local regulations.

Connect to the wired Ethernet

Connect your computer to a local network through the Ethernet connector on your computer with an Ethernet cable.



Transfer data

Quickly share your files using the built-in Bluetooth technology among devices with the same features. You also can install a disc or media card to transfer data.

Connect to a Bluetooth-enabled device (24.04 LTS) (for selected models)

You can connect all types of Bluetooth-enabled devices to your computer, such as a keyboard, a mouse, a smartphone, or speakers. Place the device that you are attempting to connect to less than 10 meters (33 feet) from the computer.



1. Open the system menu from the top-right corner and turn on the Bluetooth by clicking **Bluetooth** button.
2. Click > to expand the Bluetooth section of the menu. A list of discoverable devices is displayed.
3. Select a Bluetooth device, and then follow the on-screen instructions.

Your Bluetooth-enabled device and computer will automatically connect the next time if the two devices are in range of each other with Bluetooth turned on. You can use Bluetooth for data transfer or remote control and communication.

Use the optical drive (for selected models)

If your computer has an optical drive, read the following information.

Install or remove a disc

1. With the computer on, press the eject button on the optical drive. The tray slides out of the drive.
2. Insert a disc into the tray or remove a disc from the tray, and then push the tray back into the drive.

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

Record a disc

1. Insert a recordable disc into the optical drive that supports recording.
2. In the **Blank CD/DVD-R Disc** notification that pops up at the bottom of the screen, select **Open with CD/DVD Creator**.
3. Follow the on-screen instructions.

Use a media card (for selected models)

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

Install a media card

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

Remove a media card

Attention: Before removing a media card, unmount the card from the operating system first. Otherwise, data on the card might get corrupted or lost.

1. Launch the **Files** application.
2. Select the unmount icon next to the card and unmount the card from the operating system.
3. Press the card and remove it from your computer. Store the card safely for future use.

Set the power plan

For ENERGY STAR® compliant computers, the following power plan takes effect when your computers have been idle for a specified duration:

- Turn off the display: After 5 minutes
- Put the computer to sleep: After 20 minutes

To awaken the computer from Sleep mode, press any key on your keyboard.

To set the power plan:

1. Go to **Settings → Power**.
2. Choose or customize a power plan of your preference.

Smart power-on feature (for selected models)

The smart power-on feature helps you start up or wake up the computer from the hibernation mode simply by pressing Alt+P.

Note: Ensure that the keyboard is connected to a USB connector supporting the smart power-on feature.

Enable or disable the smart power-on feature

To enable or disable the smart power-on feature:

- Step 1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
- Step 2. Select **Power → Smart Power On** and press Enter.
- Step 3. Enable or disable the feature as desired.
- Step 4. Press F10 or Fn+F10 to save the changes and exit.

Security solutions

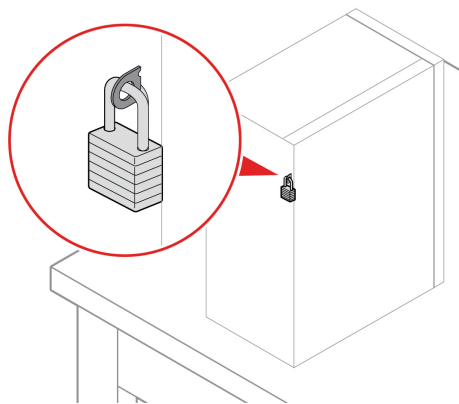
Lenovo values your information security. Your computer can be secured by physical locks, software solutions, and BIOS solutions. They can protect your computer from harm, theft, or unauthorized use.

Use physical locks

Note: Lenovo makes no comments, judgments, or warranties about the function, quality, or performance of the locking device and security feature. You can purchase a padlock or a security lock from Lenovo.

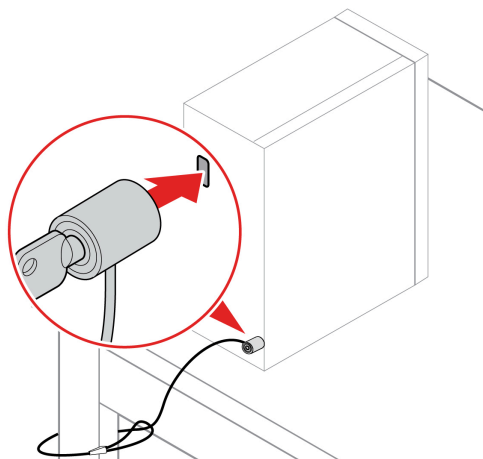
Padlock

Lock the computer cover through a padlock prevents unauthorized access to the inside of your computer.



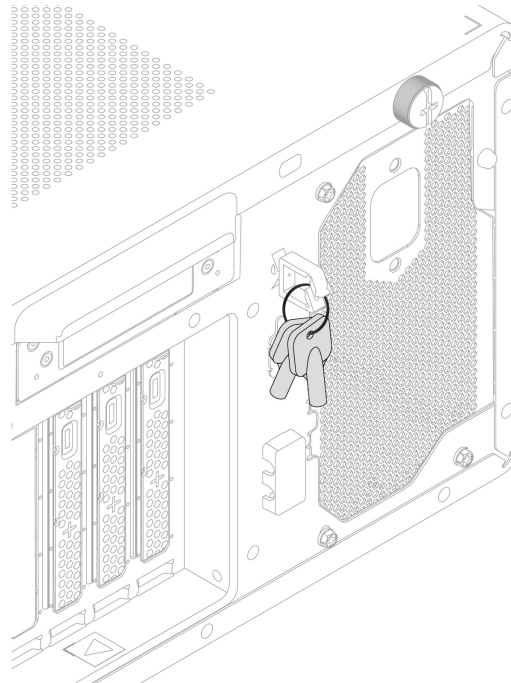
Security lock

Lock your computer to a desk, table, or other fixtures through a security lock.



Lock of the front-access HDD cage

Your computer might have a front-access HDD cage with lock. The lock prevents any unexpected removal or data loss. The keys are attached at the rear panel of the computer.

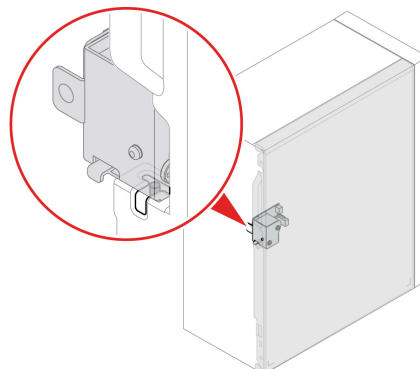


To unlock the front-access HDD cage to install or replace the storage drive, see “3.5-inch HDD” on page 37.

E-lock

Your computer might have an E-lock installed to protect the computer from unauthorized tampering of the internal components. Using the E-Lock, you can mechanically lock or unlock the computer cover. To enable or disable the E-Lock:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Security** → **Electronic Lock** to enable or disable the E-lock.
3. Press F10 or Fn+F10 to save the changes and exit. Your computer will restart automatically and then changes take effect.



Use BIOS security solutions

This section provides BIOS solutions to secure your computer and information.

Wipe the storage drive data (for selected models)

It is recommended that you wipe the storage drive data before recycling the storage drive or the computer.

To wipe the storage drive data:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Security** → **secure wipe** → **Enabled**.
3. Press F10 or Fn+F10 to save the changes and exit.
4. Restart the computer. When the logo screen is displayed, press F12 or Fn+F12.
5. Select **App Menu** → **secure wipe** and press Enter.
6. Select the storage drive you will wipe and click **NEXT**.
7. Select the entire storage drive or partition to wipe as desired.
8. Select the method as desired and click **NEXT**.
9. Click **Yes** to confirm your option when the prompting window is displayed.
10. If you have set a hard disk password for the storage drive, enter the password. Otherwise, set a temporary password following the on-screen instructions. Then, click **NEXT**. The wiping process begins.

Note: Duration of the wiping process varies depending on the storage drive capacity.

11. Click **Reboot** when you are prompted to reset the system, and then one of the following will happen:
 - If the system storage drive data is wiped, you will be prompted that no operating system is found.
 - If the non-system storage drive data is wiped, the computer restarts automatically.

Cover presence switch

The cover presence switch prevents the computer from logging in to the operating system when the computer cover is not properly installed or closed.

To enable or disable the cover presence switch connector on the system board:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Security** → **Cover Tamper Detected** and press Enter.
3. Select **Enabled** or **Disabled** and press Enter.
4. Press F10 or Fn+F10 to save the changes and exit.

If the cover presence switch is enabled and the computer cover is not correctly installed or closed, an error message will be displayed when you turn on the computer. To bypass the error message and log in to the operating system, properly install and close the computer cover, and then enable the cover presence switch connector again in the BIOS menu.

Smart USB Protection

The Smart USB Protection function is a security function that helps prevent data from being copied from the computer to USB storage devices connected to the computer. You can set the Smart USB Protection function to one of the following modes:

- **Disabled** (default setting): You can use the USB storage devices without limitation.
- **Read Only:** You cannot copy data from the computer to the USB storage devices. However, you can access data on the USB storage devices.

- **No Access:** You cannot access the USB storage devices from the computer.

To configure the Smart USB Protection function:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Security → Smart USB Protection** and press Enter.
3. Select the desired setting and press Enter.
4. Press F10 or Fn+F10 to save the changes and exit.

Absolute Persistence (for computers purchased outside mainland China)

Absolute Persistence technology is embedded in BIOS. It detects changes that happen on the hardware, software, or the call-in location. It keeps you always knowing what condition the computer is in. To activate the technology, you have to purchase a subscription to Absolute.

UEFI BIOS passwords

You can set passwords in UEFI (Unified Extensible Firmware Interface) BIOS (Basic Input/Output System) to strengthen the security of your computer.

Password types

You can set a power-on password, supervisor password, system management password, or hard disk password in UEFI BIOS to prevent unauthorized access to your computer. However, you are not prompted to enter any UEFI BIOS password when your computer resumes from sleep mode.

- Power-on password

When a power-on password is set, you are prompted to enter a valid password each time the computer is turned on.

- Supervisor password

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

When a supervisor password is set, you are prompted to enter a valid password each time you try to enter the BIOS menu.

If both the power-on password and supervisor password are set, you can enter either password. However, you must use your supervisor password to change any configuration settings.

- Hard disk password

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

Note: After you set a hard disk password, your data on the storage drive is protected even if the storage drive is removed from one computer and installed in another.

- System management password (for selected models)

You can enable the system management password to have the same authority as the supervisor password to control security related features. To customize the authority of the system management password through the UEFI BIOS menu:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Security → System Management Password Access Control**.
3. Follow the on-screen instructions.

If you have set both the supervisor password and the system management password, the supervisor password overrides the system management password.

Set, change, and remove a password

Before you start, print these instructions.

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Security**.
3. Depending on the password type, select **Set Supervisor Password**, **Set Power-On Password**, **Set System Management Password**, or **Hard Disk Password** and press Enter.
4. Follow the on-screen instructions to set, change, or remove a password.
5. Press F10 or Fn+F10 to save the changes and exit.

You should record your passwords and store them in a safe place. If you forget the passwords, contact a Lenovo-authorized service provider.

Note: If the hard disk password is forgotten, Lenovo cannot remove the password or recover data from the storage drive.

Chapter 4. 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.

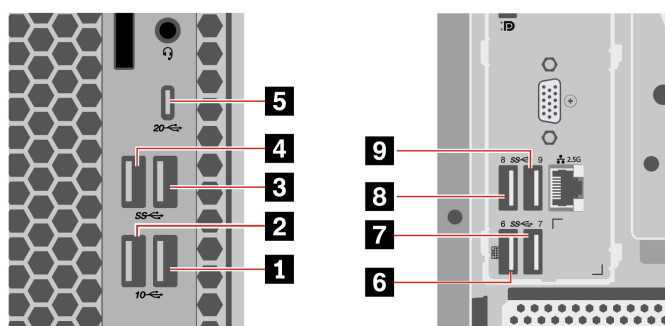
Menu	Introduction
Main	This category provides the general product-related and firmware information including system summary, machine type, product serial number, UUID number, etc.
Devices	This category introduces how to configure various devices such as USB ports and audio controllers.
Advanced	This 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
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:

Using the built-in software update service

Ubuntu software update will check the LVFS site for any firmware updates and notify you when updates are available.

