ThinkStation P8
User Guide

Read this first

Before using this documentation and the product it supports, ensure that you read and understand the following:

- *Safety and Warranty Guide*
- *Generic Safety and Compliance Notices*
- *Setup Guide*

First Edition (February 2024)

Contents

Discover your Lenovo computer

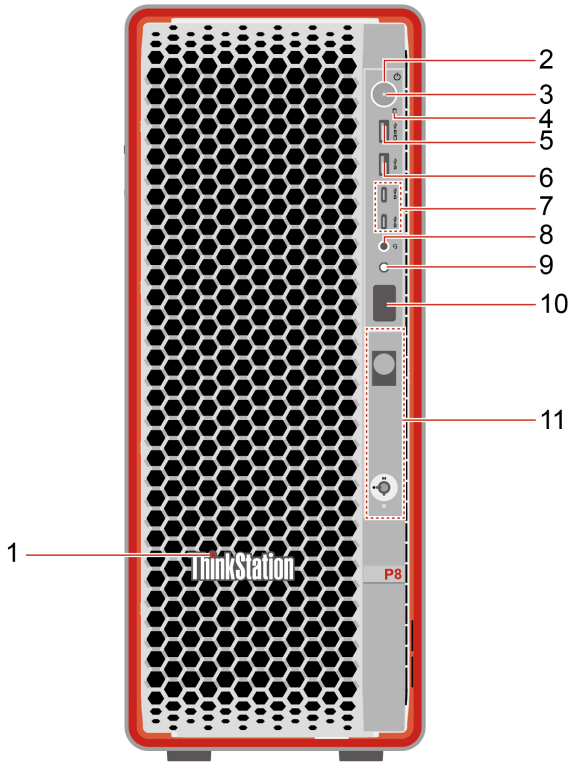
Thank you for choosing a Lenovo® computer! We are dedicated to delivering the best solution to you.

Before starting your tour, please read the following information:

- 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.
- Documentation content is subject to change without notice. To get the latest documentation, go to https://pcsupport.lenovo.com.

Chapter 1. Overview

Front



Item	Description	Item	Description
1	ThinkStation® LED	2	Power button
3	Power indicator	4	Storage indicator
5	Always On USB-A 3.2 Gen 2 connector*	6	USB-A 3.2 Gen 2 connector*
7	USB-C® (3.2 Gen 2) connectors*	8	Headset connector
9	Diagnostic panel switch	10	Diagnostic panel
11	Front-access storage bay*		

* for selected models

Statement on USB transfer rate

Depending on many factors such as the processing capability of the host and peripheral devices, file attributes, and other factors related to system configuration and operating environments, the actual transfer rate using the various USB connectors on this device will vary and will be slower than the data rate listed below for each corresponding device.

USB device	Data rate (Gbit/s)
3.2 Gen 1	5
3.2 Gen 2	10
3.2 Gen 2 × 2	20
Thunderbolt 3	40
Thunderbolt 4	40

Power indicator

Show the system status of your computer.

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

Always On USB-A 3.2 Gen 2 connector

With the Always On USB feature enabled, the Always On USB-A 3.2 Gen 2 connector can charge a USB-A compatible device when the computer is on, off, in sleep mode(S3), or in hibernate mode(S4).

To enable the Always On USB feature, do the following:

1. Enter the UEFI BIOS menu.
2. Click **Devices → USB Setup → USB Charging Port in S4/S5** to enable the Always On USB feature.

Diagnostic panel switch

Use the diagnostic panel switch to turn on or turn off the diagnostic panel, and handle occurred events.

Status	Behavior and function
No event	**Short press:** Turn on or turn off the diagnostic panel. Date and time will be displayed on the panel when it is turned on. The panel will turn off automatically if idle for three minutes.
Error events occur	The diagnostic panel will turn on automatically when an error event occurs. • **Short press (when multiple events occur):** Switch among error events and display the corresponding QR code of the selected event. • **Long press (about 3 seconds):** Clear the selected event.

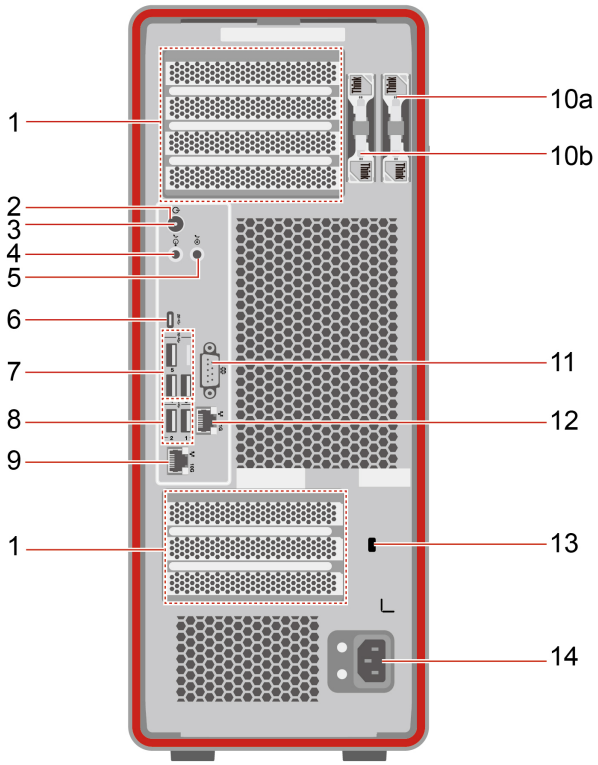
Diagnostic panel

Display the diagnostic information when an issue or error is detected. You can decode the error code at https://www.thinkworkstationsoftware.com/codes.

Related topics

- “USB specifications” on page 4
- “Use ThinkStation diagnostic tool” on page 69

Rear



Item	Description	Item	Description
1	PCIe card areas	2	Power button
3	Power indicator	4	Audio line-out connector
5	Audio line-in connector	6	USB-C® (3.2 Gen 2×2) connector
7	USB-A 3.2 Gen 2 connectors	8	USB-A 2.0 connectors
9	Ethernet connector (10G)	10a	Key-nest for side cover
10b	Key-nest for M.2 SSD storage box	11	Serial connector*
12	Ethernet connector (1G)	13	Security-lock slot
14	Power cord connector		

* for selected models

PCIe card areas

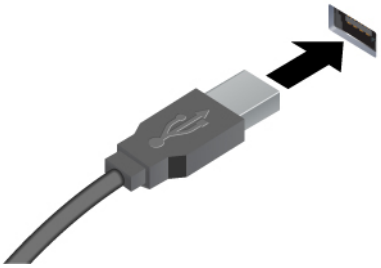
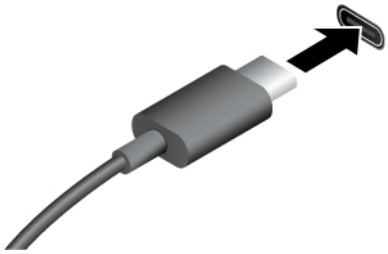
The video output connectors in PCIe areas might be HDMI™ connectors, DisplayPort™ connectors, or Mini DisplayPort™ connectors.

Related topics

- “Use physical locks” on page 11
- “Connect to multiple external displays” on page 18
- “USB specifications” on page 4

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) • SS USB-A connector (USB 5Gbps) • 10 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.
 • SS USB-C connector (USB 5Gbps) • 10 USB-C connector (USB 10Gbps) • 20 USB-C connector (USB4 20Gbps) • USB-C connector (Thunderbolt 3) • USB-C connector (Thunderbolt 4)	• Charge USB-C compatible devices with the output voltage and current of 5 V and 3 A. • Connect to an external display: – USB-C to VGA: 1920 x 1200 pixels, 60 Hz – USB-C to DP: 3840 x 2160 pixels, 60 Hz • Connect to USB-C accessories to help expand your computer functionality. To purchase USB-C accessories, go to https://www.lenovo.com/accessories.

Platform specifications

Specification	Description
Dimensions	• Width: 175 mm (7 inches) • Height (with feet): 441 mm (18 inches) • Depth: 508 mm (20 inches)
Weight (without packaging)	Maximum configuration as shipped: 23 kg (51 lb)
Hardware configuration	Type `Device Manager` in the Windows search box and then press Enter. Type the administrator password or provide confirmation, if prompted.
Power supply	• 1000-watt 92% power supply • 1400-watt 92% power supply
Electrical input	• Input voltage: From 100 V ac to 240 V ac • Input frequency: 50/60 Hz
Memory	Up to eight DDR5 (double data rate 5) ECC (error correction code) RDIMMs (registered dual inline memory modules) • Memory module type: – 16 GB, 32 GB, or 64 GB DDR5-4800 ECC RDIMM – 128 GB DDR5-4800 ECC 3DS-RDIMM • Maximum memory capacity: Up to 1 TB (8 x 128 GB if available)
Storage device	• 3.5-inch HDD (hard disk drive)* • M.2 SSD (solid-state drive)* • U.2 or U.3 SSD* **Note:** To view the storage drive capacity of your computer, type `Disk Management` in the Windows search box and then press Enter. The storage drive capacity indicated by the system is less than the nominal capacity.
Video features	• Four PCIe x16 slots on the system board for installing graphics cards • Up to 16 external displays can be connected with four four-port graphics cards installed
Expansion	• Internal storage drive cages* • Optional internal storage drive cage* • On-board M.2 SSD slots • PCIe slots • Memory slots • Front-access storage bay* **Note:** For detailed expansion rules, see “Expansion modules” on page 7.
Network features	• Bluetooth* • Ethernet LAN • Wireless LAN*

* for selected models

Operating environment

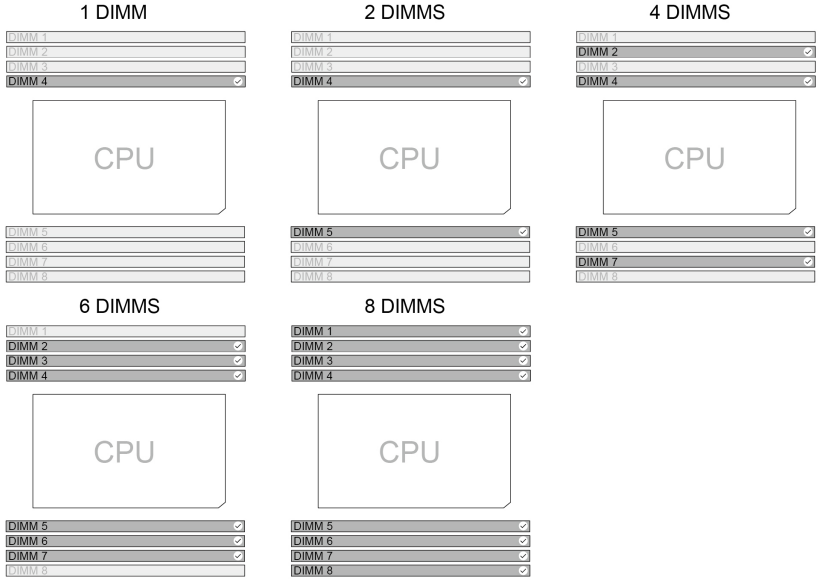
- Maximum altitude (without pressurization):
  - Operating: From 0 m (0 ft) to 3048 m (10 000 ft)
  - Storage: From 0 m (0 ft) to 12192 m (40 000 ft)
- Temperature:
  - Operating: From 10 °C (50 °F) to 35 °C (95 °F)
  - Storage: From -40 °C (-40 °F) to 60 °C (140 °F)
- Relative humidity:
  - Operating: 20%-80% (non-condensing)
  - Storage: 10%-90% (non-condensing)

System memory speed

ThinkStation P8 comes with DDR5-4800 memory modules and will run up to 4800 MT/s.

To avoid unexpected frequency reduction, ensure that you install memory modules in a right way:

- Installed memory module quantity: 1 pc, 2 pcs, 4 pcs, 6 pcs, or 8 pcs
- Install memory modules of the same type, the same capacity, and the same DRAM densities.
- Install memory modules in the order shown in the following illustration:



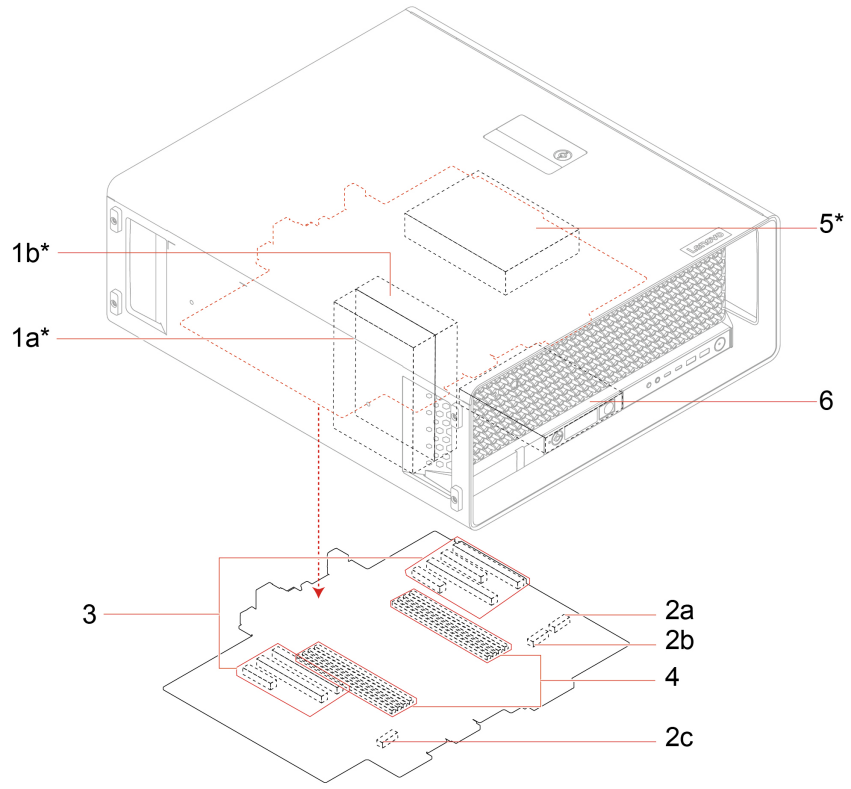
Notes:

- The actual system memory speed depends on the microprocessor model. For example, your computer comes with 4800 MT/s memory modules, but the microprocessor only supports up to 4400 MT/s memory modules. Then the system memory speed will be no faster than 4400 MT/s. For microprocessor 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.

