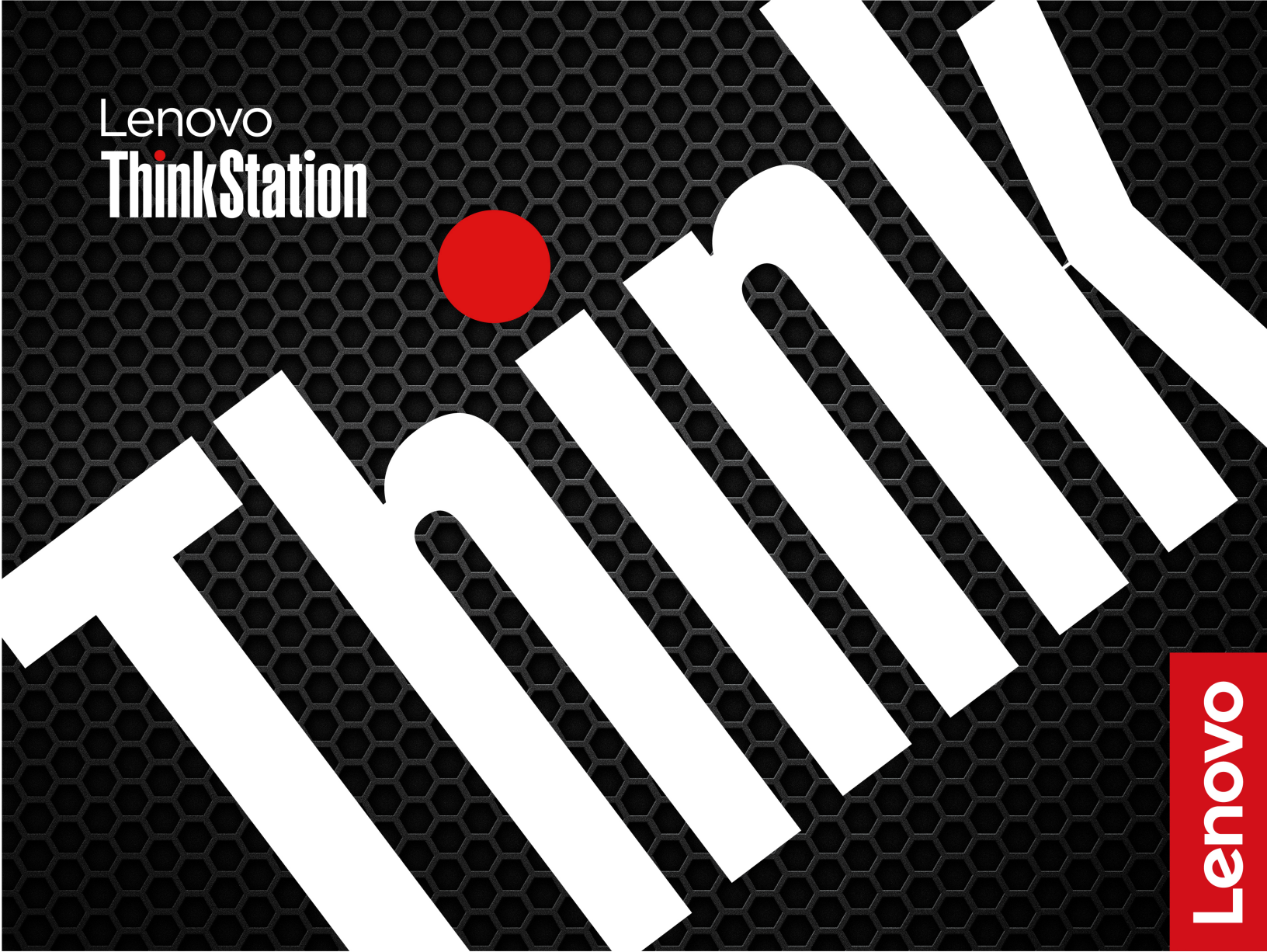


Linux User Guide

Lenovo
ThinkStation



ThinkStation P5

About this documentation

This documentation applies to the ThinkStation product models listed below.

Model name	Machine types (MT)
ThinkStation P5	30G9, 30GA, 30GB, and 30GF

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

Before using this documentation, please read the following information:

- *Setup Guide* (printed)
- *Safety and Warranty Guide* (printed)
- For more compliance information, refer to *Regulatory Notice* at https://support.lenovo.com/docs/common-commercial_rn and *Generic Safety and Compliance Notices* at <https://pcsupport.lenovo.com/docs/generic-notices>.
- 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. Lenovo makes constant improvements to the documentation of your computer, including this *User Guide*. To get the latest documentation, go to:
 - For computers purchased in mainland China: <https://iknow.lenovo.com.cn>
 - For computers purchased outside mainland China: <https://support.lenovo.com/documentation>

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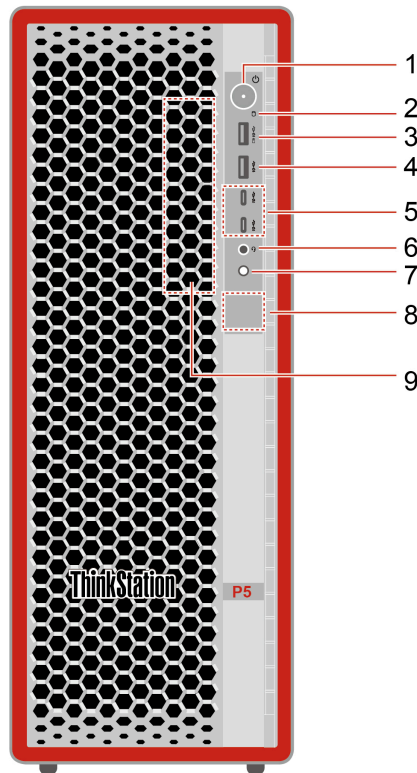
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Chapter 1. Overview

Front



Item	Description	Item	Description
1	Power button with power indicator	2	Storage indicator
3	Always on USB-A 3.2 Gen 2 connector*	4	USB-A 3.2 Gen 2 connector*
5	USB-C (3.2 Gen 2) connectors*	6	Combo audio jack
7	Diagnostic LCD switch	8	Diagnostic LCD
9	Flex 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.