From the Lenovo Support Web site

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

Step 1. Go to <https://pcsupport.lenovo.com> and select the entry for your computer.

Step 2. Click **Drivers & Software** → **Manual Update** → **BIOS/UEFI**.

Step 3. Follow the on-screen instructions to download and install the latest UEFI BIOS update package.

Chapter 5. 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.

Notes:

- 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.

Chapter 6. CRU replacement

Learn about how to remove or install the hardware components in your computer.

Before CRU replacement

Before replacing hardware of your computer, read this section first. You will get to know what is CRU, the CRU list, system board connectors, and prerequisites for CRU replacement.

What is CRU

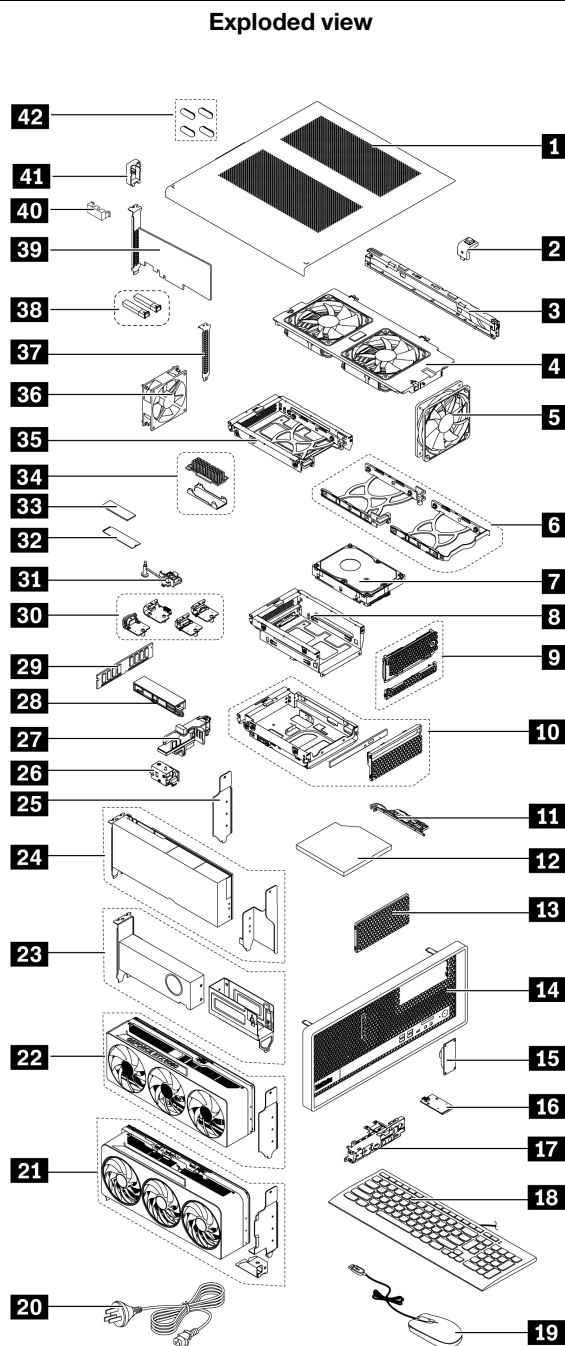
Customer Replaceable Units (CRUs) are parts that can be replaced by the customer. Lenovo computers contain the following types of CRUs:

- **Self-service CRUs:** Refer to parts that can be replaced easily by customer 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 machine.

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. You might be required to return the defective part that is replaced by the CRU. When return is required: (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. For full details, see the Lenovo Limited Warranty documentation at:

https://www.lenovo.com/warranty/llw_02

CRU list



Part list

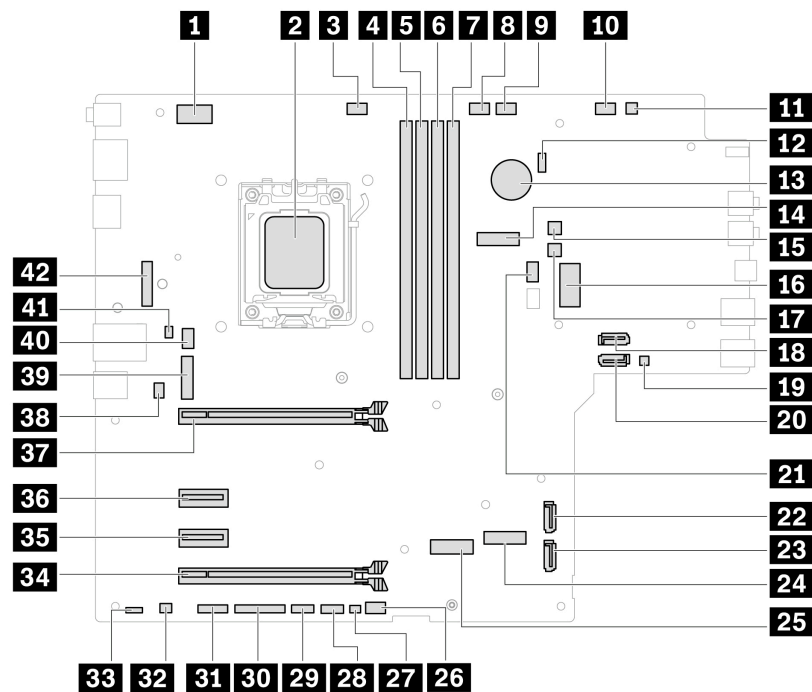
Self-service CRUs:

- 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*

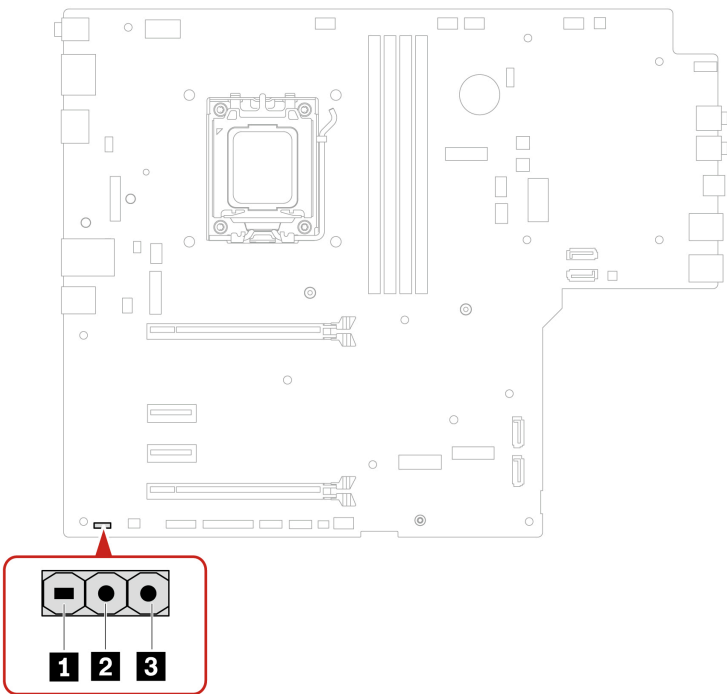
System board illustration



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
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)

Item	Item
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

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.

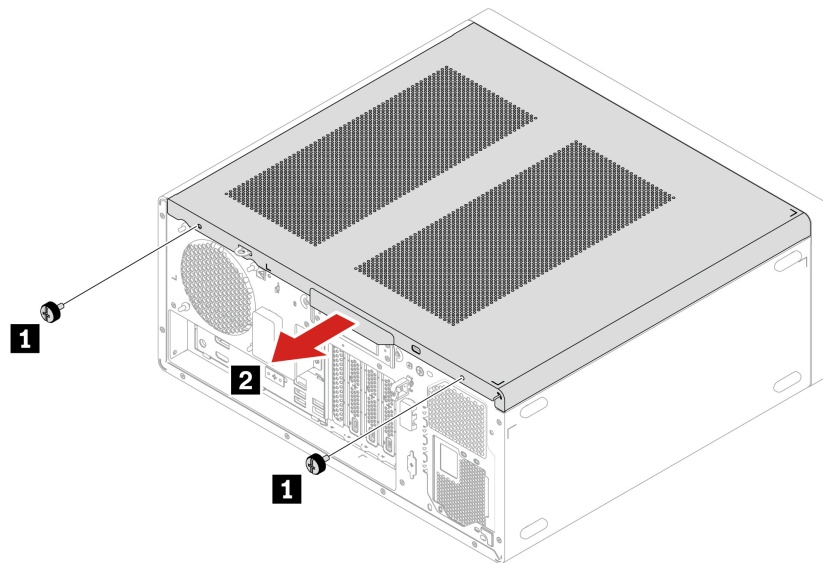
Left side cover

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

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.

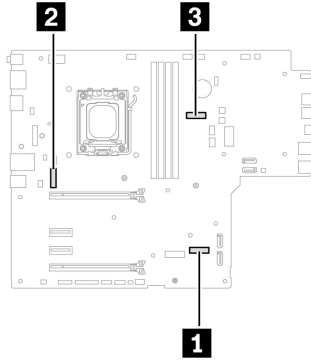
Storage

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

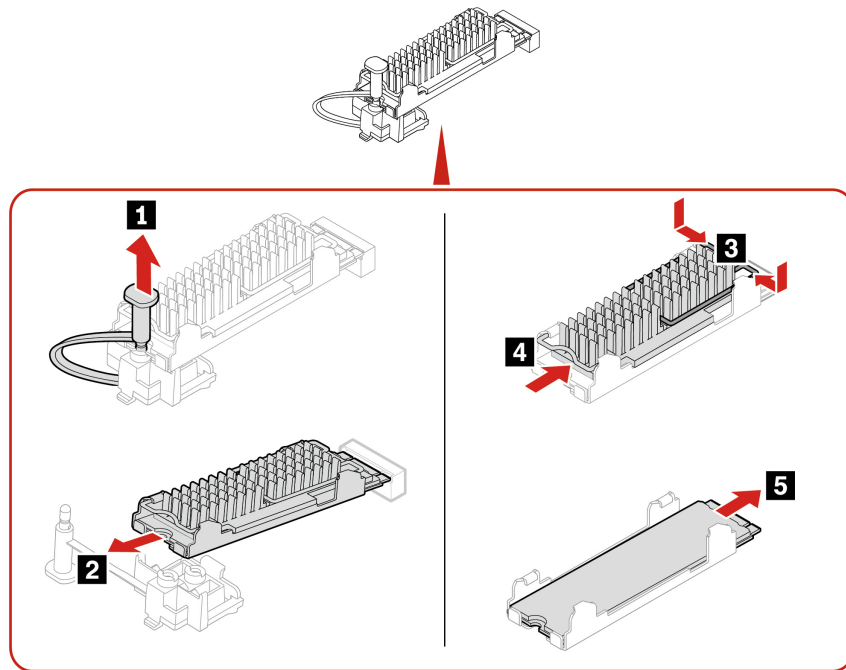
Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