Chapter 2. Features

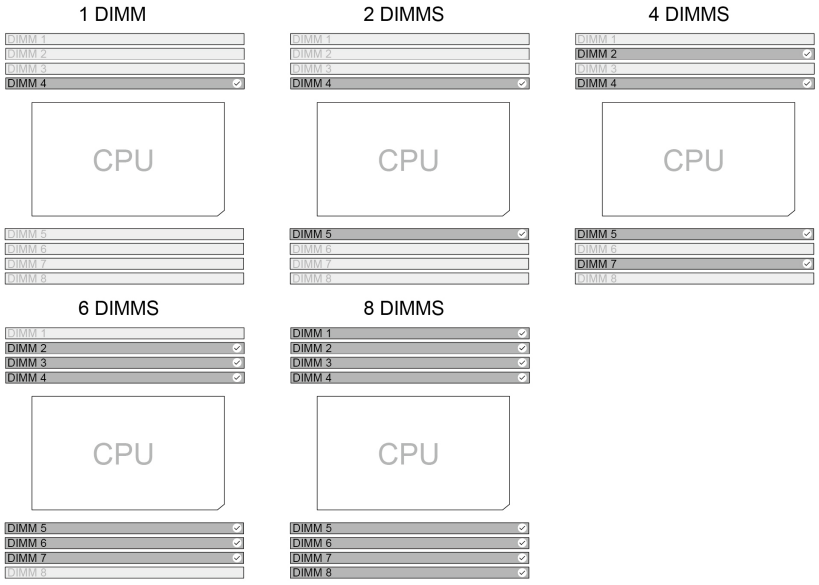
Expansion modules

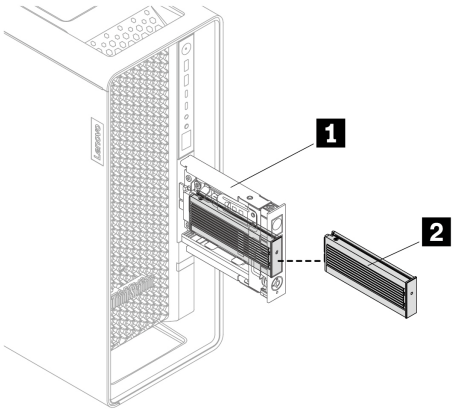
You can enhance your computer capacity and performance by adding various devices according to the rules in the following table. To replace a device, see Chapter 5 “CRU replacenment” on page 29.



* for selected models

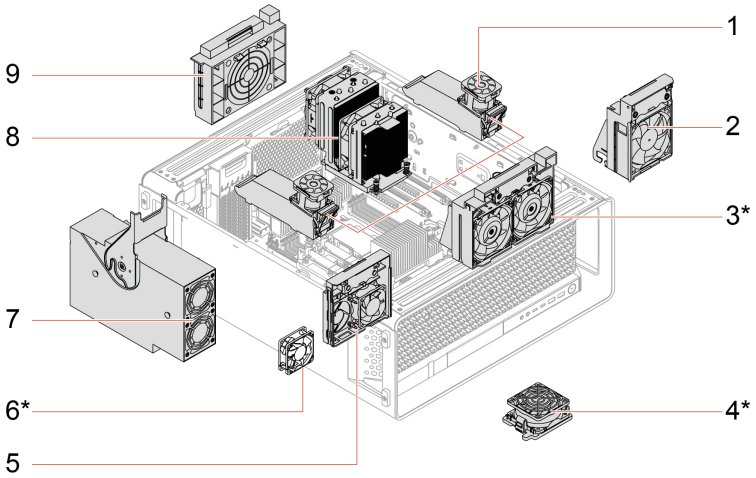
Location	Rules
1. Internal storage drive cages*	You computer has up to two internal storage drive cages. Each internal storage drive cage can support the following storage drives: • Up to one 3.5-inch HDD • Up to two M.2 SSD • Up to one U.2 or U.3 SSD **Notes:** • Storage drive installation priority: 1a is the first and 1b is the second. • The storage drives installed in 1a and 1b should be the same.
2. On-board M.2 SSD slots	You computer has three on-board M.2 SSD slots. **Note:** On-board M.2 SSD installation priority: 2a is the first, 2b is the second, and 2c is the third.

Location	Rules
3. PCIe slots	You computer has seven PCIe slots. PCIe slot types and PCIe card installation priority are as follows: 3rd Slot 1 – Gen5 x16 5th Slot 2 – Gen5 x8 1st Slot 3 – Gen5 x16 6th Slot 4 – Gen5 x8 2nd Slot 5 – Gen5 x16 4th Slot 6 – Gen5 x16 7th Slot 7 – Gen4 x8
4. Memory slots	You computer has eight memory slots for installing the following memory modules: • 16 GB, 32 GB, or 64 GB DDR5-4800 ECC RDIMM • 128 GB DDR5-4800 ECC 3DS-RDIMM **Notes:** • Supported memory module quantity: 1 pc, 2 pcs, 4 pcs, 6 pcs, or 8 pcs • Install memory modules of the same type and the same capacity. • Install memory modules in the order shown in the following illustration:: 

Location	Rules
5. Optional internal storage drive cage*	The optional internal storage drive cage can support a 3.5-inch HDD when 1a and 1b are both occupied with 3.5-inch HDDs. **Note:** When the computer is installed with NVIDIA Quadro SYNC II card or GeForce 40X0 graphics card, do not install 3.5-inch HDD in the optional internal storage drive cage.
6. Front-access storage bay	Depending on your computer model, one of the following devices is installed in the front-access storage bay: • Blank bezel* • 15-in-1 media card reader* • NVMe storage tray* (1) **Note:** The M.2 SSD storage box(2) in the NVMe storage tray is hot-swappable when NVMe RAID mode is disabled and the operating system of your computer does not reside on the M.2 SSD inside. It means you can replace the M.2 SSD inside without even turning off your computer. 

Cooling system

The cooling system of your computer allows for unobstructed airflow. Illustrations and descriptions of the fans and heat sinks are as follows:



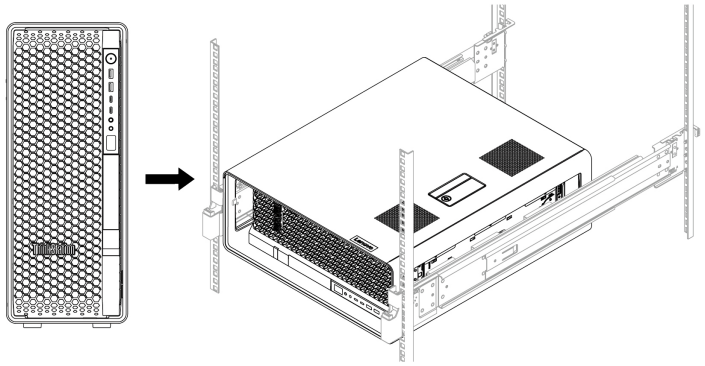
* for selected models

Item	Description	Item	Description
1	Memory fans and air ducts	2	Upper PCIe fan
3	Front fan*	4	Front-access storage fan*
5	Lower PCIe fan	6	Internal storage drive fan*
7	Power supply assembly fan	8	Microprocessor heat sink
9	Rear fan		

Note: To replace the fans and heat sinks, see “Fans” on page 58.

Rack-mounted chassis

Your computer offers flexibility for both desktop and data center environments. With an easy-to-attach sliding rail kit, you can install the computer into a rack. You can buy the rail kit from Lenovo. It will come with a guide to help you install your computer into a rack.



ThinkStation DASH support

DASH (desktop and mobile architecture for system hardware) is a set of specifications developed by dmtf, which aims to provide open standards based web service management for desktop and mobile client systems.

Profile list

Profile	Requirement
Base Desktop and Mobile	Mandatory
Profile Registration	Mandatory
Role Based Authorization	Mandatory
Simple Identity Management	Mandatory
Boot Control	Optional
CPU	Optional

Profile	Requirement
Indicators	Optional
Physical Asset	Optional
Power State Management	Optional
Sensors	Optional
Software Inventory	Optional
System Memory	Optional
BIOS Management	Optional
DHCP Client	Optional
DNS Client	Optional
Ethernet Port	Optional
Host LAN Network Port	Optional
IP Interface	Optional
OS Status	Optional
Software Update	Optional
Text Console Redirection	Optional
USB Redirection	Optional
Record Log	Optional
SSH	Optional
Computer system	Optional

Note: KVM Redirection supports remote management in OS only, not in BIOS setup.

Enable DASH in BIOS

1. Select **Advanced → DASH Configuration → Enable** and press Enter.
2. Install Realtek Lan driver and DASH service.
3. Config DASH account and password with DASHConfigRT.

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.

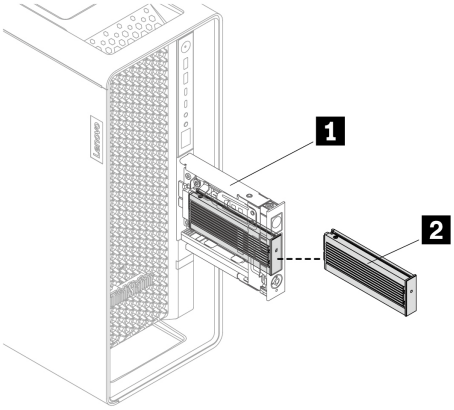
Use physical locks

You can secure your computer and information by the following physical locks.

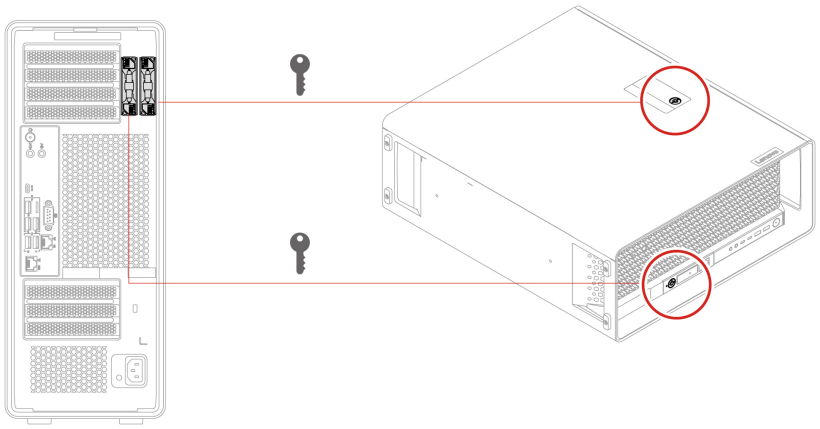
Locks and keys for side cover and M.2 SSD storage box

- **Locks**
  - Locks for side cover and M.2 SSD storage box prevent unauthorized access to the inside of your computer chassis or storage drive.

– The M.2 SSD storage box(2) in the NVMe storage tray is hot-swappable when NVMe RAID mode is disabled and the operating system of your computer does not reside on the M.2 SSD inside. It means you can replace the M.2 SSD inside without even turning off your computer. Locking the M.2 SSD storage box can prevent unexpected removal.



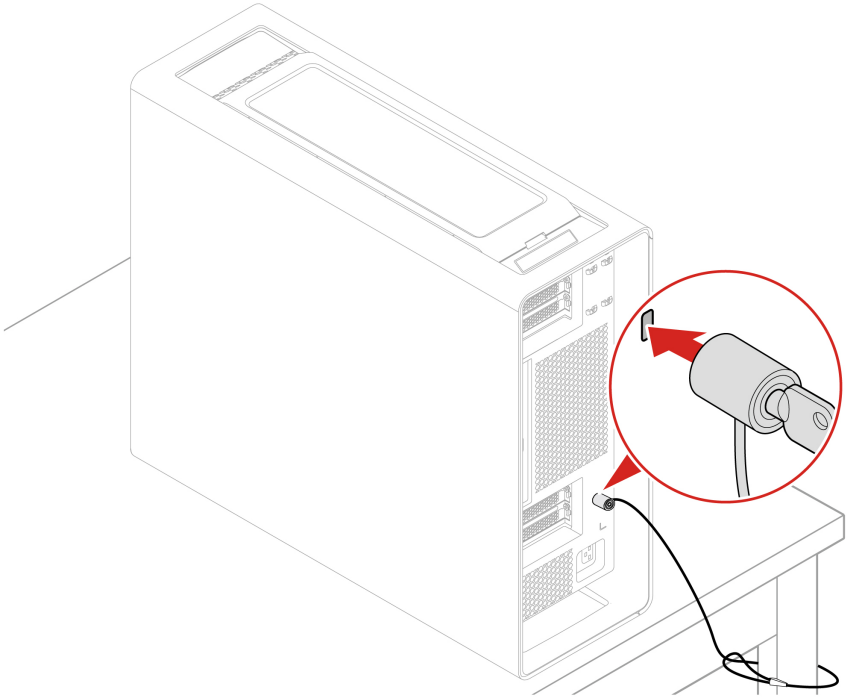
- **Keys**
  – The keys are attached to the key-nests on the rear panel. Store the keys in a secure place when you are not using them.
  – The keys can be common or random. For details, see the table below:



Location	Lock description	Key description
Side cover	A common lock, a random lock, or a dummy lock	The key for the side cover might be one of the following: – Common key carved with `00` that can open common locks on the same computer or on different computers. – Random key carved with `R` and `xx`, for example, `01`, `02`, and `03`: that can open random locks carved with the same letter or number. – No key needed for dummy lock.
M.2 SSD storage box	A common lock	A common key carved with `00` that can open common locks on the same computer or on different computers.

Security lock

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



Note: You can purchase such a security lock from Lenovo if needed. But Lenovo makes no comments, judgments, or warranties about the function, quality, or performance of locking device produced by a third party.

Use software security solutions

The following software solutions help secure your computer and information.

- **Windows Security**

  Windows Security is a software built-in to the operating system. It continually scans for malicious software, viruses, and other security threats. Besides, Windows updates are downloaded automatically to help keep your computer safe. Windows Security also enables you to manage tools including firewall, account protection, application and browser control, and so on.

- **Antivirus programs**

  Lenovo preinstalls a full-version antivirus software on selected models of computer. It helps defend the computer against viruses, safeguard your identity, and keep your personal information secured.

- **Absolute Persistence**

  Absolute Persistence technology is embedded in firmware. 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.

Note: For more information about how to use these software solutions, refer to their help systems respectively.

Use BIOS security solutions

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

Wipe the storage drive data

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.

Erase all storage drive data

It is recommended that you erase all storage drive data before recycling a storage drive or the computer.

To erase all 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**.

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 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** 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:

1. Properly install or close the computer cover.
2. Enter the BIOS menu, save and then exit.

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.

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 3. Get started

Set up the computer

This section helps you set up your computer.

Side ventilation notice

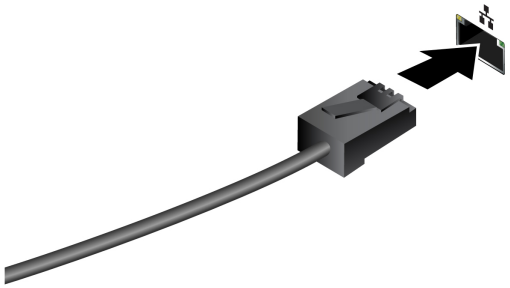
Side ventilation design is available on some models. Pay attention to the ventilation distance requirements for models with different configurations:

- Systems configured with rear-exhausting graphics cards (such as NVIDIA RTX 6000 Ada) do not require side ventilation.
- Systems configured with internal-exhausting graphics cards (such as GeForce RTX 40X0) require side ventilation. Do not block air vents on the left side cover. To ensure heat dissipation, do not place any objects within 4.5 cm (1.8 inches) or 1 rack unit from the left side cover.
- For rack-mounted systems, a rack spacer is recommended in the gap above the system.

Note: Do not install internal-exhausting graphics cards (such as GeForce RTX 40X0) on systems without side ventilation on the left side cover.

Initial setup instructions

1. Connect the cables of external displays to appropriate connectors on the graphics card installed in the computer.
2. Connect the mouse and the keyboard to the computer respectively.
3. Connect the cables of other devices according to the devices' instructions.
4. Connect the power cord to the power cord connector on the computer and then connect it to a properly-grounded electrical outlet.
5. Press the power button to turn on the computer.
6. Follow the on-screen instructions to complete the setup procedures.
7. Connect to a wired or wireless network:
   - Wired network: connect Ethernet cable of local network to the Ethernet connector on the computer.



   - Wireless network: click the network icon on the bottom right of your display to connect to an available network. Provide required information if needed.

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

Connect to multiple external displays

With multiple external displays, you can use several screens controlled by one computer at the same time. Your workspace will expand and productivity will boost. For example, it allows you to:

- Display or view more content at the same time
- Switch easily between applications and windows
- Improve collaboration and web conferencing

Connect displays to graphics cards

Connecting external displays to graphics cards will provide you with reliable using experience.

1. Configure graphics cards: Your computer has four PCIe x16 slots for installing graphics cards. You can connect up to 16 external displays with four four-port graphics cards installed.
   a. Determine the quantity and the kind of graphics cards according to your needs.
   b. Connection requirements of each graphics cards may vary. See documentations of the graphics cards for details.
   c. For graphics card installation, see “PCIe card and extender” on page 51.
2. Match the connectors of graphics cards and external displays: The connectors on graphics cards interface can be HDMI™ , DisplayPort™ , or Mini DisplayPort™ connectors. Corresponding cables or adapters are needed to match the connectors of graphics cards and external displays.
3. Connect and configure external displays:
   a. Connect one end of the cables or adapters to external displays, and the other end to corresponding connectors on graphics cards directly.
   b. Connect the power cord and turn on the power button of external displays.
   c. Right-click a blank area on the desktop and select display settings. Select the display that you want to configure and change display settings of your preference.

Connect wireless displays

1. Ensure that both your computer and the wireless external displays support Miracast®.
2. Press Windows logo key + K and then select a wireless display to connect.
3. Right-click a blank area on the desktop and select display settings. Select the display that you want to configure and change display settings of your preference.

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 10 minutes
- Put the computer to sleep: After 25 minutes

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

To set the power plan:

1. Type **Power Options** in the Windows search box and then press Enter.
2. Choose or customize a power plan of your preference.

The Vantage app

The Vantage app is a customized one-stop solution to help you maintain your computer with automated updates and fixes, configure hardware settings, and get personalized support.

To access the Vantage app, type `Vantage` in the Windows search box.

Notes:

- The available features vary depending on the computer model.
- The Vantage app makes periodic updates of the features to keep improving your experience with your computer. The description of features might be different from that on your actual user interface. You can download the latest version of Vantage app from Microsoft Store.

The Vantage app enables you to:

- Know the device status easily and customize device settings.
- Download and install UEFI BIOS, firmware, and driver to keep your computer up-to-date.
- Monitor your computer health, and secure your computer against outside threats.
- Scan your computer hardware and diagnose hardware problems.
- Look up warranty status (online).
- Access *User Guide* and helpful articles.

Accessibility features

Lenovo is committed to making information technology accessible to everyone, including those with hearing, vision, or mobility limitations. Lenovo supports accessibility features in the following ways to help all users better engage with Lenovo products.

Accessible documentation

Lenovo documentation is designed to meet users' accessibility needs. Users can read the documentation with assistance as needed. For example:

- Text and images are in high contrast. Color contrast can enhance the visual experience. In this mode, all contents are highlighted to be more visible.
- Text is logical and readable. Images are also readable with alternative text provided. A screen reader can enhance the hearing or listening experience. In this mode, all contents are clearer and easier to understand.
- Text is large and clear, making it easier to read. A magnifier can enlarge the text to improve readability.

For more information, watch the video at:
https://support.lenovo.com/docs/pc_pub_accessibility

Accessible product design

Lenovo product design also supports accessibility features.

Note: The accessibility features vary by product. Depending on the product model, some accessibility features listed below might not be applicable to the product. To get the most up-to-date accessibility information for the product, go to https://www.lenovo.com/accessibility. For additional support from Lenovo, users can find phone numbers for their country or region from https://support.lenovo.com/supportphonelist.

- **Keyboards**

Lenovo keyboards support various accessibility features. For example:

- Consistent layout of keyboards for easier use
- Tactile markings on some keys for easier identification
- Appropriate spacing between keys for typing efficiency
- Sufficient contrast of keys, controls, and labels for better visibility
- On-screen notification or lighted notification for some keys for ease of use
- Keys and controls that can be reached and operated using one hand and require minimal dexterity for ease of use

- **Industry-standard connectors**

  The industry-standard connectors on Lenovo products enable better compatibility with peripheral devices.

- **Operating systems**

  The accessibility features of the operating systems can be configured to assist users in the following ways:

  - Vision features, such as text size and visual effect settings, make the screen contents easier to see.
  - Hearing features, such as audio and caption settings, make the screen contents easier to hear.
  - Interaction features, such as speech and eye-control settings, make the product easier to control.

  To access the accessibility features of the Windows 11 operating system, go to **Start → Settings → Accessibility**.

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.

Menu	Introduction
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.

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.

Step 1. Open the Vantage app, and then click **Device → System Update**.

Step 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.

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.

From the Windows Update

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

Step 1. Type `Settings` in the Windows search box and press Enter.

Step 2. Click **Update & Security → Windows Update → Check for Updates**.

Step 3. If a BIOS update package appears in your update list, click **Download or Install** to initiate the update.

Chapter 4. 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 one of the following to select the SATA RAID mode or NVMe RAID mode:
   - SATA RAID mode:
     a. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
     b. Select **Devices → Storage Setup → Configure SATA as (AHCI/RAID)**.
     c. Select **RAID**.
   - NVMe RAID mode:
     a. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
     b. Select **Devices → NVMe Setup → NVMe RAID Mode (Enabled/Disabled)**.
     c. Select **Enabled**.
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.

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 2-8 disks.
  - 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 disks.
  - 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 3-8 disks.
  - 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, 6, or 8 disks.
  - 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 1-8 disks.
  - 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.

Configure RAID with MegaRAID Configuration Utility

To configure RAID with MegaRAID Configuration Utility, ensure that:

- A MegaRAID adapter is installed on your computer.
- The storage drives used for RAID configuration are connected to the installed MegaRAID adapter instead of the system board.

Storage drive requirements for RAID levels

Your computer supports the following RAID levels:

- RAID 0: striped disk array
  - Consists of at least two NVMe storage drives
  - Supported strip size: 64 KB, 128 KB, 256 KB, 512 KB, or 1 MB
  - Better performance without fault tolerance

  CAUTION:
  RAID 0 does not support any data redundancy. Use RAID 0 with caution. If a drive in the RAID 0 array fails, the data will be lost and there is no way to get it recovered.
- RAID 1: mirrored disk array
  - Consists of two or four NVMe storage drives
  - Improved read performance and 100% redundancy
- RAID 10: striped and mirrored disk array (a combination of RAID 0 and RAID 1)
  - Consists of four NVMe storage drives

  - Data being striped across storage drive groups
  - Provides both high data transfer rates and complete data redundancy
- RAID 5: block-level striped disk array with distributed parity
  - Consists of at least three NVMe storage drives
  - Supported strip size: 64 KB, 128 KB, 256 KB, 512 KB, or 1 MB
  - Better performance and fault tolerance
  - Available only on selected models of MegaRAID adapters
- RAID 6: block-level striped disk array with dual distributed parity
  - Consists of at least four NVMe storage drives
  - Supported strip size: 64 KB, 128 KB, 256 KB, 512 KB, or 1 MB
  - Better performance and fault tolerance that can stand up to loss of two storage drives
  - Available only on selected models of MegaRAID adapters

Create a RAID volume

Attention: All the existing data stored on the selected drives will be erased while the RAID volume is being created.

To create a RAID volume:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Devices → MegaRAID Configuration Utility** and press Enter.
3. Select **Main Menu** and press Enter.
4. Select **Configuration Management** and press Enter.
5. Select **Create Virtual Drive** and press Enter.
6. Select and configure the options one by one.
   a. **Select RAID Level**: You can set the RAID level to one of the following:
      - **RAID0**
      - **RAID1**
      - **RAID5**
      - **RAID6**
      - **RAID10**

      Note: Some of the RAID levels might not be displayed because the number of installed storage drives and the model of the MegaRAID adapter vary.
   b. **Select Drives From**: Select **Unconfigured capacity** or **Free capacity** depending on your needs and press Enter.
   c. **Select Drives**: Select a storage drive and press Enter. After selecting all storage drives for creating the RAID volume, select **Apply Changes** and press Enter. When promoted, select **Confirm** and press Enter. Then, select **Yes** and press Enter to save the storage drive selection. Finally, select **OK** and press Enter.
   d. **Virtual Drive Name**: You can type a preferred name for the volume name.
   e. **Strip Size** (if applicable): Select a strip size and press Enter.
7. Select **Save Configuration** and press Enter. When promoted, select **Confirm** and press Enter. Then, select **Yes** and press Enter to confirm the creation of the RAID volume.
8. Press F10 or Fn+F10 to save the changes and exit.

View the information about a RAID volume

To view the information about a RAID volume:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Devices → MegaRAID Configuration Utility** and press Enter.
3. Select **Main Menu** and press Enter.
4. Select **Virtual Drive Management** and press Enter.
5. Select a RAID volume and press Enter to view the detailed information.
6. Press F10 or Fn+F10 to save the changes and exit.

Virtual drive state

Virtual drive can be in one of the following states:

State	Display in the output of StorCLI commands	Virtual drive status
Optimal	**optl**	All members of the virtual drive are online.
Partially Degraded	**Pdgd**	The virtual drive is capable of sustaining more than one member drive's failure. Currently, only a RAID 6 or RAID 60 virtual drive can be partially degraded.
Degraded	**dgrd**	One or more member drives have failed. The virtual drive can no longer sustain a subsequent drive failure.
Offline	**OfLn**	One or more member drives have failed. Virtual drive data has lost.

CAUTION:
Continuously monitor the RAID volume status to save drives from undesired data loss. If there is any drive failure, remove the failing drive and install a new one.

Delete a RAID volume

Attention: All the existing data stored on the selected drives will be erased after you delete RAID volumes.

To delete a RAID volume:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Devices → MegaRAID Configuration Utility**.
3. Select **Main Menu** and press Enter.
4. Select **Virtual Drive Management** and press Enter.
5. Select the RAID volume that is not needed and press Enter.
6. Under **Operation**, select **Delete Virtual Drive** and press Enter.
7. Select **Go** and press Enter. When prompted, select **Confirm** and press Enter. Then, select **Yes** and press Enter to delete the RAID volume.
8. Press F10 or Fn+F10 to save the changes and exit.

Chapter 5. CRU replacement

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

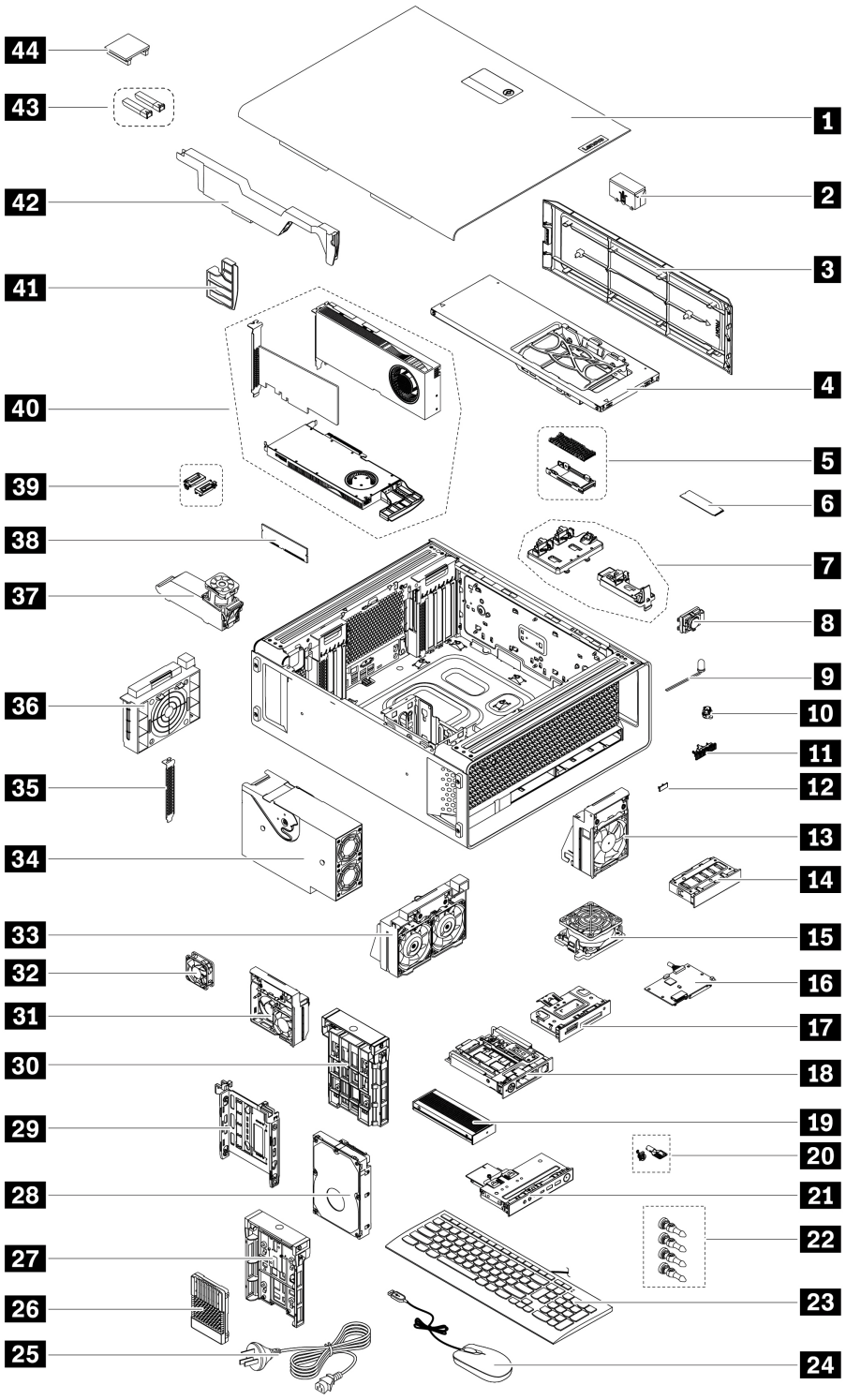
Customer Replaceable Units (CRUs) are parts that can be replaced by the customer. Lenovo computers contain the following types of CRUs:

- **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

The following is the CRU list of your computer.