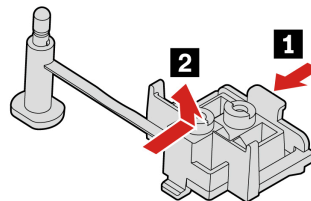


Removal steps of the M.2 SSD, heat sink kit, and holder of slot **1**

1. Remove the “Left side cover” on page 34.
2. Remove the M.2 SSD and heat sink kit



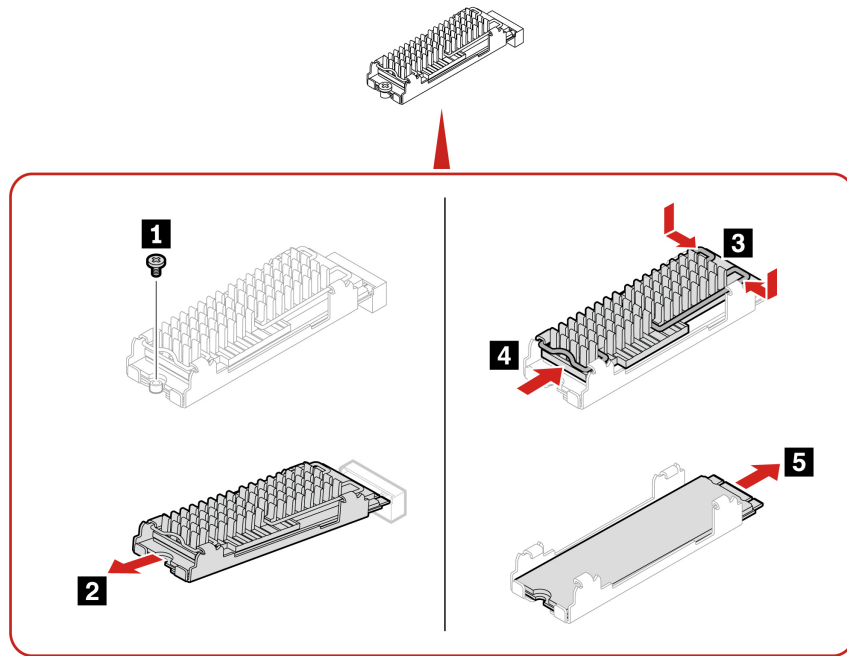
3. Remove the M.2 SSD holder.



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

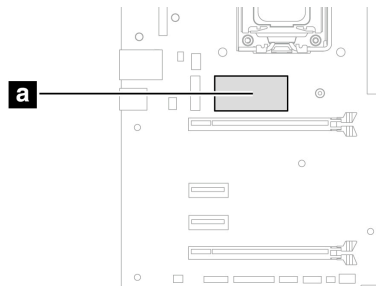
1. Remove the following parts, if any:
 - “Left side cover” on page 34

- “Slim ODD and slim-ODD latch” on page 45
 - “3.5-inch HDD” on page 37
 - “HDD and slim-ODD cages” on page 40
 - “Side fan with bracket” on page 47
 - “PCIe card” on page 52
 - “Chassis beam” on page 60
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.



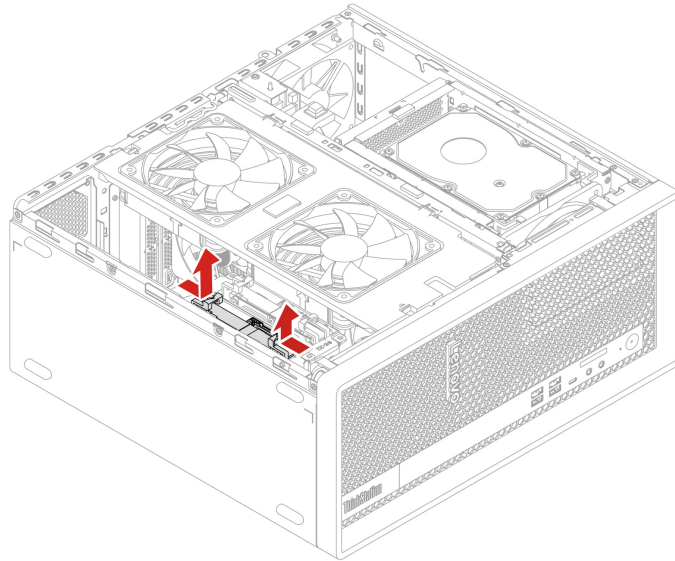
3.5-inch HDD

Prerequisite

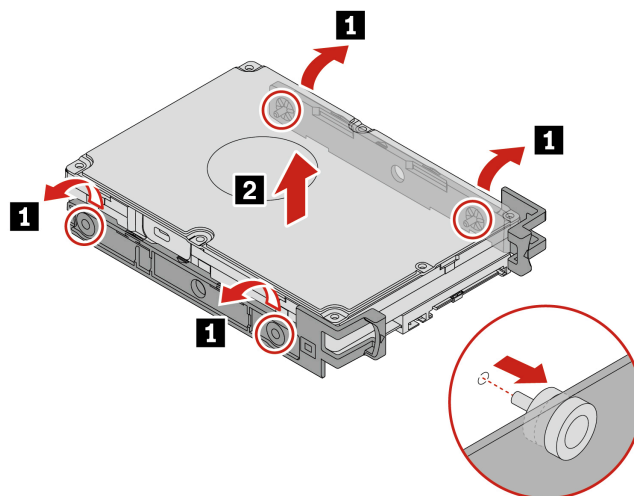
Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

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

1. Remove the “Left side cover” on page 34.
2. Remove the 3.5-inch HDD with tray from the HDD cage.



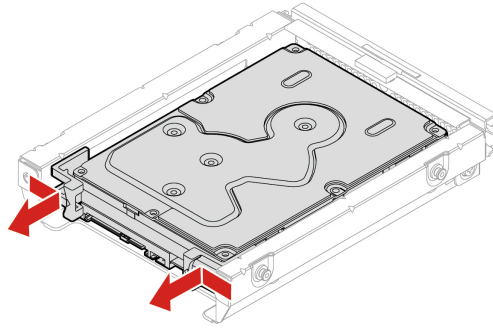
3. Remove the 3.5-inch HDD from the tray.



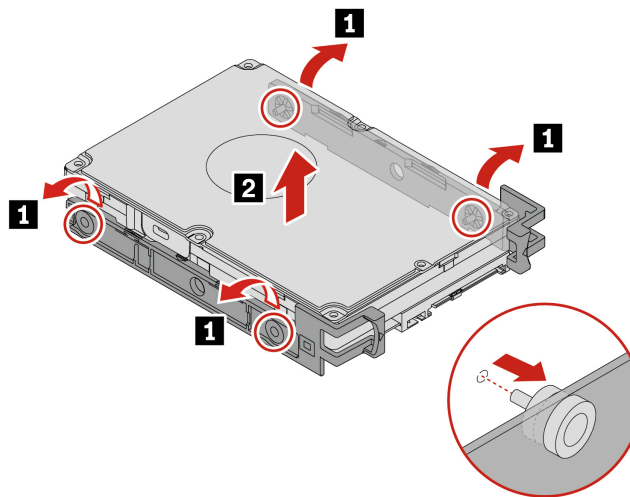
Removal steps of 3.5-inch HDD in the 3rd HDD cage

1. Remove the following parts:
 - a. “Left side cover” on page 34
 - b. “3rd HDD cage” on page 42

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

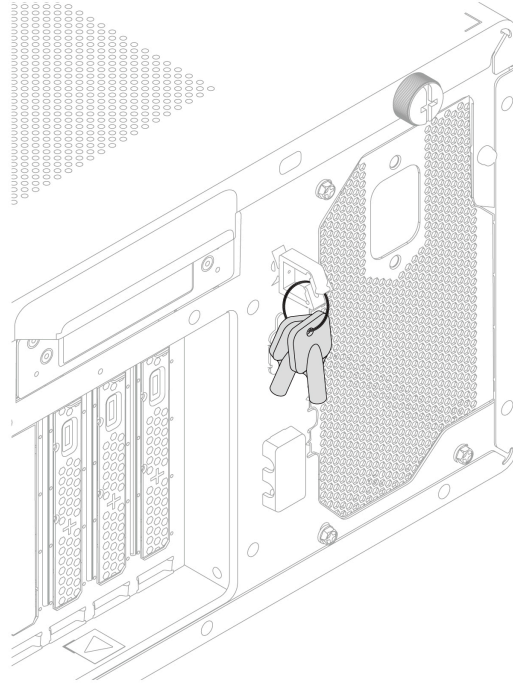


3. Remove the 3.5-inch HDD from the tray.

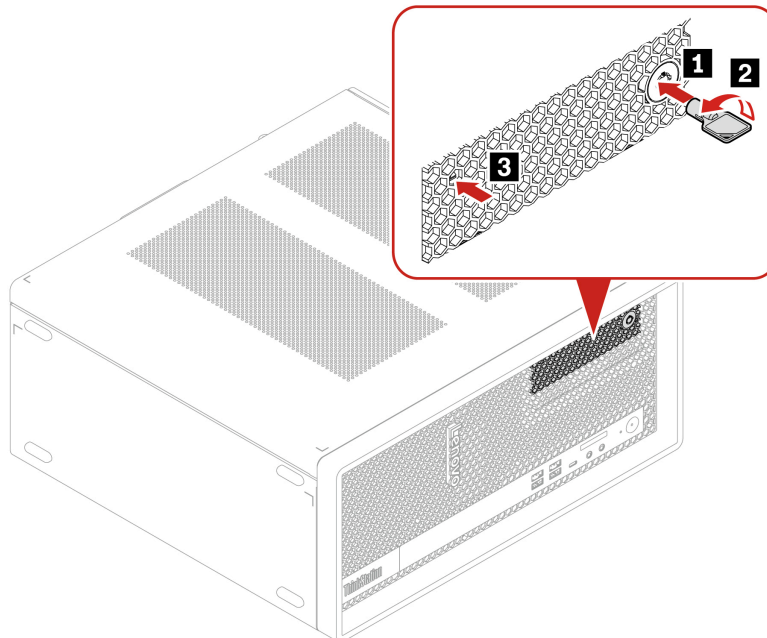


Removal steps of 3.5-inch HDD in the front-access HDD cage

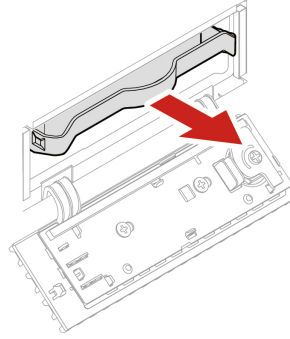
1. Find the key attached at the rear panel of the computer.



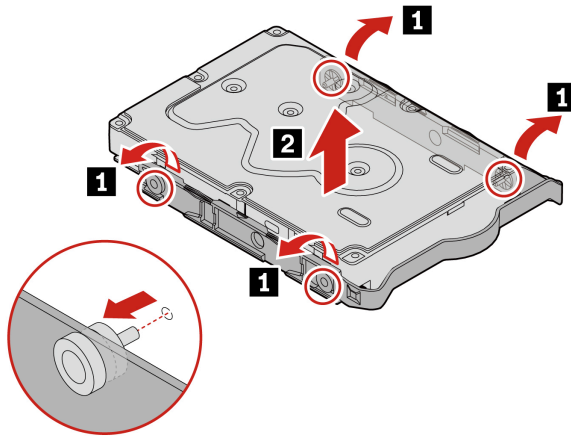
2. Open the front-access-HDD-cage bezel with the key.



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.

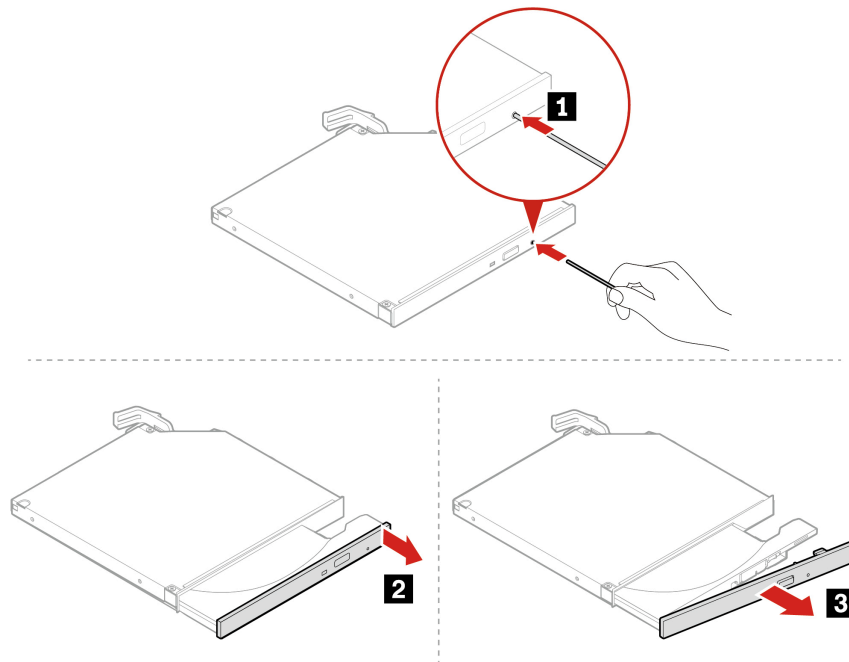
Slim-ODD bezel, cage, and front cover assembly

Prerequisite

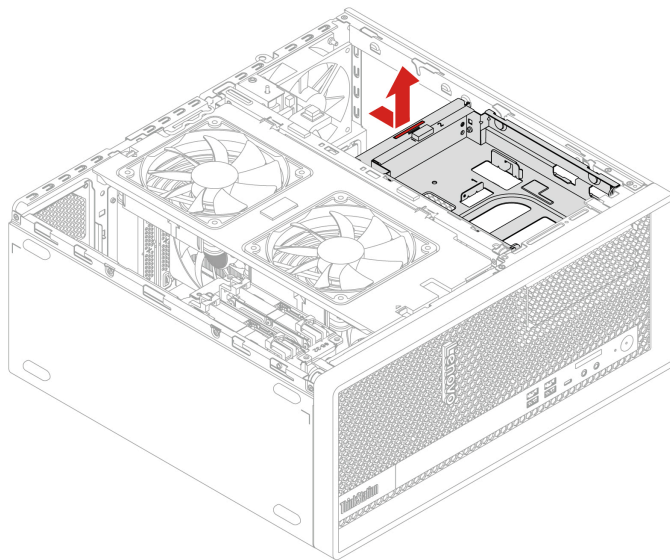
Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts:
 - a. “Left side cover” on page 34
 - b. “Slim ODD and slim-ODD latch” on page 45
2. Remove the slim-ODD bezel.

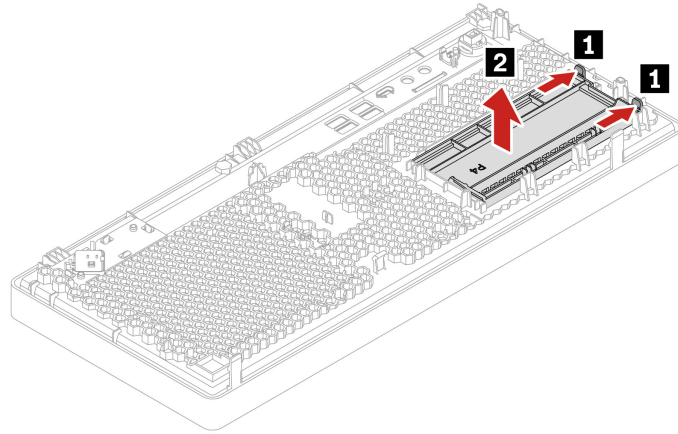


3. Remove the slim-ODD cage.



4. Remove the “Front bezel” on page 49.

5. Remove the slim-ODD front cover.



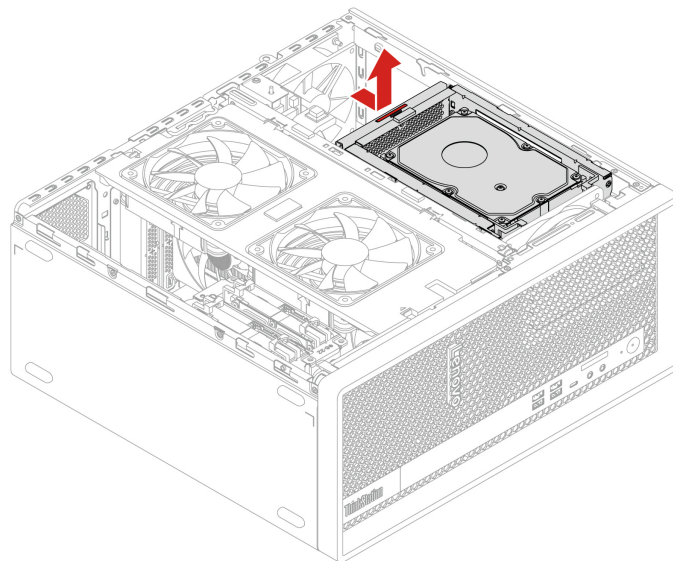
3rd HDD cage

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts, if any:
 - “Left side cover” on page 34
 - “3.5-inch HDD” on page 37
2. Remove the 3rd HDD cage.



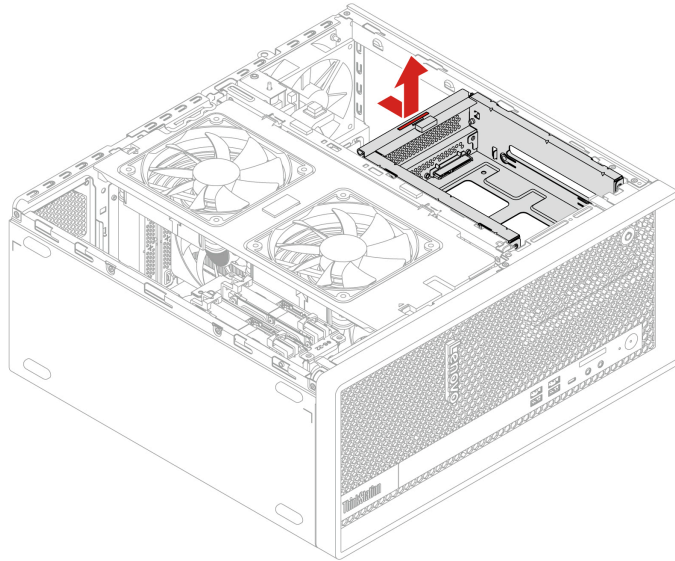
Front-access HDD cage

Prerequisite

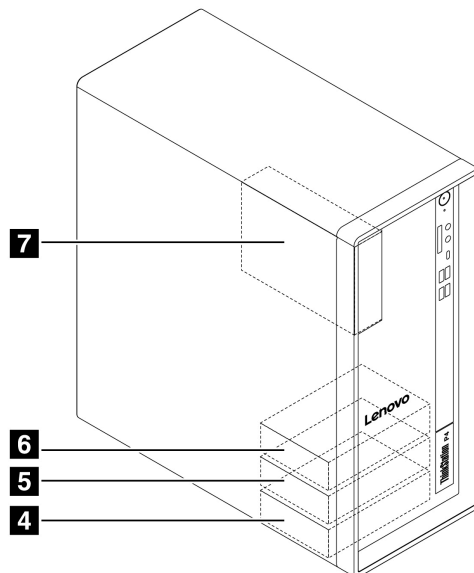
Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts, if any:
 - “Left side cover” on page 34
 - “3.5-inch HDD” on page 37
2. Remove the front-access HDD cage.



Storage installation rule



Follow these overall rules to install any storage cage:

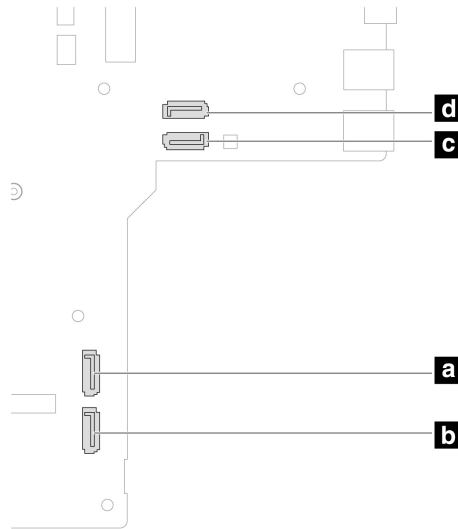
- Bay **4**: 1st HDD cage
- Bay **5**: 2nd HDD cage

- 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

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

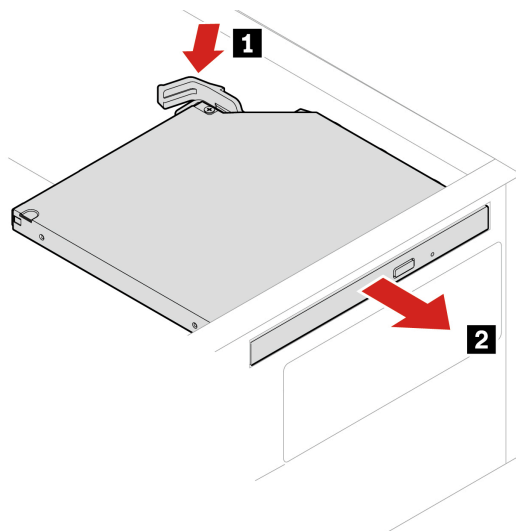
Slim ODD and slim-ODD latch

Prerequisite

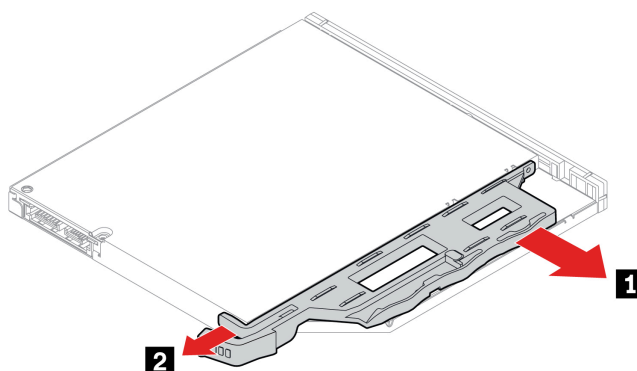
Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the “Left side cover” on page 34.
2. Remove the slim ODD.



3. Remove the slim-ODD latch.



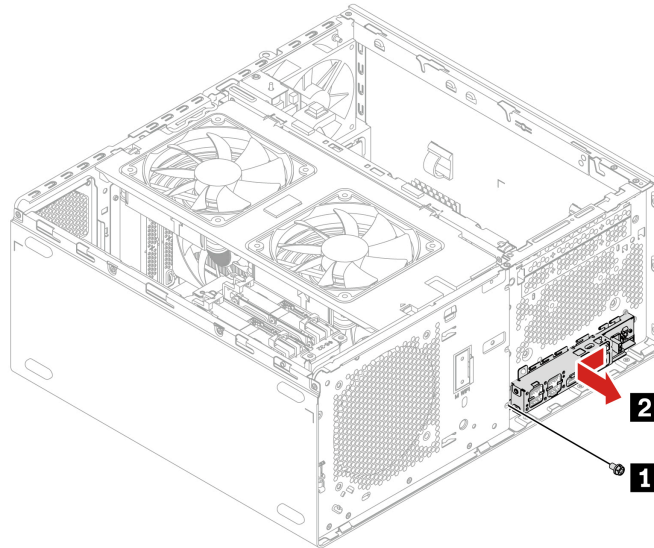
Front I/O bracket and SD card reader

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

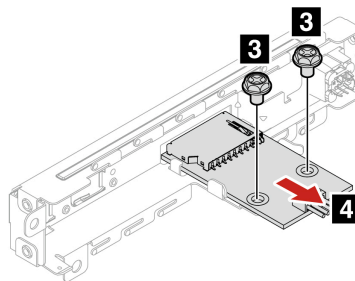
Removal steps

1. Remove the following parts, if any:
 - a. “Left side cover” on page 34
 - b. “Slim ODD and slim-ODD latch” on page 45
 - c. “3.5-inch HDD” on page 37
 - d. “HDD and slim-ODD cages” on page 40
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.