Number	Description	Self-service CRU	Optional-service CRU
1	Side cover	Yes	No
2	NVLINK retainer*	Yes	No
3	Top cover	Yes	No

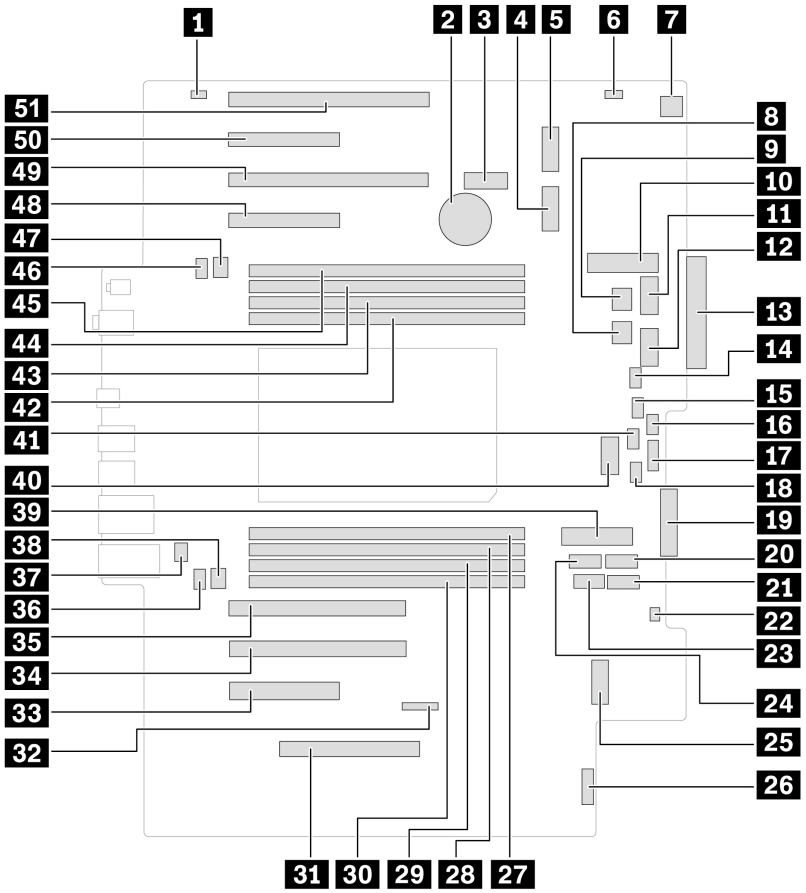
Number	Description	Self-service CRU	Optional-service CRU
4	Optional internal storage drive cage*	Yes	No
5	M.2 SSD heat sink kit*	Yes	No
6	M.2 SSD*	Yes	No
7	M.2 SSD holder*	Yes	No
8	Internal speaker	No	Yes
9	ThinkStation LED	Yes	No
10	ThinkStation LED holder	Yes	No
11	ThinkStation Logo badge	Yes	No
12	Computer ID badge	Yes	No
13	Upper PCIe fan	Yes	No
14	Blank bezel*	Yes	No
15	Front-access storage fan*	Yes	No
16	PCBA of 15-in-1 media card reader*	No	Yes
17	15-in-1 media card reader*	No	Yes
18	NVMe storage tray*	Yes	No
19	M.2 SSD storage box*	Yes	No
20	Locks and keys for side cover and M.2 SSD storage box	Yes	No
21	Front panel I/O assembly	No	Yes
22	Fan grommets*	Yes	No
23	Keyboard*	Yes	No
24	Mouse*	Yes	No
25	Power cord*	Yes	No
26	U.2 or U.3 SSD*	Yes	No
27	U.2 or U.3 SSD bracket*	Yes	No
28	HDD*	Yes	No
29	HDD bracket*	Yes	No
30	M.2 SSD bracket*	Yes	No
31	Lower PCIe fan	Yes	No
32	Internal storage drive fan*	Yes	No
33	Front fan*	Yes	No
34	Power supply assembly	Yes	No
35	PCIe bracket*	Yes	No
36	Rear fan	Yes	No
37	Memory fan and air duct	Yes	No
38	Memory module	Yes	No

Number	Description	Self-service CRU	Optional-service CRU
39	Wi-Fi antenna cover*	Yes	No
40	PCIe card*	Yes	No
41	Customized PCIe card extender*	Yes	No
42	Super capacitor module*	Yes	No
43	Fiber modules for NVIDIA ConnectX-6 Ethernet Adapter*	Yes	No
44	NVLINK bridge*	No	Yes

* for selected models

System board illustration

Note: The system board might look slightly different from the illustration.



Item	Item
1 Internal speaker connector	2 Coin-cell battery
3 Wi-Fi socket	4 M.2 SSD slot 2
5 M.2 SSD slot 1	6 Cover presence switch (intrusion switch) connector

Item	Item
7 Upper PCIe (slot1–4) fan connector	8 Internal storage drive cage power connector 1
9 Internal storage drive cage power connector 2	10 Internal storage drive cage slot 1
11 Graphics card power connector 1	12 Graphics card power connector 3
13 Front-panel I/O connector	14 Front fan connector
15 Front-access storage fan connector	16 Internal storage drive fan connector
17 Internal USB-A 2.0 connector	18 CPU fan connector 1
19 Front-access storage bay connector	20 SATA 3 connector
21 SATA 2 connector	22 ThinkStation LED connector
23 Internal USB-A 3.2 Gen 2 connector	24 SATA 1 connector
25 M.2 SSD slot 3	26 TCM connector
27 Memory slot 5 (DIMM 5)	28 Memory slot 6 (DIMM 6)
29 Memory slot 7 (DIMM 7)	30 Memory slot 8 (DIMM 8)
31 Power supply connector	32 BMC card connector
33 PCIe slot 7 - Gen 4 x 8	34 PCIe slot 6 - Gen 5 x 16
35 PCIe slot 5 - Gen 5 x 16	36 CPU fan connector 2
37 Serial port (COM) connector	38 Memory fan 2 connector
39 Internal storage drive cage slot 2	40 Graphics card power connector 2
41 Lower PCIe (slot5–7) fan connector	42 Memory slot 4 (DIMM 4)
43 Memory slot 3 (DIMM 3)	44 Memory slot 2 (DIMM 2)
45 Memory slot 1 (DIMM 1)	46 Memory fan 1 connector
47 Rear fan connector	48 PCIe slot 4 - Gen 5 x 8
49 PCIe slot 3 - Gen 5 x 16	50 PCIe slot 2 - Gen 5 x 8
51 PCIe slot 1 - Gen 5 x 16	

Prerequisites for hardware replacement

General prerequisites

Read *Generic Safety and Compliance Notices*.

Prerequisites for opening computer cover

- 

  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.

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

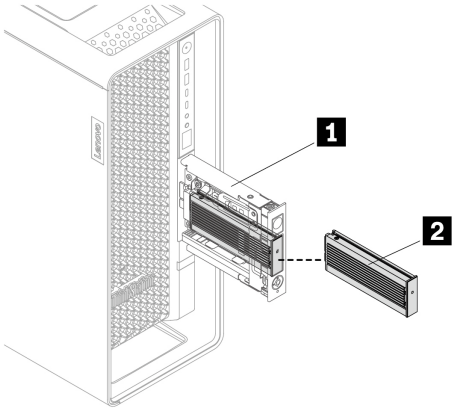
Prerequisites for storage drive replacement

Attention: The internal storage drive is sensitive. Inappropriate handling might cause damage and loss of data. When handling the internal storage drive, observe the following guidelines:

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

Prerequisites for hot-swappable M.2 SSD storage box replacement

For some computer models, an NVMe storage tray might be installed in the front-access storage bay. The M.2 SSD storage box(2) in the NVMe storage tray(1) can be hot-swappable, which means you can replace the M.2 SSD inside without even turning off your computer.



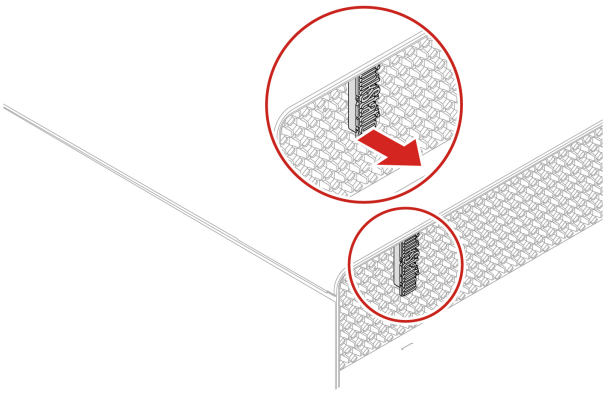
Attention: To avoid damage and loss of data, observe the following guidelines before replacing the hot-swappable M.2 SSD storage box:

- Ensure that NVMe RAID mode is disabled.
- Ensure that the operating system of your computer does not reside on the M.2 SSD inside the hot-swappable M.2 SSD storage box.
- Lock the M.2 SSD storage box to prevent unexpected removal. The keys are attached to the rear of the computer. For security, store the keys in a secure place.

ThinkStation logo badge

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

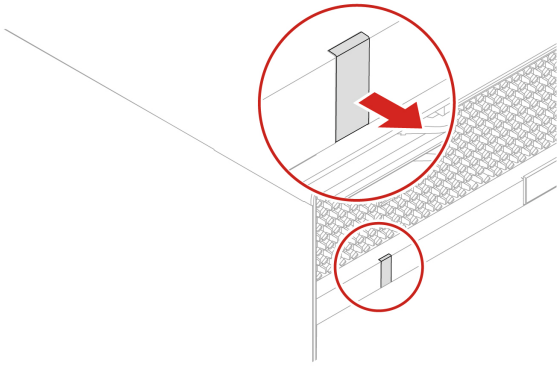
Removal steps



Computer ID badge

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

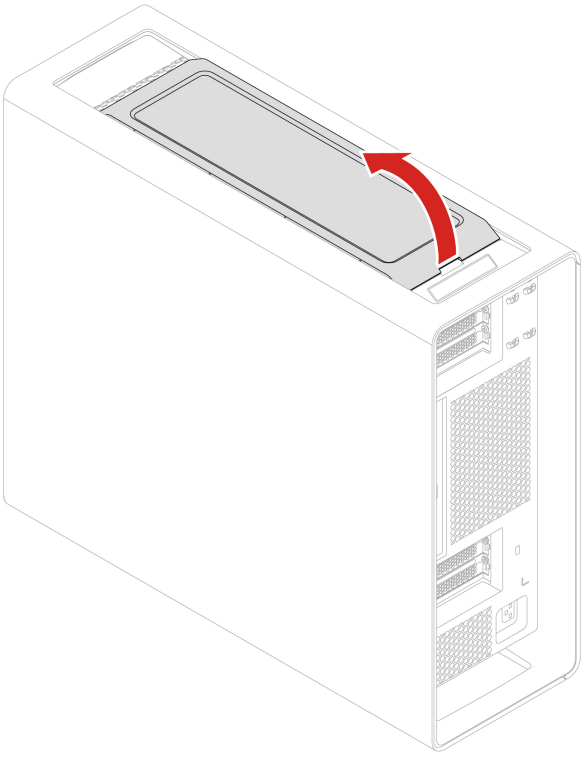
Removal steps



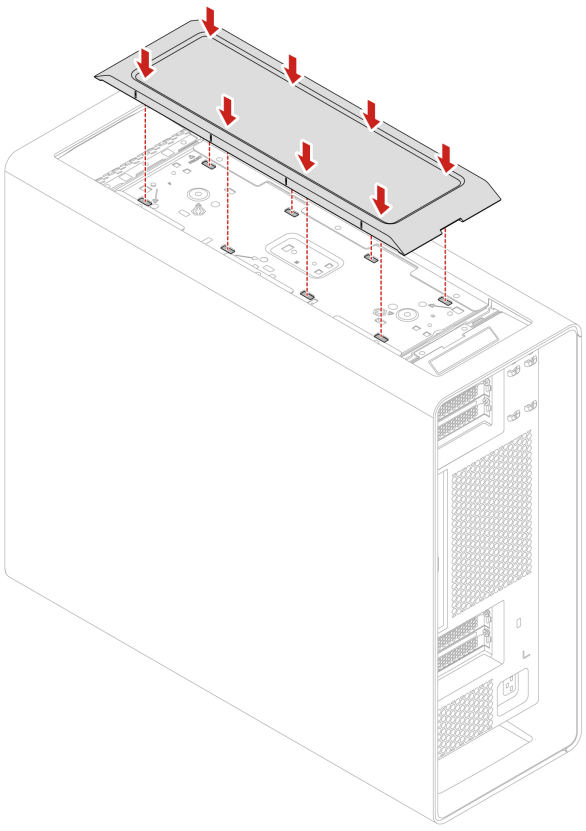
Top cover

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps



Installation steps

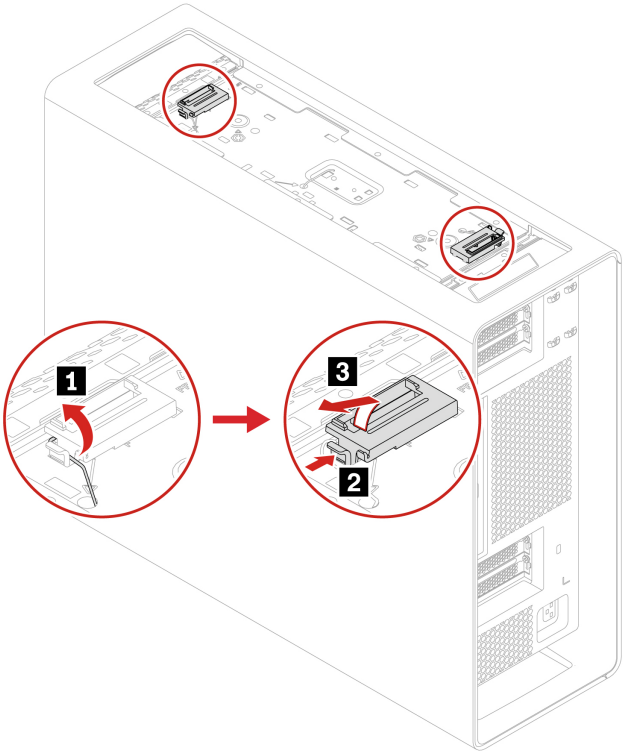


Wi-Fi antenna cover

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the “Top cover” on page 35.
2. Remove the Wi-Fi antenna cover.