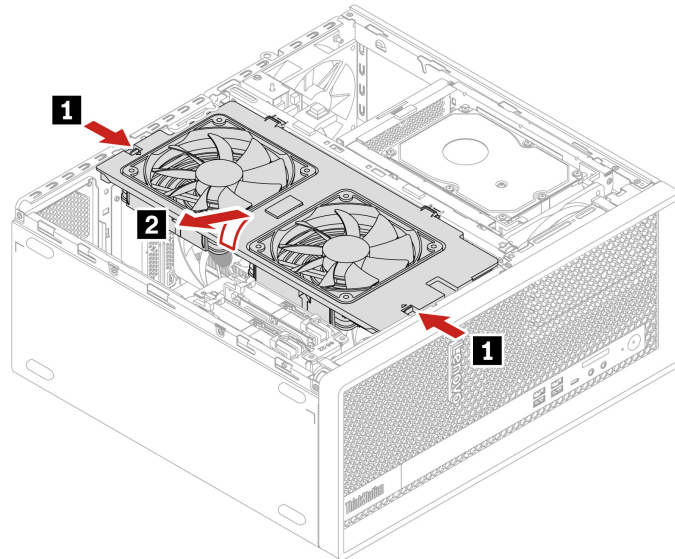
Side fan with bracket

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the “Left side cover” on page 34.
2. Remove the side fan with bracket (for selected models).



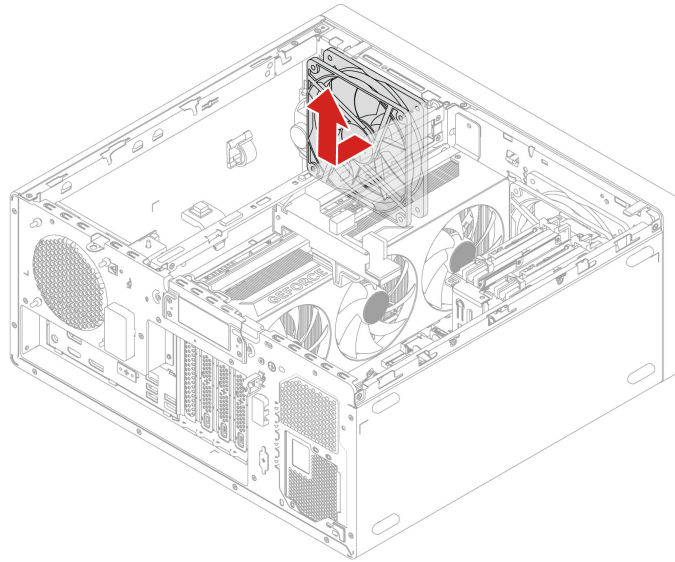
Front top fan

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts:
 - a. “Left side cover” on page 34
 - b. “Slim ODD and slim-ODD latch” on page 45
 - c. “3.5-inch HDD” on page 37
 - d. “HDD and slim-ODD cages” on page 40
 - e. “Side fan with bracket” on page 47
2. Pull to remove the front top fan.



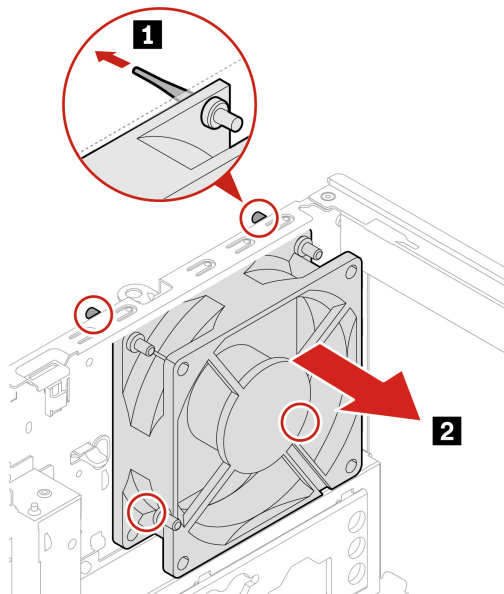
Rear fan

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

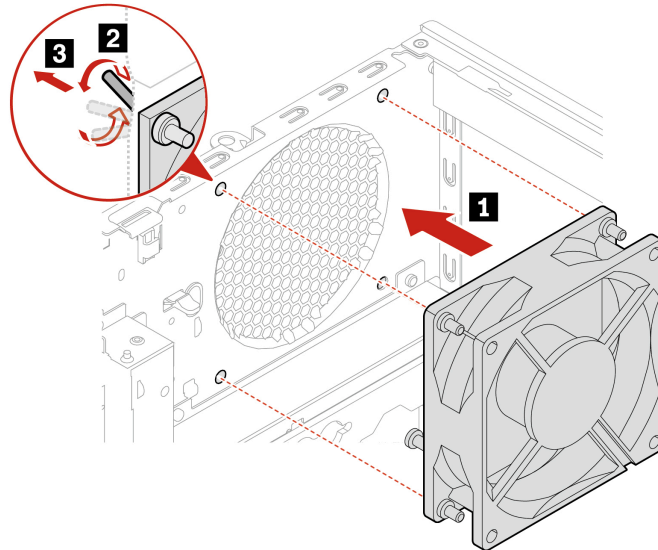
Removal steps

1. Remove the “Left side cover” on page 34.
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.



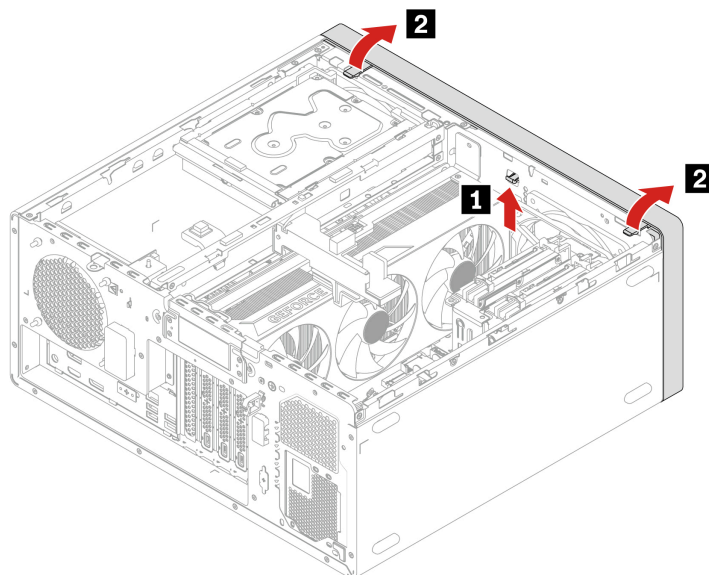
Front bezel

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts, if any:
 - a. “Left side cover” on page 34
 - b. “Slim ODD and slim-ODD latch” on page 45
 - c. “Slim-ODD bezel, cage, and front cover assembly” on page 40
 - d. “Side fan with bracket” on page 47
2. Press the hook and remove the front bezel.



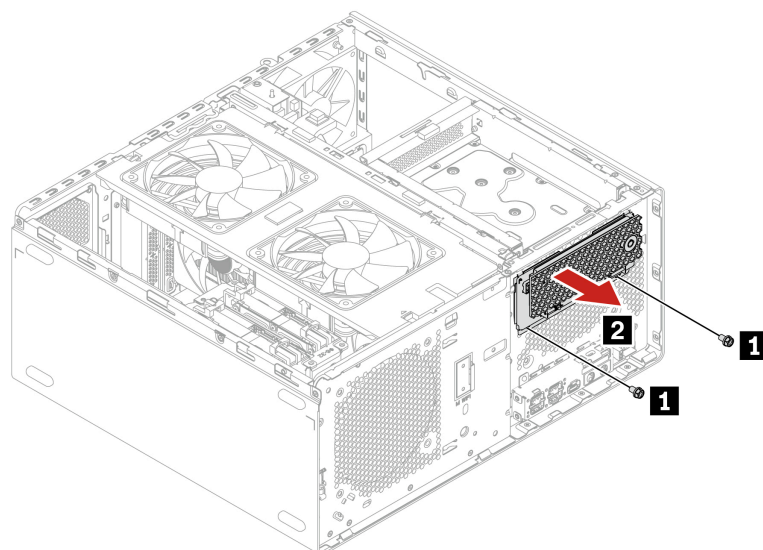
Front-access-HDD-cage bezel

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts:
 - a. “Left side cover” on page 34
 - b. “Side fan with bracket” on page 47
 - c. “Front bezel” on page 49
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)

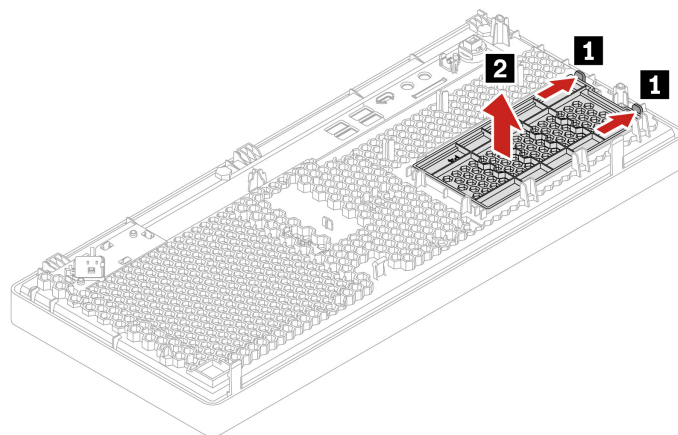
Flex-bay dummy bezel

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts:
 - a. “Left side cover” on page 34
 - b. “Side fan with bracket” on page 47
 - c. “Front bezel” on page 49
2. Remove the flex-bay dummy bezel.

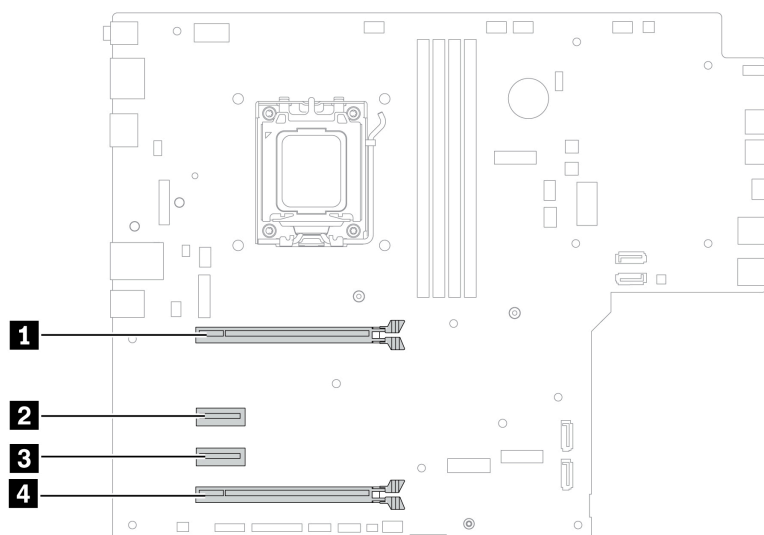


PCIe card

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

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 53.

PCIe card bracket

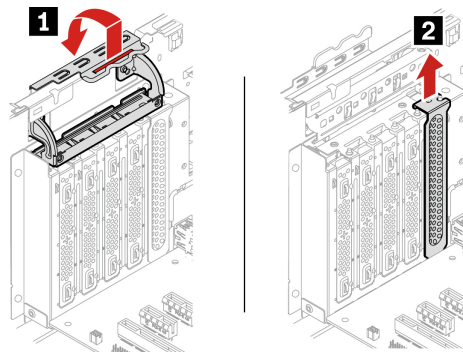
Note: Some computer models might not be shipped with PCIe card. In this case, the PCIe card bracket in the following illustration is removable.