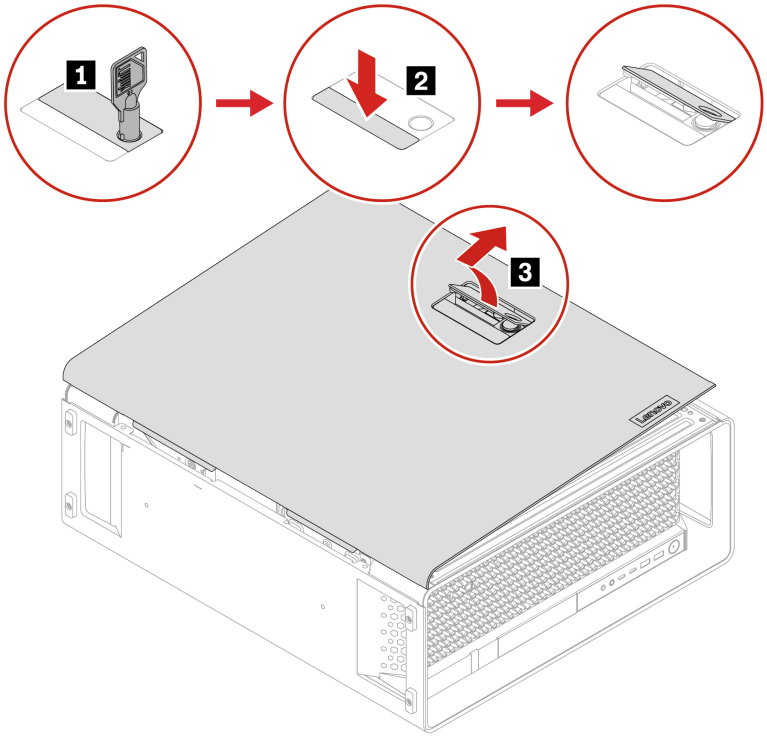


Side cover

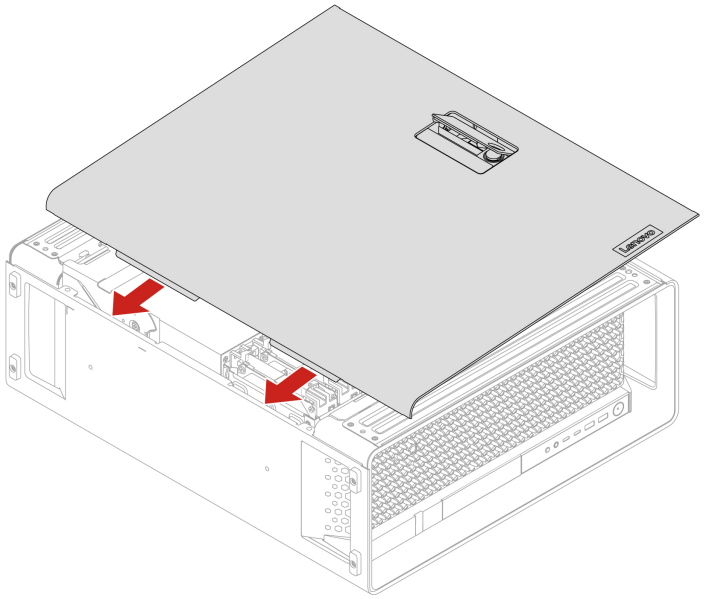
Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

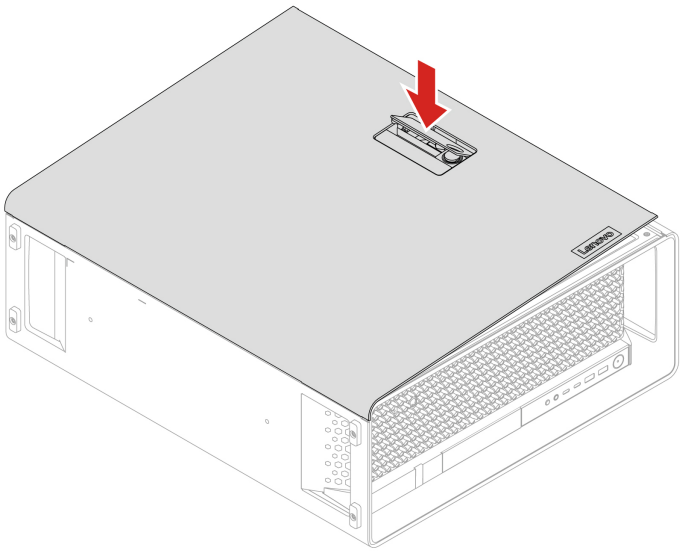
Removal steps

1. Lay the computer on its side for easier access to the side cover.
2. Press to open the side cover handle and remove the side cover.



Installation steps



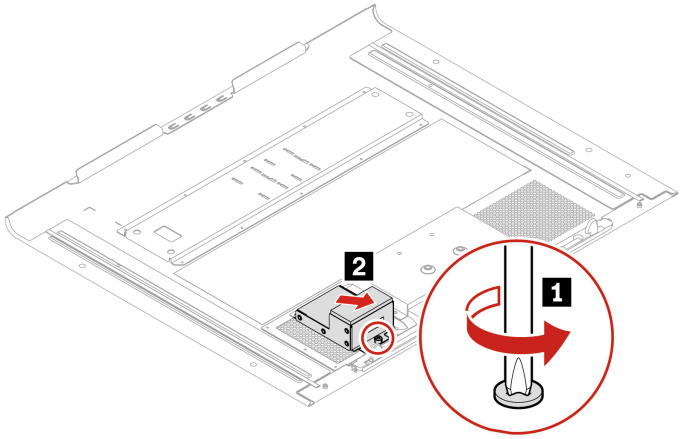


NVLINK retainer

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the “Side cover” on page 37.
2. Remove the NVLINK retainer.



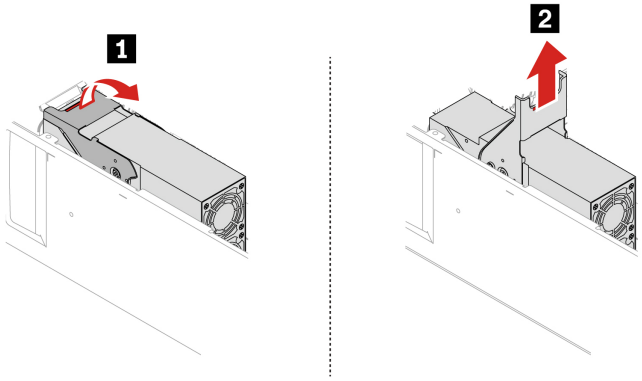
Screw (quantity)	Color	Torque
M3 x 5 mm, Ni coated (1)	Black	5.0 ± 0.5 lb/in

Power supply assembly

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the “Side cover” on page 37.
2. Remove the power supply assembly.



Storage drives

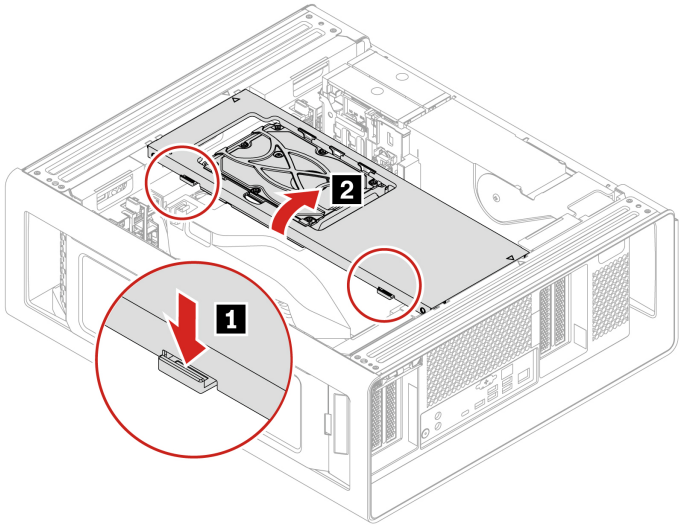
By reading this section, you will learn to replace storage drives in your computer. For their types, locations, and rules, see “Expansion modules” on page 7.

Optional internal storage drive cage

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the “Side cover” on page 37.
2. Remove the optional internal storage drive cage.

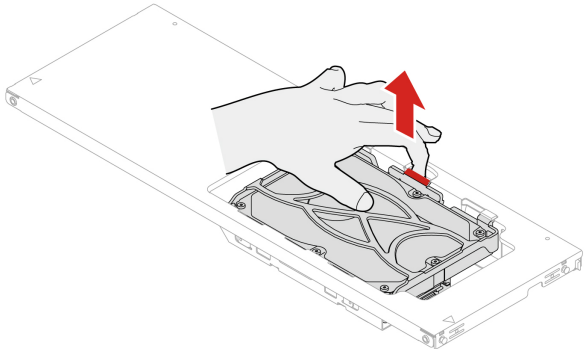


HDD in optional internal storage drive cage

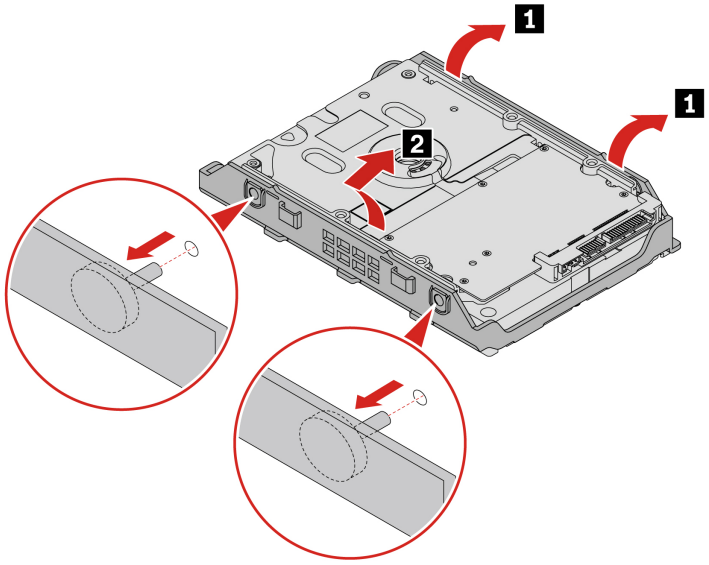
Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the following parts, if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
2. Remove the HDD with its bracket from the optional internal storage drive cage.



3. Remove the HDD from its bracket.



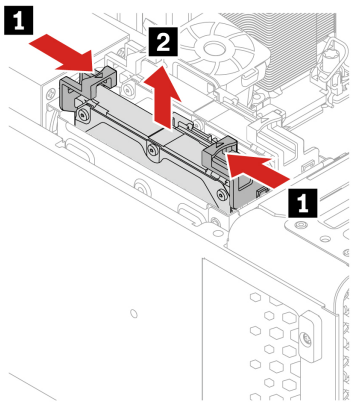
Note: When the computer is installed with NVIDIA Quadro SYNC II card or GeForce 40X0 graphics card, do not install 3.5-inch HDD in the optional internal storage drive cage.

HDD in the internal storage drive cage

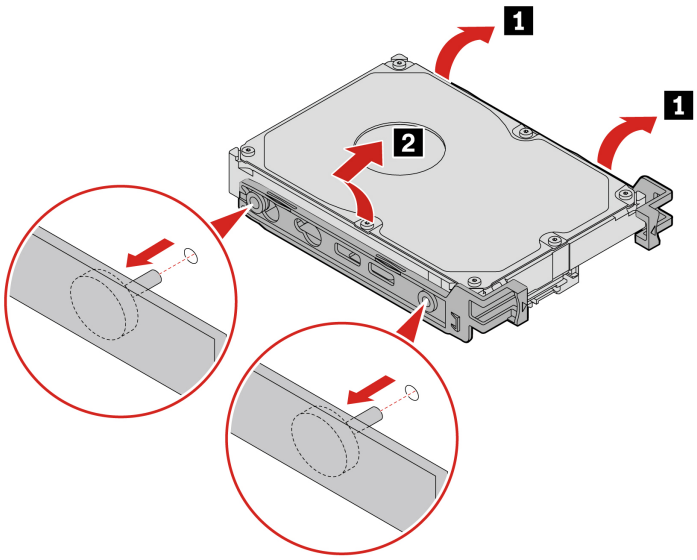
Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the “Side cover” on page 37.
2. Remove the HDD with its bracket from the internal storage drive cage.



3. Remove the HDD from its bracket.

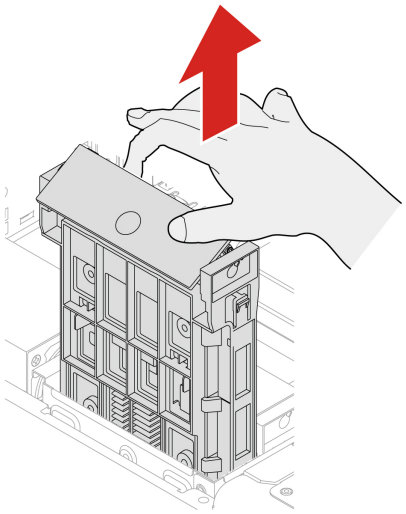


U.2 or U.3 SSD in the internal storage drive cage

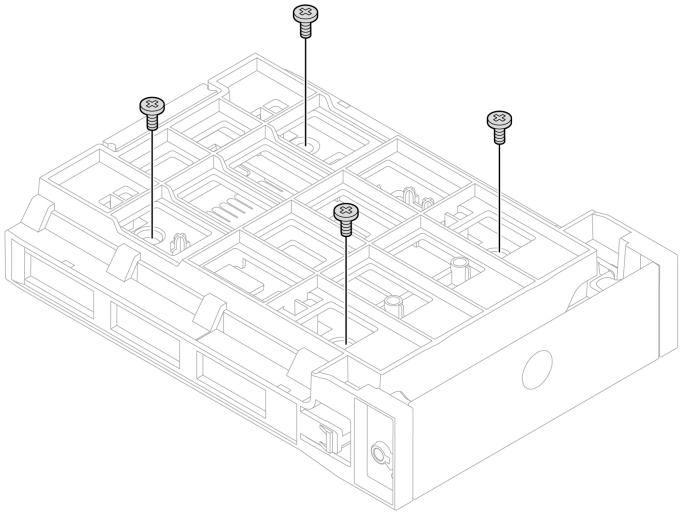
Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

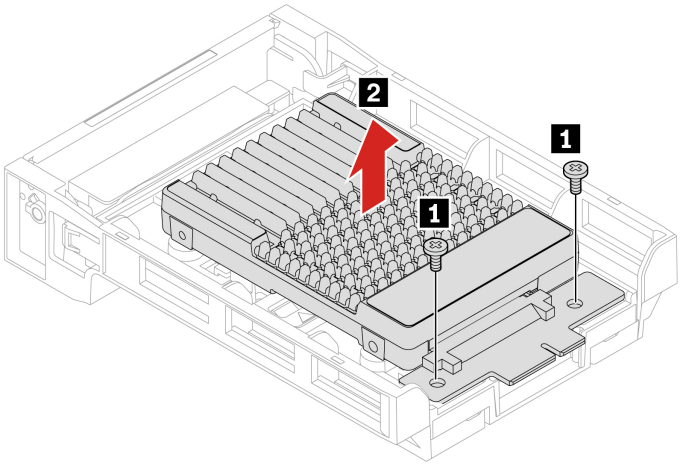
1. Remove the “Side cover” on page 37.
2. Remove the U.2 or U.3 SSD with its bracket from the internal storage drive cage.



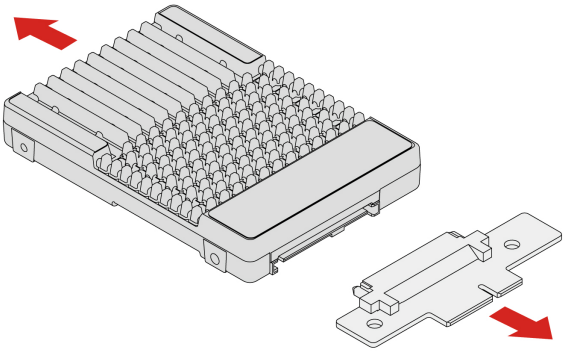
3. Remove the U.2 or U.3 SSD from its bracket.



Screw (quantity)	Color	Torque
M3 x 3.75 mm, Zn coated (4)	Black	5.0 ± 0.5 lb/in



Screw (quantity)	Color	Torque
M3 x 2 mm, Zn coated (2)	Blue	5.0 ± 0.5 lb/in

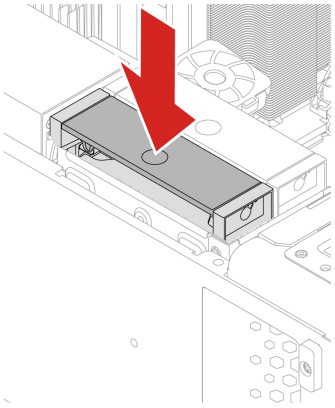


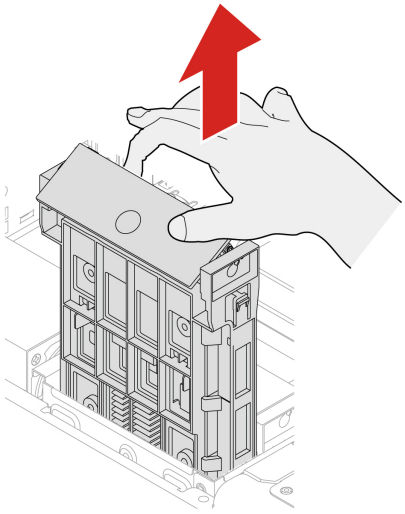
M.2 SSD bracket in internal storage drive cage

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the “Side cover” on page 37.
2. Remove the M.2 SSD bracket from the chassis.