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts, if any:
 - “Left side cover” on page 34
 - “Side fan with bracket” on page 47
2. Remove the PCIe card bracket.



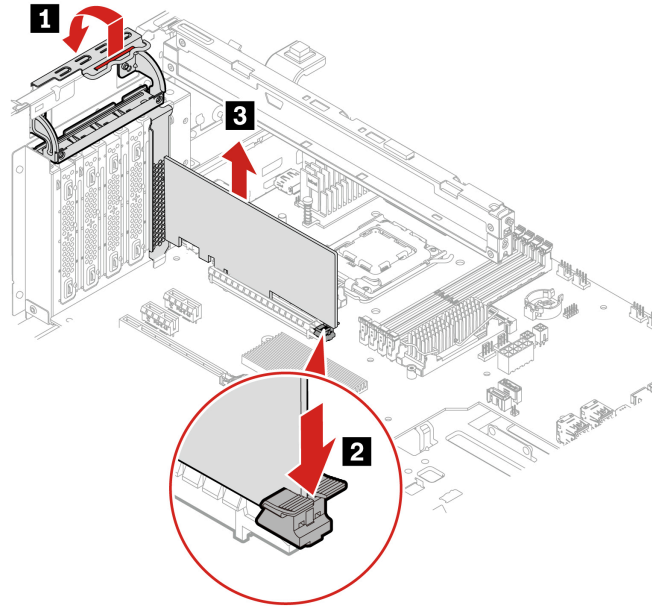
PCIe adapter card

Prerequisite

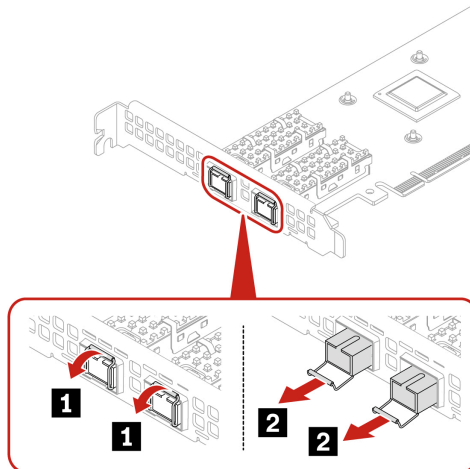
Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts, if any:
 - a. “Left side cover” on page 34
 - b. “Side fan with bracket” on page 47
2. Remove the PCIe adapter card.



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



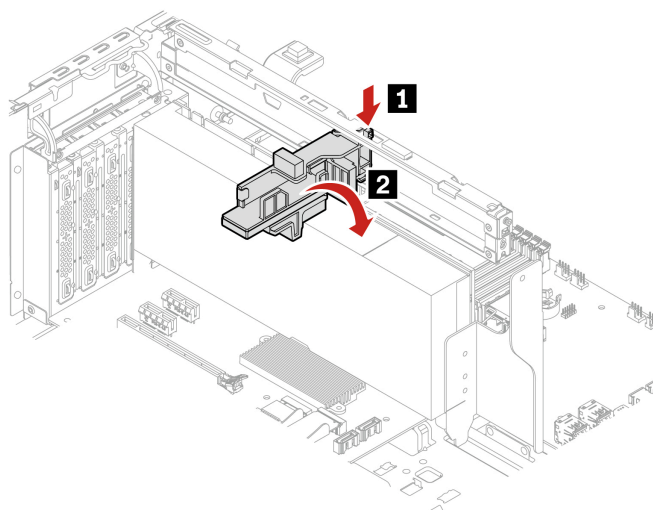
Graphics card

Prerequisite

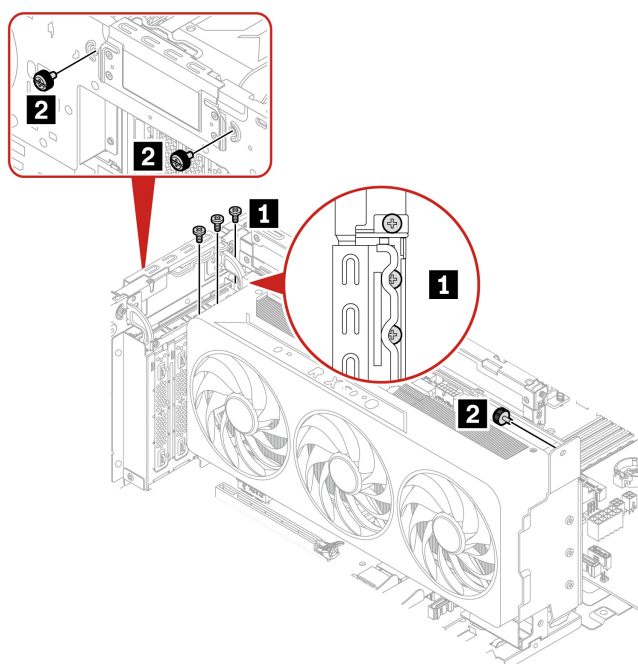
Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps of type-1 graphics card

1. Remove the following parts, if any:
 - “Left side cover” on page 34
 - “Side fan with bracket” on page 47
 - Graphics card retainer

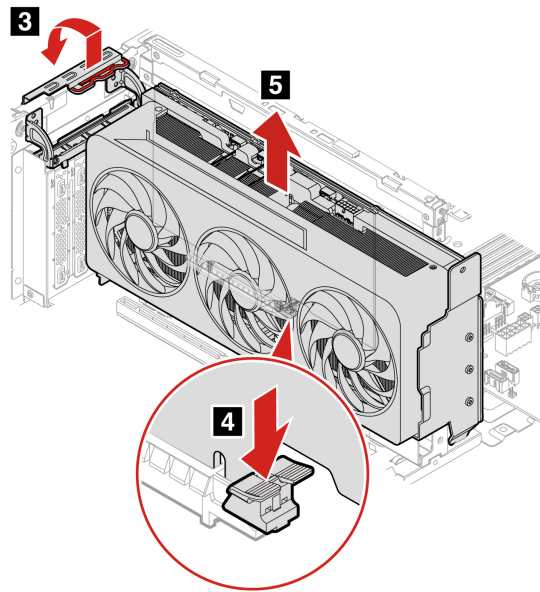


2. Remove the screws **1** and **2**, if any.



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)

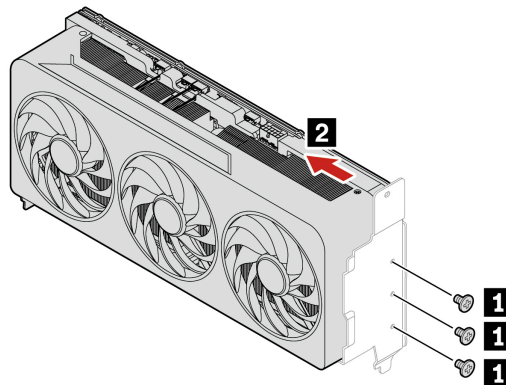
3. Remove the graphics card with the extender, if any.



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 65).

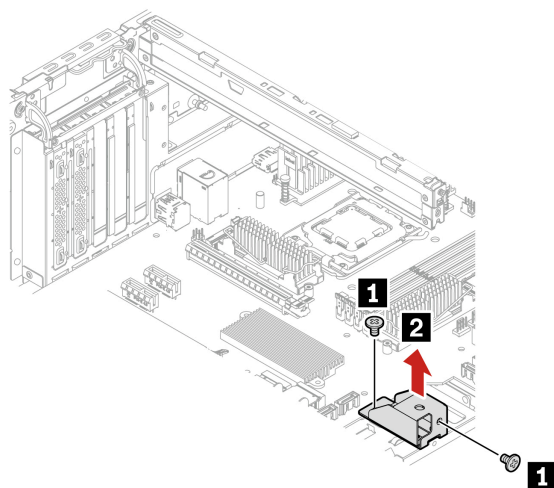
4. Remove the graphics card from the extender, if any.

Note: The extender may vary by models.



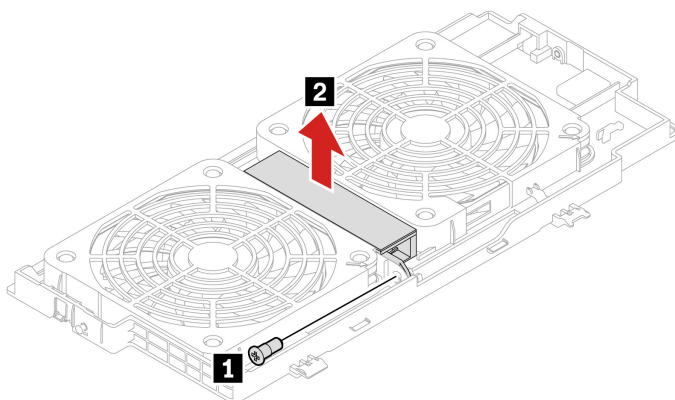
Step	Screw	Quantity	Torque
1	M3 × 5 mm (0.2 inches), Zn coated	2 or 3 (for selected models)	3 ± 0.5 in-lb (3.46 ± 0.58 kgf-cm)

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)

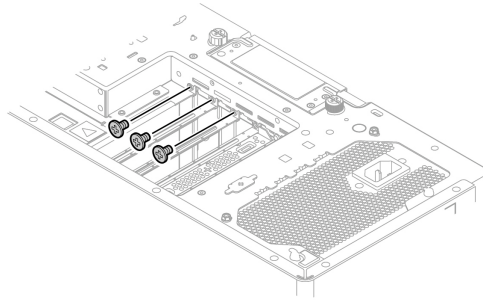
6. Remove the graphics card cable holder, if any.



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

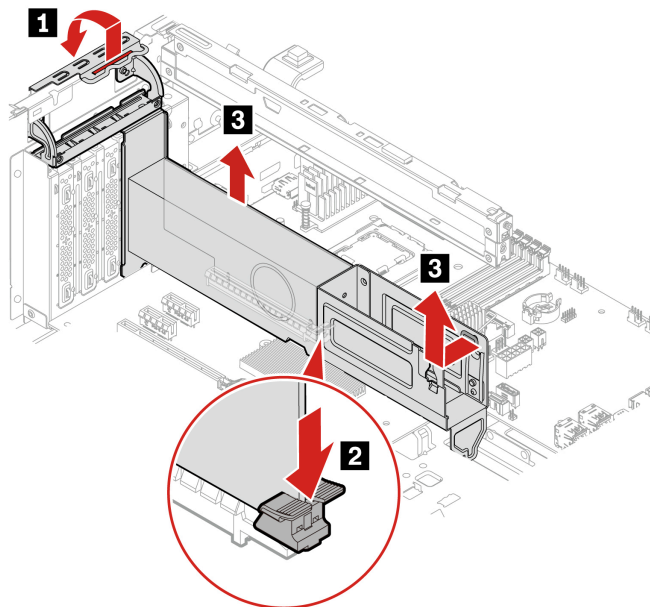
For certain models, remove the two or three screws on the rear panel (as shown) before installing the new graphics card.



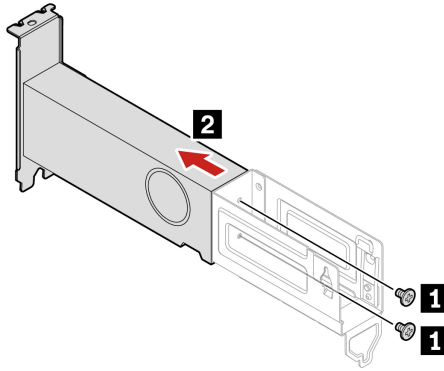
Screw	Quantity	Torque
#6-32 × 6mm (0.2 inches), Zn coated	2 or 3	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

Removal steps of type-2 graphics card

1. Remove the following parts, if any:
 - a. “Left side cover” on page 34
 - b. “Side fan with bracket” on page 47
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)

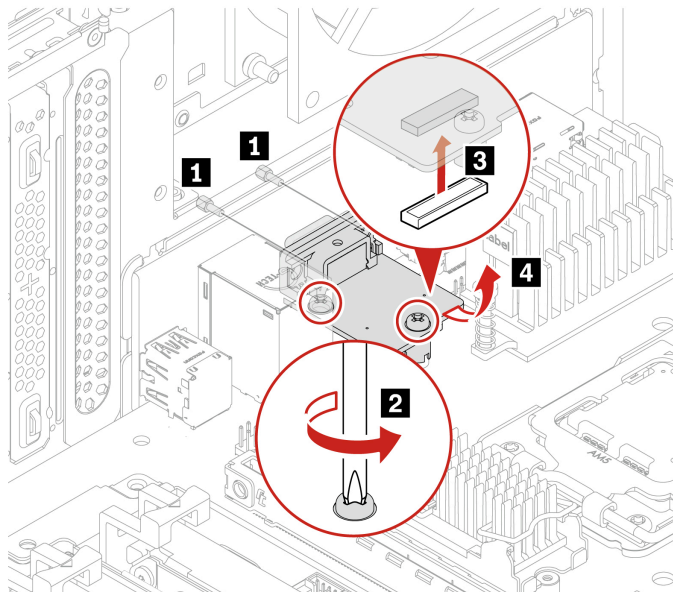
Flexible I/O port card

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

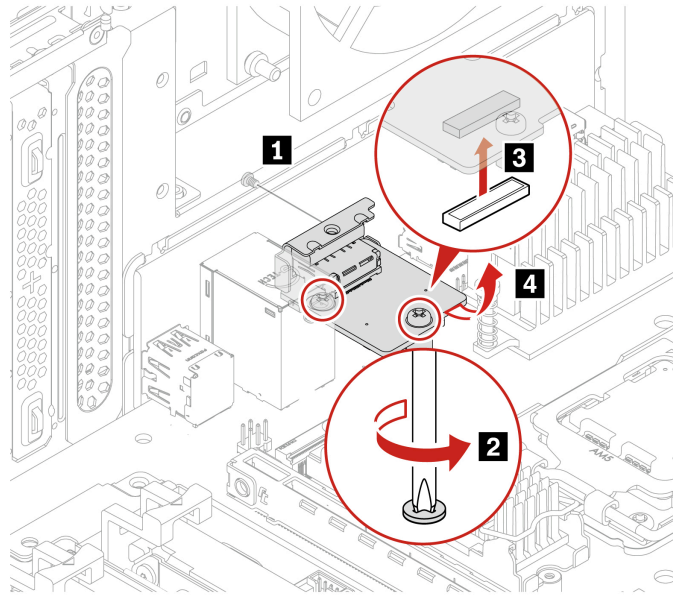
Removal steps

1. Remove the “Left side cover” on page 34.
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)

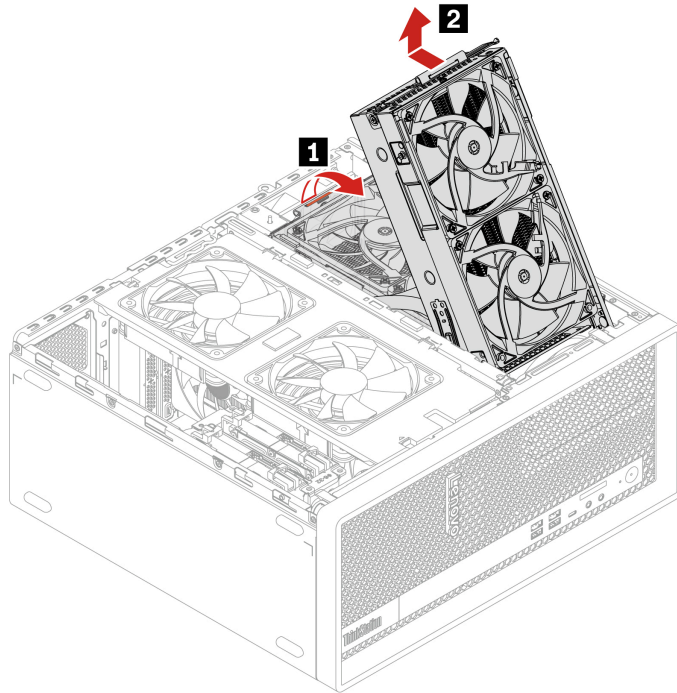
Chassis beam

Prerequisite

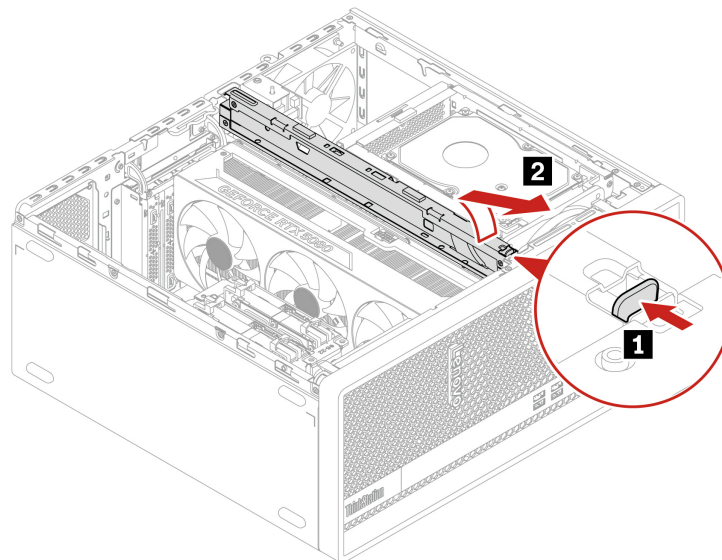
Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts, if any:
 - a. “Left side cover” on page 34
 - b. “Side fan with bracket” on page 47
2. Rotate the liquid cooler to the angle shown in the figure below. Gently lift it without fully removing it.

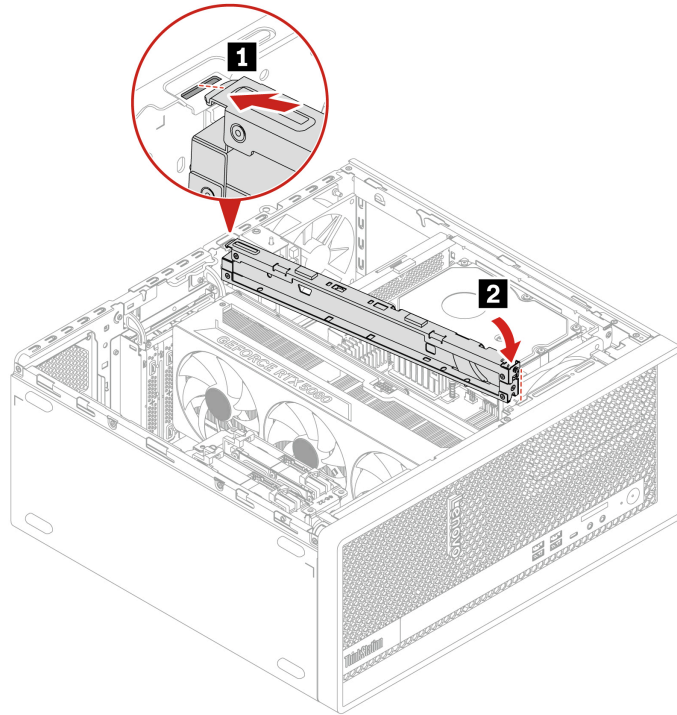


3. Remove the chassis beam.



Installation step

Install the chassis beam.



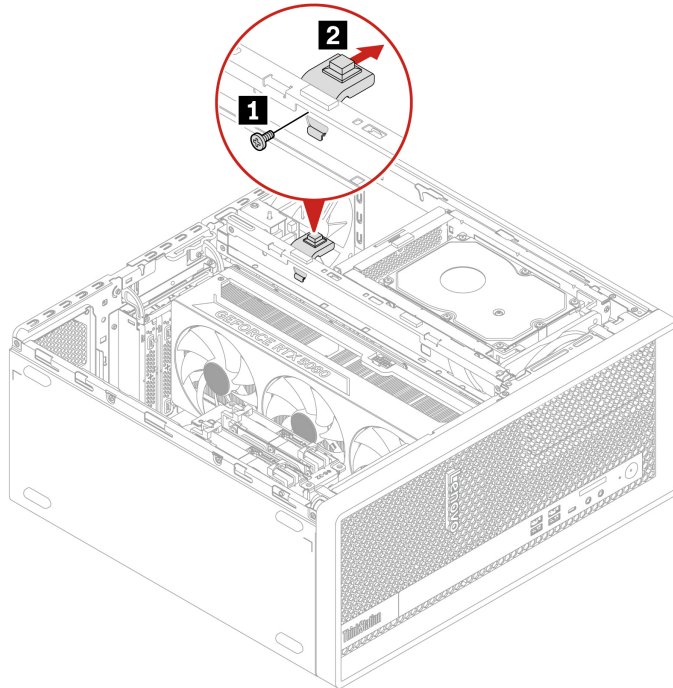
Cover presence switch

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts, if any:
 - a. “Left side cover” on page 34
 - b. “Side fan with bracket” on page 47
 - c. “PCIe card” on page 52
 - d. “Chassis beam” on page 60
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)

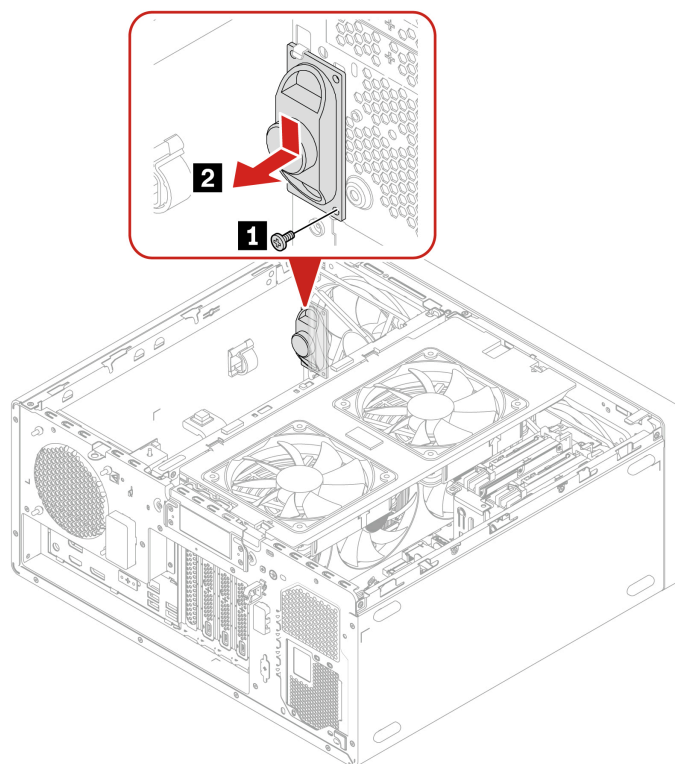
Internal speaker

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the following parts, if any:
 - “Left side cover” on page 34
 - “Slim ODD and slim-ODD latch” on page 45
 - “3.5-inch HDD” on page 37
 - “HDD and slim-ODD cages” on page 40
 - “Side fan with bracket” on page 47
 - “Front top fan” on page 47
2. Remove the internal speaker.