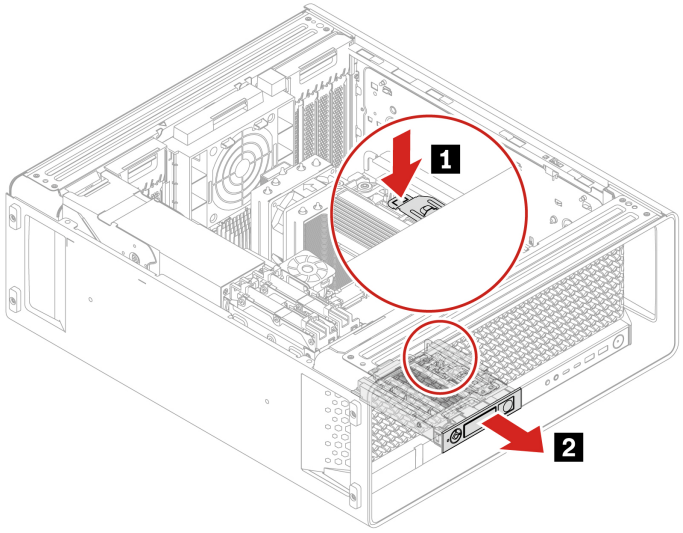


Devices in the front-access storage bay

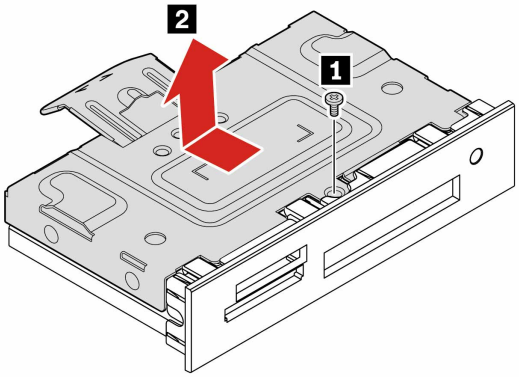
Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

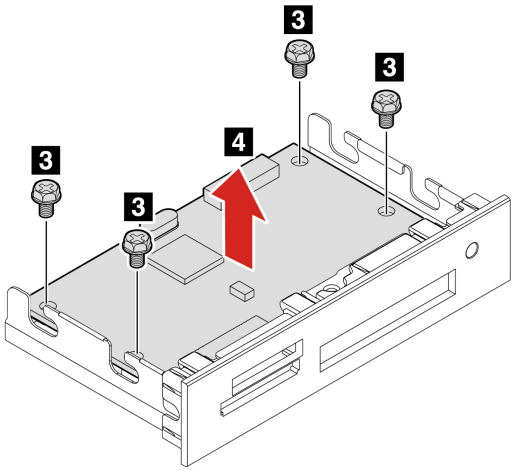
1. Remove the following parts if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
   c. “Front fan” on page 58
   d. “Front-access storage fan” on page 60
2. Remove device in the front-access storage bay, which can be NVMe storage tray, 15-in-1 media card reader, or blank bezel.
   - NVMe storage tray / 15-in-1 media card reader:



PCBA of 15-in-1 media card reader:

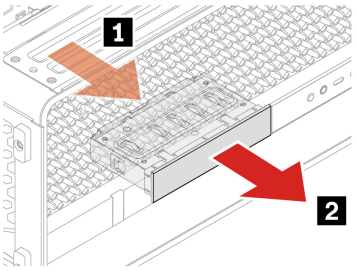


Screw (quantity)	Color	Torque
M3 x 4 mm, Zn coated (1)	Blue	3.0 ± 0.5 lb/in



Screw (quantity)	Color	Torque
M3 x 5 mm, Ni coated (4)	Black	5.0 ± 0.5 lb/in

- Blank bezel:



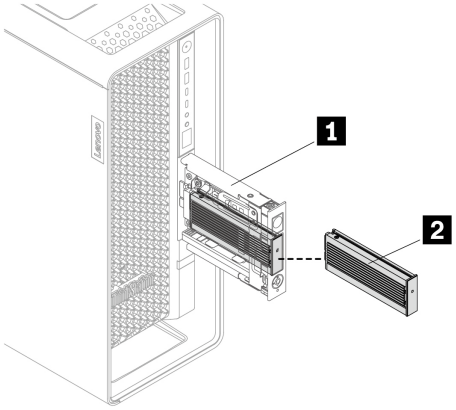
M.2 SSD storage box in NVMe storage tray

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

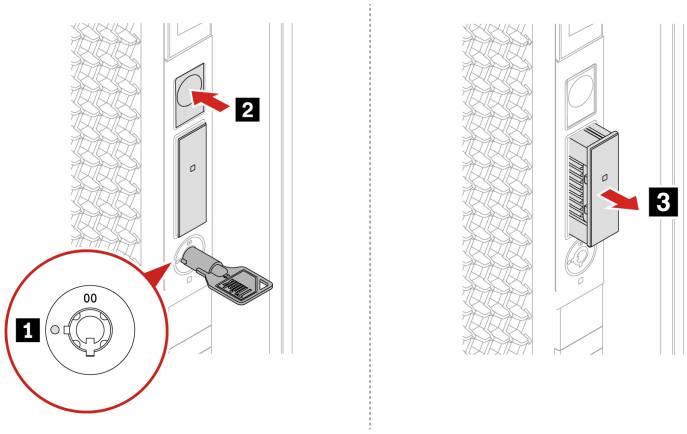
Removal steps

Notes:

- 1 NVMe storage tray
- 2 M.2 SSD storage box



You might need to use the key attached at the rear of the computer to unlock the M.2 SSD storage box.

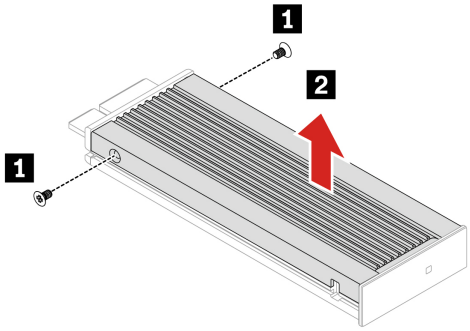


M.2 SSD in M.2 SSD storage box

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

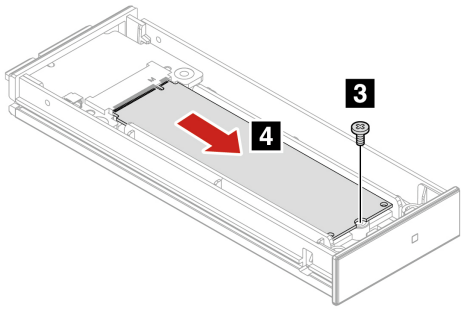
Removal steps

1. Remove the “M.2 SSD storage box in NVMe storage tray” on page 47
2. Remove the M.2 SSD heatsink kit.



Screw (quantity)	Color	Torque
M2 x 3.6 mm, Zn coated (2)	Blue	1.5± 0.2 lb/in

3. Remove the M.2 SSD.



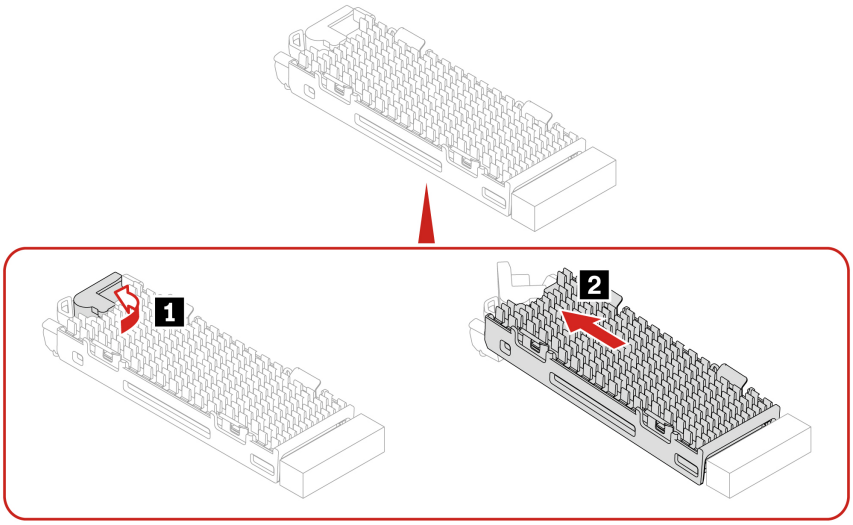
Screw (quantity)	Color	Torque
M2 x 4.5 mm, Zn coated (1)	Black	1.5± 0.2 lb/in

On-board M.2 SSD

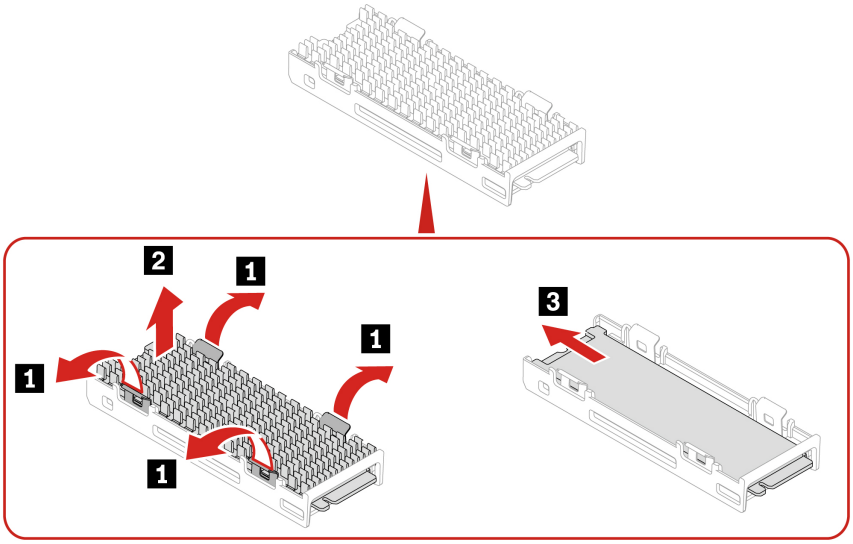
Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the following parts if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
2. Remove the M.2 SSD with its heatsink kit.

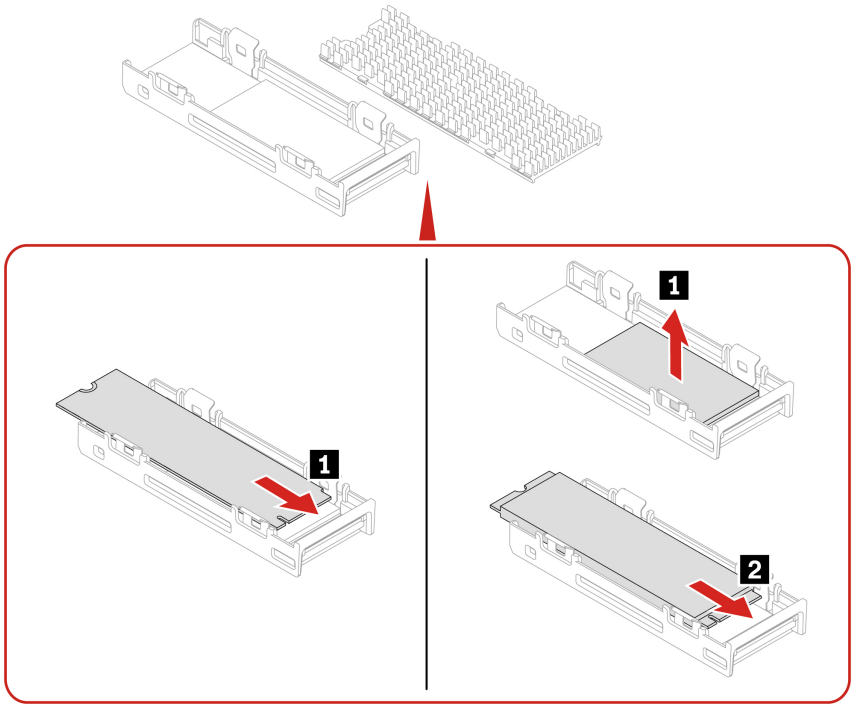


3. Remove the M.2 SSD from its heatsink kit.

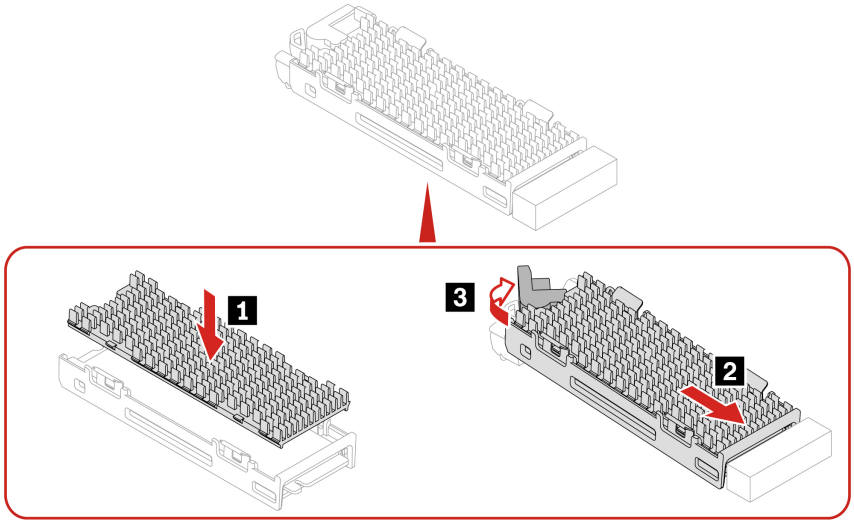


Installation steps

1. Install the M.2 SSD to its heatsink kit.



2. Install the M.2 SSD with its heatsink kit.



PCIe cards

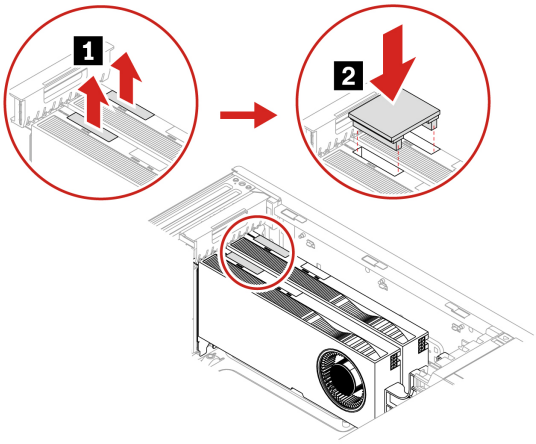
By reading this section, you will learn to replace PCIe cards, including graphics cards, in your computer.

NVLINK bridge

- Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.
- The NVLINK bridge is shipped in an accessary box within the computer carton box. You need to take it out from the packaging and install it by yourself.