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

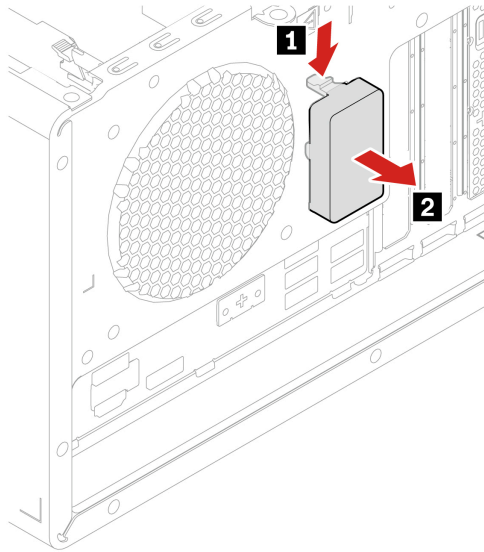
Wi-Fi antenna cover

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the “Left side cover” on page 34.
2. Remove the Wi-Fi antenna cover.

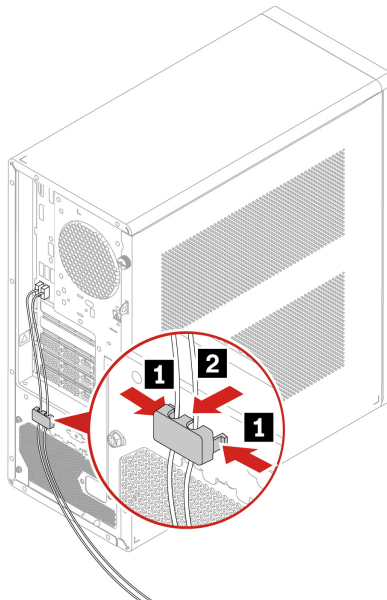


Smart cable clip

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps



Memory module

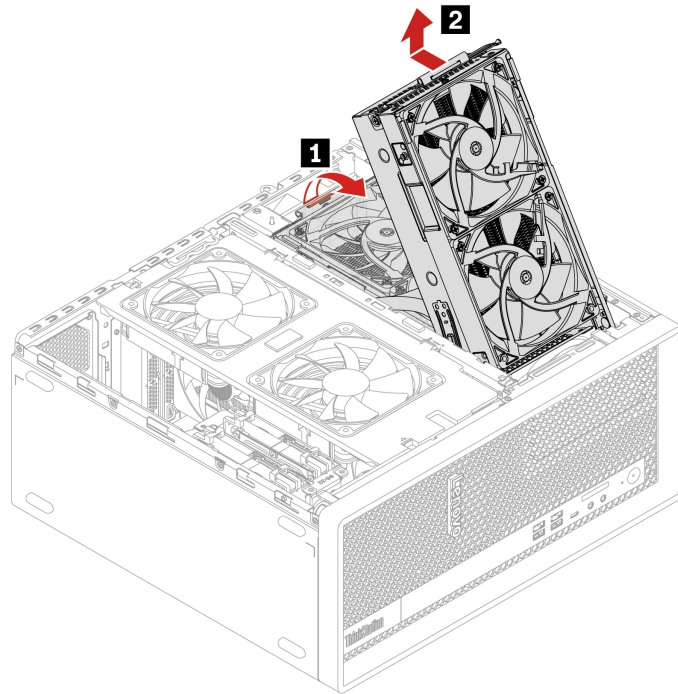
Prerequisite

- Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

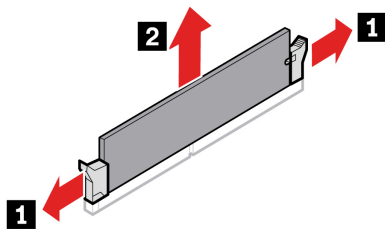
- Ensure that you remove or install memory modules at least one minute after disconnecting power cords from the system. It allows the system to be completely discharged of electricity and safe for handling memory modules.

Removal steps

1. Remove the following parts, if any:
 - “Left side cover” on page 34
 - “Slim ODD and slim-ODD latch” on page 45
 - “3.5-inch HDD” on page 37
 - “HDD and slim-ODD cages” on page 40
2. Rotate the liquid cooler to the angle shown in the figure below. Gently lift it without fully removing it.



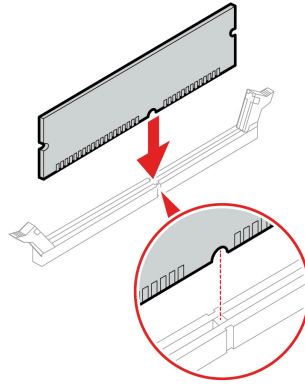
3. Remove the memory module.



Installation steps and rules

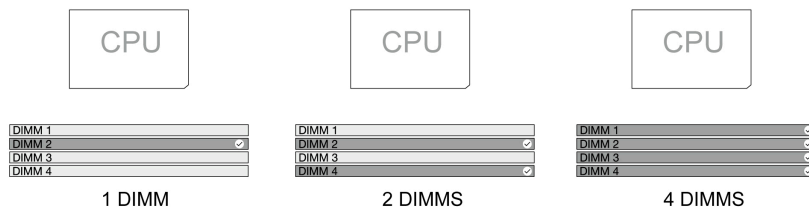
• Installation step

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

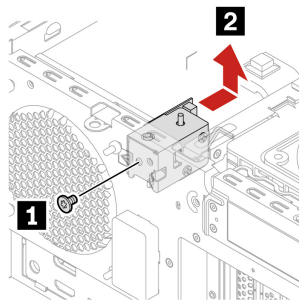
Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

1. Remove the “Left side cover” on page 34.
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 coated	1	5 ± 0.5 in-lb (5.75 ± 0.58 kgf-cm)

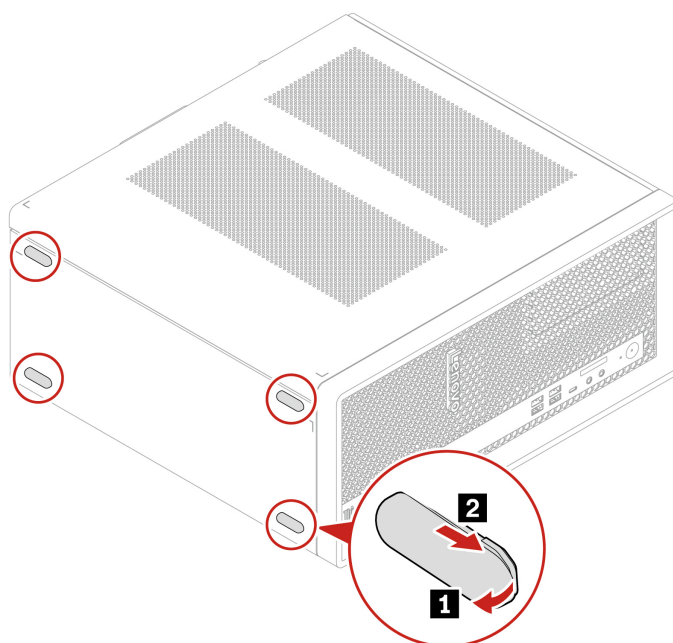
Chassis rubber foot

Prerequisite

Before you start, ensure that you have read “Prerequisites for hardware replacement” on page 32.

Removal steps

Remove the chassis rubber foot.

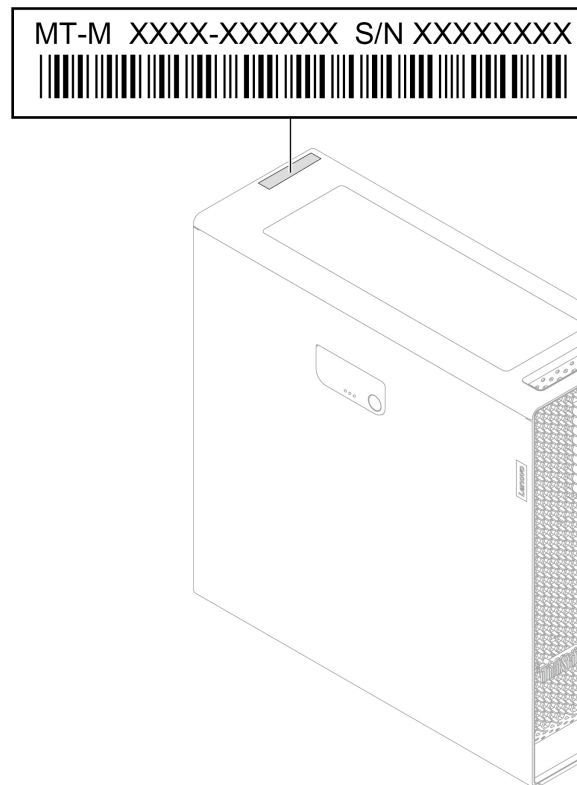


Chapter 7. Help and support

Find your serial number

You can find the serial number via one of the following.

- Open the Terminal and run `sudo dmidecode -t system | grep Serial`.
- Check the machine-type model and serial-number label of your computer (see illustration below).



Lenovo diagnostic tools

For information about Lenovo diagnostic tools, go to:

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

Call Lenovo

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

Before you contact Lenovo

Prepare the needed information before you contact Lenovo.

1. Record the problem symptoms and details:

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

2. Record the system information:

- Product name.
- Machine type and “serial number” on page 69.

Lenovo Customer Support Center

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

Telephone numbers

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.

Services available during the warranty period

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

Services not covered

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

For the terms and conditions of the Lenovo Limited Warranty that apply to your Lenovo hardware product, see *Safety and Warranty Guide* that comes with your computer.

Self-help resources

Use the following self-help resources to learn more about the computer and troubleshoot problems.

Resources	How to access?
Lenovo Support Web Site	https://pcsupport.lenovo.com
Tips	https://www.lenovo.com/tips
Lenovo Community	https://forums.lenovo.com

Resources	How to access?
Accessibility information	https://www.lenovo.com/accessibility
Ubuntu help information	https://help.ubuntu.com/lts/ubuntu-help/index.html

Purchase accessories or additional services

This topic provides instructions on how to purchase accessories or additional services.

Accessories

Lenovo has a number of hardware accessories and upgrades to help expand the functionalities of your computer. Accessories include memory modules, storage devices, network cards, power adapters, keyboards, mice, and so on.

To shop at Lenovo, go to <https://www.lenovo.com/accessories>.

Additional services

During and after the warranty period, you can purchase additional services from Lenovo at <https://pcsupport.lenovo.com/warrantyupgrade>.

Service availability and service names might vary by country or region.

Accessibility features

Lenovo is committed to making information technology accessible to everyone, including individuals with hearing, vision, mobility, cognitive, or speech disabilities. To get the most up-to-date and detailed accessibility features information for the product, go to https://support.lenovo.com/docs/product_accessibility_features.

Supplemental information about the Ubuntu operating system

In limited countries or regions, Lenovo offers customers an option to order computers with the preinstalled Ubuntu® operating system.

If the Ubuntu operating system is available on your computer, read the following information before you use the computer. Ignore any information related to Windows-based programs, utilities, and Lenovo preinstalled applications in this documentation.

Access the Lenovo Limited Warranty

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

The LLW also is preinstalled on the computer. To access the LLW, go to the following directory:

```
/opt/Lenovo
```

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

Access the Ubuntu help system

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

To learn more about the Ubuntu operating system, go to:

<https://www.ubuntu.com>

Get support information

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

To access the latest *User Guide* and *Safety and Warranty Guide*, go to:

<https://pcsupport.lenovo.com>

Access open-source information

This device includes software made publicly available by Lenovo, including software licensed under the General Public License and/or the Lesser General Public License (the open source software).

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You may send your request in writing to the address below accompanied by a check or money order for \$15 to:

Lenovo Legal Department
Attn: Open Source Team / Source Code Requests
8001 Development Dr.
Morrisville, NC 27560

Please include the version of the OS and the version of the Linux Kernel pre-shipped on this Device as part of your request. Be sure to provide a return address.

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Appendix A. Important notice for Quebec consumers

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Appendix B. 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 C. Notices and trademarks

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<https://pcsupport.lenovo.com>

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