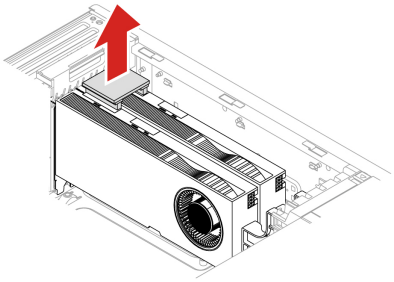
Installation steps

1. Remove the “Side cover” on page 37.
2. Install the NVLINK bridge.



Removal steps

1. Remove the “Side cover” on page 37.
2. Remove the NVLINK bridge.

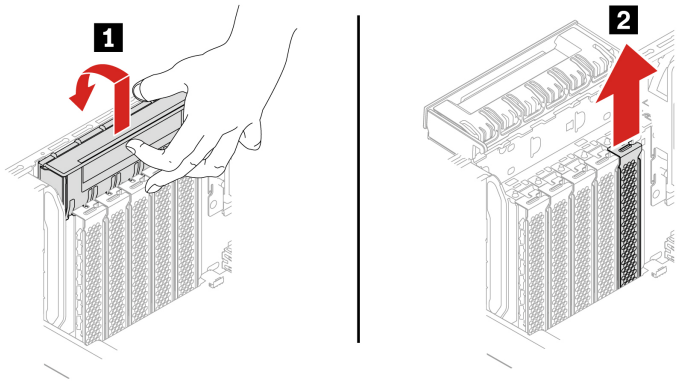


PCIe card bracket

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the “Side cover” on page 37.
2. Open the handle and remove the PCIe card bracket.

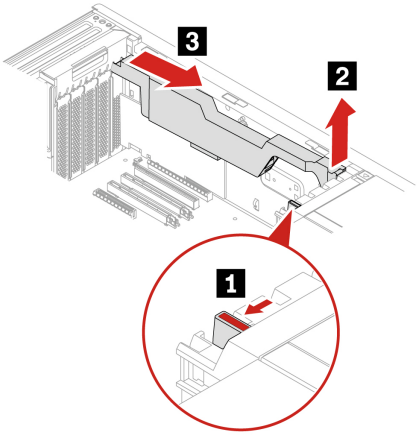


Half-length PCIe card

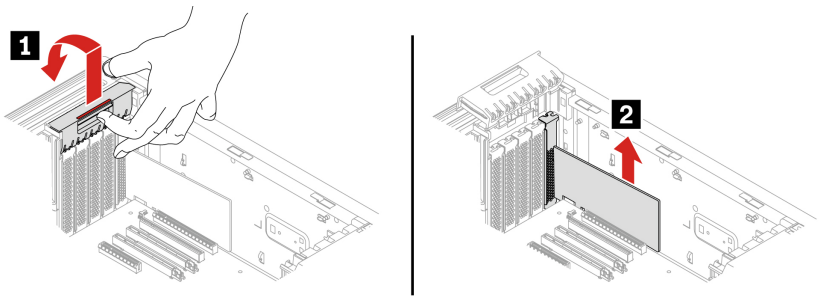
Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

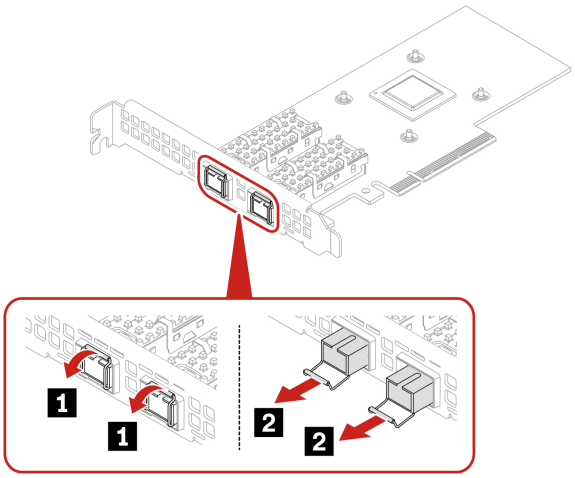
1. Remove the “Side cover” on page 37.
2. Remove the PCIe card.
   a. Remove the PCIe card retainer. The PCIe card retainer is only available on some PCIe cards.



   b. Open the handle and remove the PCIe card. The card might fit tightly into the slot. If necessary, alternately move each side of the card a small amount until the card is removed from the slot.



   c. For NVIDIA ConnectX-6 Ethernet Adapter card, the following fiber modules can be removed.

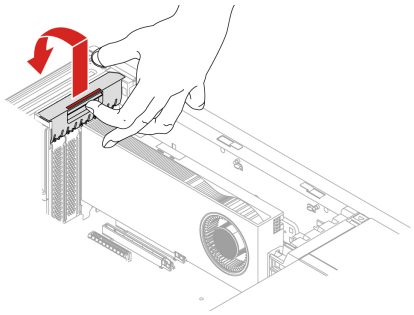


Full-length PCIe card

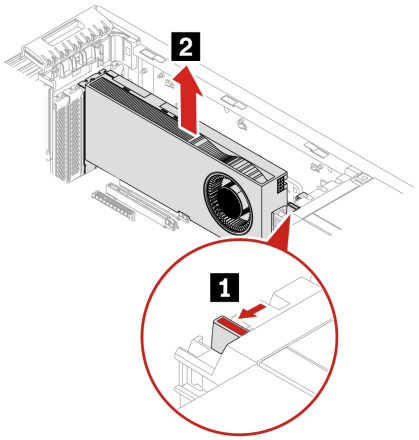
Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the “Side cover” on page 37.
2. Remove the PCIe card.
   a. Open the handle.



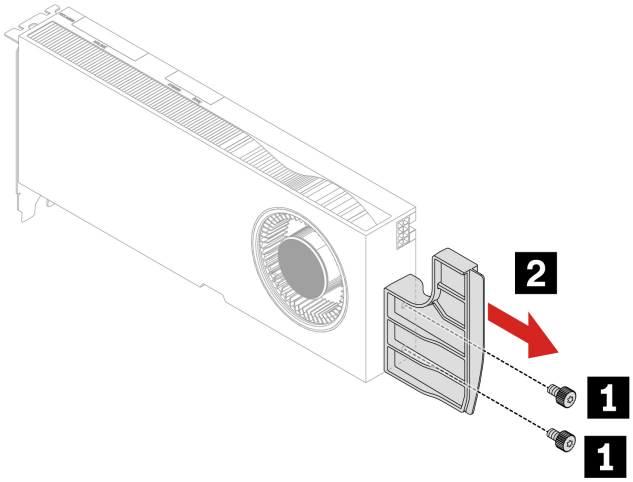
   b. Remove the PCIe card. The card might fit tightly into the slot. If necessary, alternately move each side of the card a small amount until the card is removed from the slot.



c. Remove the PCIe card extender if needed.

Notes:

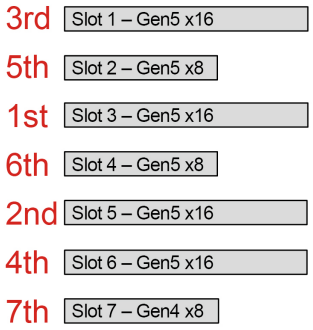
- For computer models with GFX RTX 4000 Ada, the graphics card and the PCIe card extender work as a CRU assembly. Do not try to remove the extender.
- For computer models with double-width or wider graphics cards (such as NVIDIA RTX 6000 Ada and GeForce RTX 40X0), the PCIe card extender is a customized CRU part. You can remove it according to the following illustration.
- If you want to install a double-width or wider graphics card, install the customized PCIe card extender first.



Screw (quantity)	Color	Torque
M3 x 5.5 mm, Nickle coated (2)	Black	3-3.5 lb/in

PCIe card installation order

- Before installing PCIe card, you need to remove “PCIe card bracket” on page 52.
- Install PCIe cards according to the corresponding slot types and the following illustrated installation order:



- If you replace a Geforce RTX 40X0 graphics card, do not change its installation slot.

Cable connection

Note: The connectors on the cards or system board might look slightly different from the illustrations.

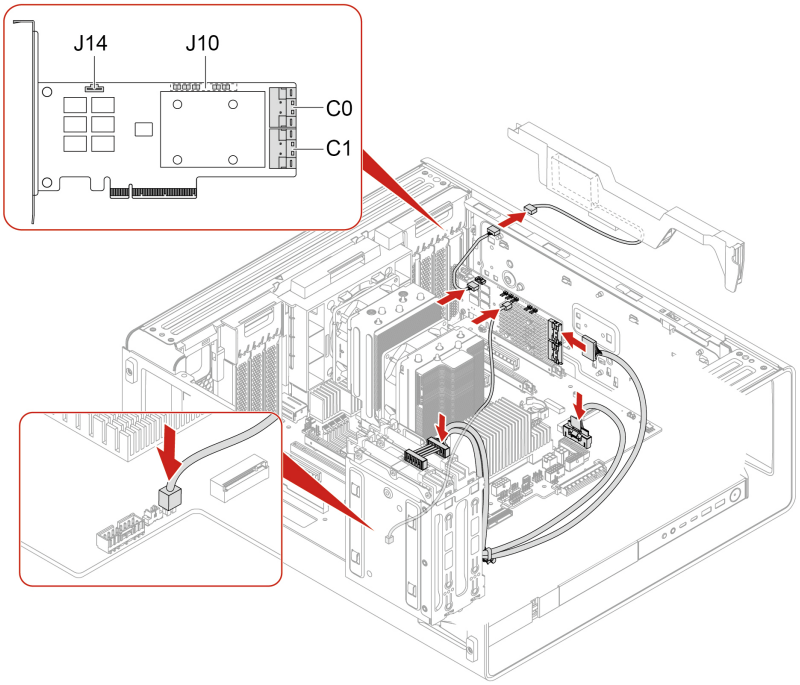


Figure 1. Cable connection for BCM9560 RAID AIC

Notes:

- C0 connector priority is higher than C1 connector.
- Internal storage drive cage priority: 1a, 1b, and 5. See “Expansion modules” on page 7.

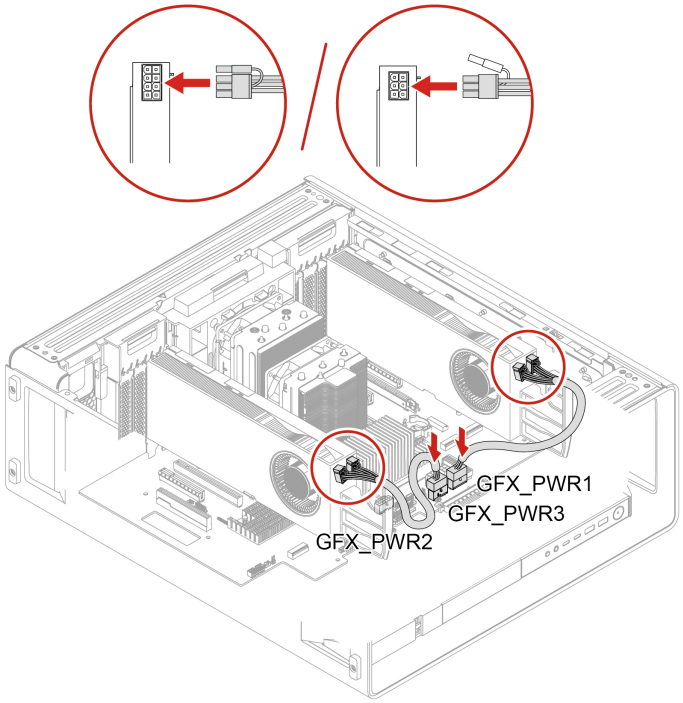


Figure 2. GFX GV100/RTX A5000/RTX A4000 Aux power connection

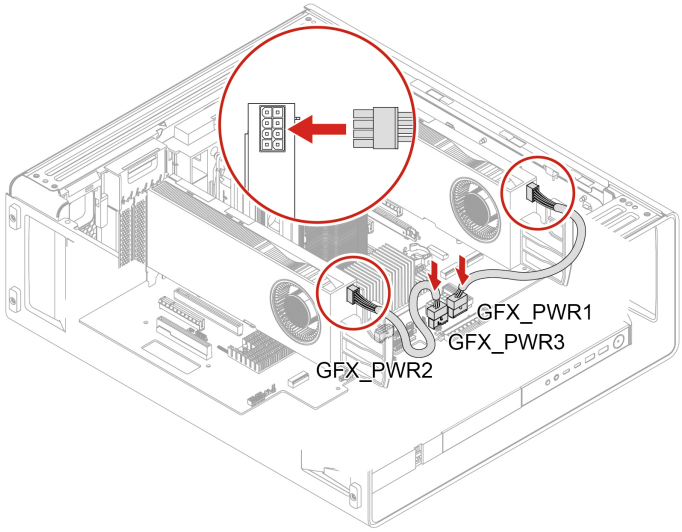


Figure 3. GFX RTX A6000 Aux power connection

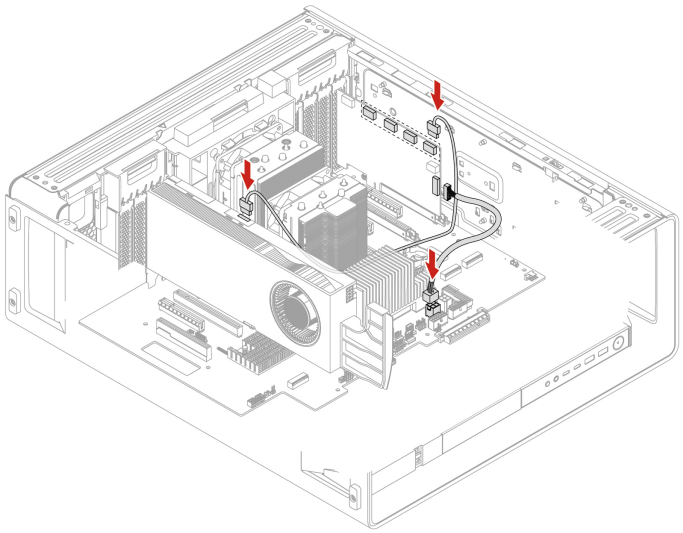


Figure 4. Cable connection for NVIDIA Quadro SYNC II card

Fans

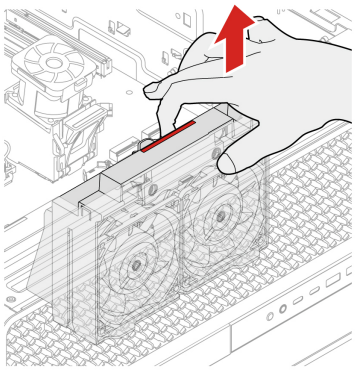
By reading this section, you will learn to replace the fans in your computer.

Front fan

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the following parts if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
2. Remove the front fan.

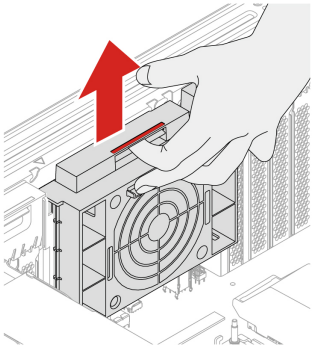


Rear fan

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the following parts if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
2. Remove the rear fan.

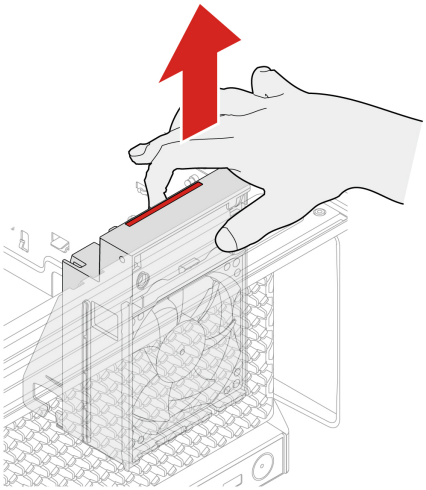


Upper PCIe fan

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the following parts if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
   c. “Front fan” on page 58
2. Remove the upper PCIe fan.

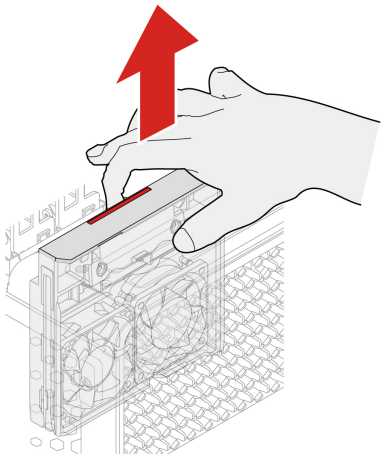


Lower PCIe fan and internal storage drive fan

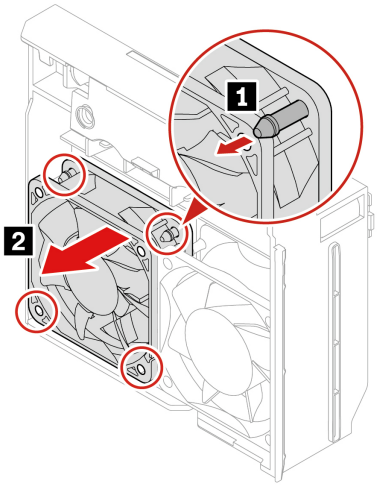
Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the following parts if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
   c. “Front fan” on page 58
2. Remove the lower PCIe fan and internal storage drive fan together.



3. Remove the internal storage drive fan.

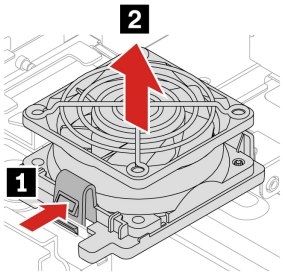


Front-access storage fan

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the following parts if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
2. Remove the front-access storage fan.

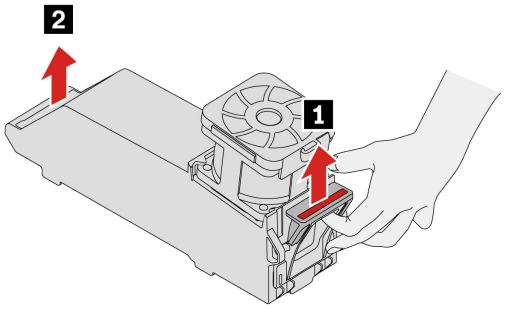


Memory fan and air duct

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

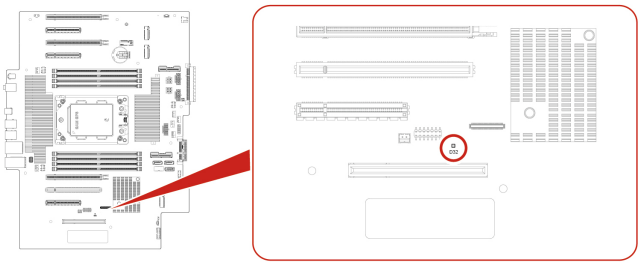
Removal steps

1. Remove the following parts if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
2. Remove the memory fan and air duct.



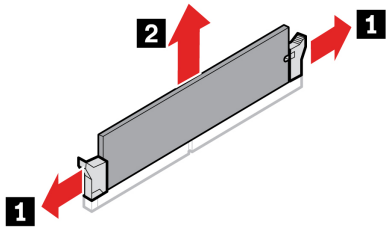
Memory module

- Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.
- Do not replace the memory module until the LED indicator on the system board goes off. It indicates that the system is completely discharged of electricity.

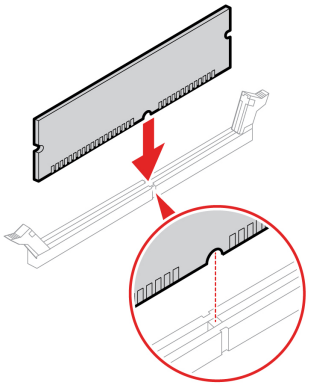


Removal steps

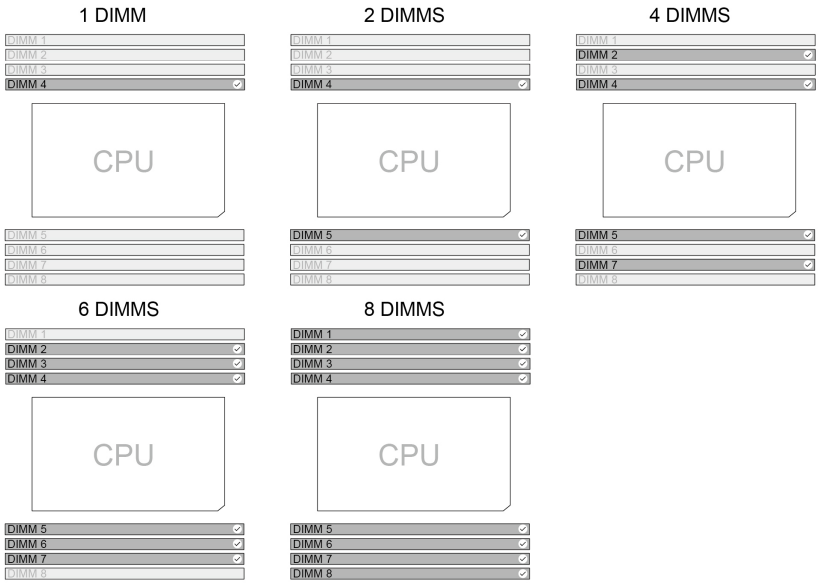
1. Remove the following parts if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
   c. “Memory fan and air duct” on page 61



Installation steps



Note: Ensure that you install memory modules in the order shown in the following illustration.

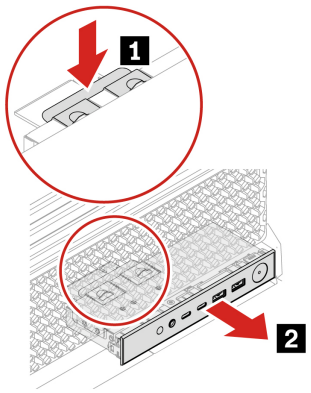


Front panel I/O assembly

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the following parts if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
   c. “Front fan” on page 58
   d. “Upper PCIe fan” on page 59
2. Remove the front panel I/O assembly.



ThinkStation LED and holder

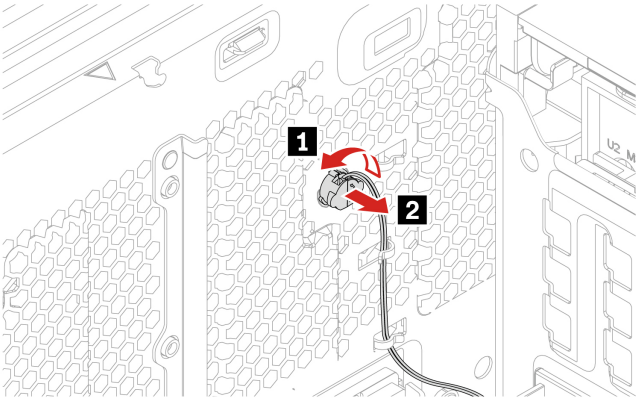
Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

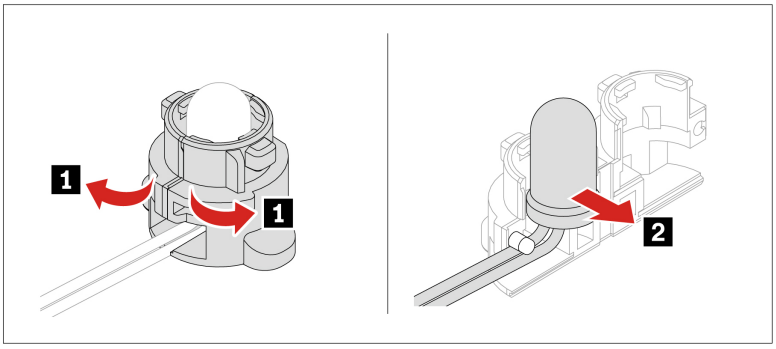
1. Remove the following parts if any:

a. “Side cover” on page 37
b. “Optional internal storage drive cage” on page 40
c. “Front fan” on page 58
d. “Lower PCIe and internal storage drive fan” on page 60

2. Remove the ThinkStation LED.



3. Remove the ThinkStation LED holder.

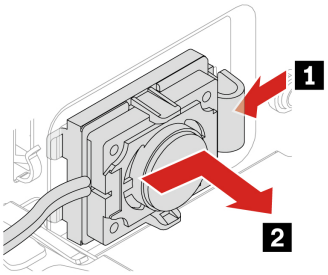


Internal speaker

Before you start, ensure that you have read “Prerequisite for CRU replacement” on page 33.

Removal steps

1. Remove the following parts if any:
   a. “Side cover” on page 37
   b. “Optional internal storage drive cage” on page 40
   c. “Front fan” on page 58
   d. “Rear fan” on page 58
   e. “Lower PCIe and internal storage drive fan” on page 60
2. Remove the internal speaker.


1
2

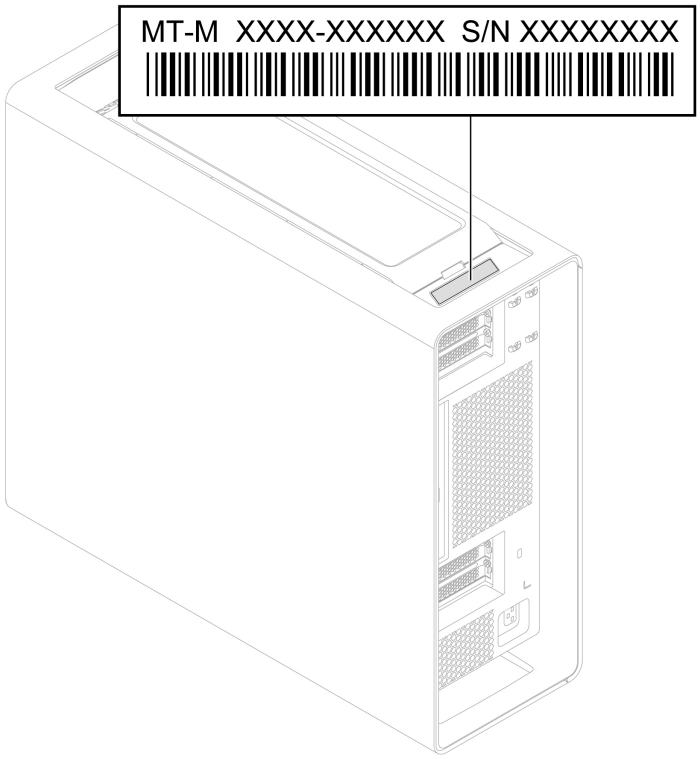
Chapter 6. Help and support

Find your serial number

This topic helps you find 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)



Diagnose and troubleshoot your computer

This section provides introduction to a set of diagnostics and troubleshooting tools at Lenovo Support Web site and the Vantage app. They can help you diagnose common software and hardware issues.

The following table lists these diagnostics tools and the recommended conditions for each tool.

Diagnostics tool	Recommended scenario
Troubleshoot and diagnose at Lenovo Support Web site	You want to have an online troubleshooting or scan of hardware and drivers on your computer.
Hardware scan	• Your computer is installed with the Vantage app. • You want to perform basic examinations of the hardware components.
Use ThinkStation diagnostic tool	You want to use diagnostic solutions to test hardware components and report operating-system-controlled settings that interfere with the correct operation of your computer.

Troubleshoot and diagnose at Lenovo Support Web site

Lenovo provides two different diagnosing solutions to help you identify and resolve problems on your computer.

Step 1. Go to https://www.pcsupport.lenovo.com/ and enter your product name in the search box.

Step 2. Click **Troubleshoot & Diagnose** and select the option that fits your need.

Notes:

- Before launching any automatic diagnosing process, a pop-up window will be prompted to install Lenovo Service Bridge. Lenovo Service Bridge helps to connect your computer with Lenovo diagnosing tools.
- Lenovo Support Web site makes periodic updates of the sections to keep improving your experience with your computer. The Web site interface and descriptions of sections might be different from that on your actual interface.

- If you are unaware of what problem your computer goes with, it is recommended that you select **Easy** and follow on-screen instructions to get your firmware updated and obtain the hardware status.
- If you have identified the problem on your computer, you can select **Custom** and follow on-screen instructions to resolve the problem.

If solutions can not resolve problems on your computer, you can follow on-screen instructions to submit an e-ticket or contact Lenovo for professional assistance.

Hardware scan

Hardware scan is an effective hardware testing tool to help you identify existing hardware issues.

To run the Hardware scan:

Step 1. Type `Vantage` in the Windows search box and then press Enter.

Step 2. Click **Hardware scan** or **Support → Hardware scan**.

Step 3. Select **QUICK SCAN** or **CUSTOMIZE** and then follow the on-screen instructions to run the hardware scan.

Notes:

- The Quick Scan tool contains a pre-selected suite of tests that performs basic examinations of the hardware components found in the system. The Customize tool enables you to select one or several hardware components to perform the examinations.

- Before selecting **QUICK SCAN**, click **Refresh Modules** to ensure that the list of hardware components is the components currently available for the computer.

Step 4. If any hardware failure is detected, the result varies depending on the warranty status and varies by country or region. Follow the on-screen instructions to resolve the issue.

Use ThinkStation diagnostic tool

When an error message pops up in the Windows notification area, a four-digit error code is displayed on the diagnostic panel (for selected models) on the front panel, or the diagnostic indicator on the front panel turns on, do one of the following:

- If ThinkStation Diagnostics can be launched properly:
  1. Click the error message or the ThinkStation Diagnostics icon to launch the program.
  2. All events are logged locally in the program. Locate the related event and view the event log to find possible solutions.
  3. Record the four-digit error code displayed on the diagnostic panel (for selected models) or in ThinkStation Diagnostics, and then decode the error at https://www.thinkworkstationsoftware.com/codes.

  Note: You can download ThinkStation Diagnostics at https://pcsupport.lenovo.com/lenovodiagnosticsolutions/downloads.
- If your computer does not function:
  1. Use your smartphone to scan the QR code displayed on the diagnostic panel to open https://www.thinkworkstationsoftware.com/codes.
  2. Decode the error according to the four-digit error code displayed on the diagnostic panel.

For more information, go to https://www.thinkworkstationsoftware.com/diags.

Recover your Windows operating system

Use the following recovery options to reset or restore your computer when your computer comes with issues.

- Use Lenovo recovery options.
  1. Go to https://support.lenovo.com/HowToCreateLenovoRecovery.
  2. Follow the on-screen instructions.
- Use Windows recovery options.
  1. Go to https://pcsupport.lenovo.com.
  2. Detect your computer or manually select your computer model.
  3. Navigate to the troubleshooting menu to diagnose the operating system for recovery instructions.

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 67.

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
Accessibility information	https://www.lenovo.com/accessibility
Windows help information	• Open the Start menu and click **Get Help** or **Tips**. • Use Windows Search or the Cortana® personal assistant. • Microsoft support Web site: https://support.microsoft.com

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.

Certification-related information

Product name: ThinkStation P8

Machine types: 30HF, 30HH, and 30HJ

Further compliance information related to your product is available at https://www.lenovo.com/compliance.

Compliance information

For more compliance information, refer to *Regulatory Notice* at https://pcsupport.lenovo.com and *Generic Safety and Compliance Notices* at https://pcsupport.lenovo.com/docs/generic_notices.

Appendix A. Notices and trademarks

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https://pcsupport.lenovo.com

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