Storage indicator

The storage indicator blinks when a storage drive is under reading or writing.

Diagnostic LCD switch

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

Status	Behavior and function
No event	Short press: Turn on or turn off the diagnostic LCD. Date and time will be displayed on the LCD when it is turned on. The LCD will turn off automatically if idle for three minutes.
Error events occur	The diagnostic LCD will turn on automatically when an error event occurs. <ul style="list-style-type: none"> • 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.

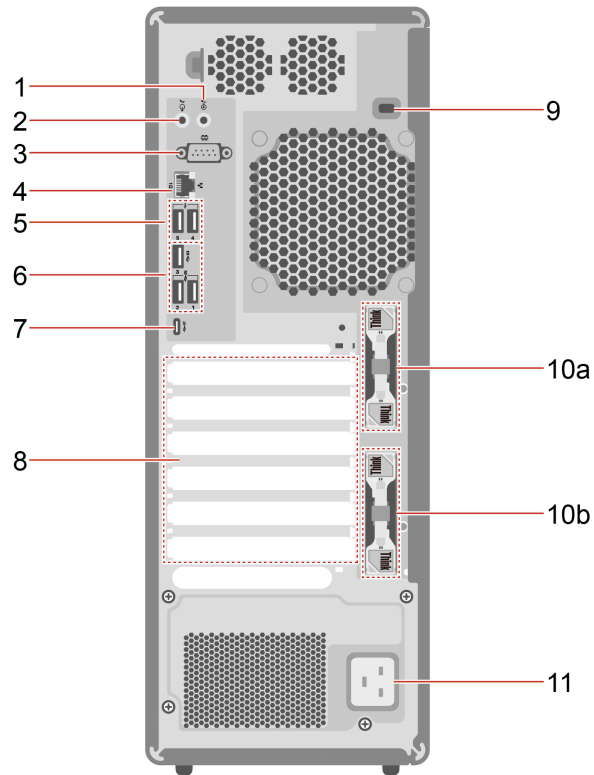
The diagnostic LCD behavior can be changed in the UEFI BIOS as follows.

1. Turn on or restart the computer. When the logo screen is displayed, press F1 or Fn+F1 to enter the UEFI BIOS menu.
2. Go to **Advanced** → **Diagnostics**. Choose to show only the Diagnostic Error Code or both it and the BIOS POST Code. Adjust other settings if needed.

Related topics

- “USB specifications” on page 7

Rear

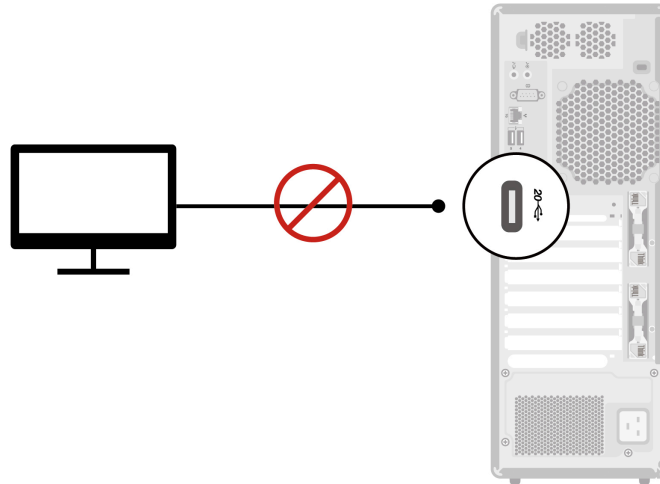


Item	Description	Item	Description
1	Audio line-in connector	2	Audio line-out connector
3	Serial connector*	4	Ethernet connector (1G)
5	USB-A 2.0 connectors	6	USB-A 3.2 Gen 2 connectors
7	USB-C (3.2 Gen 2x2) connector	8	PCI-Express card area
9	Security-lock slot	10a	Key-nest for the side cover*
10b	Key-nest for the M.2 solid-state drive in flex module*	11	Power connector

* for selected models

USB-C (3.2 Gen 2x2) connector

Do not connect your external display to the USB-C connector on the rear panel. Otherwise, the external display will not work and the USB-C connector may get damaged.




Serial connector


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

Related topics

- “Lock the computer” on page 13
- “Connect an external display” on page 9
- “USB specifications” on page 7

Specifications

Specifications	Description
Dimensions	<ul style="list-style-type: none"> • Width: 165 mm (6.5 inches) • Height: 440 mm (17.3 inches) with feet • Depth: 453.9 mm (17.9 inches)
Weight (without packaging)	Maximum configuration as shipped: 19 kg (41.89 lb)
Hardware configuration	<ul style="list-style-type: none"> • For Ubuntu 22.04: <ol style="list-style-type: none"> 1. Open the system menu from the top-right corner and click Settings. 2. Click About. • For Ubuntu 24.04: <ol style="list-style-type: none"> 1. Open the system menu from the top-right corner and click . 2. Click System → About.
Power supply	<ul style="list-style-type: none"> • 750-watt automatic voltage-sensing power supply • 1000-watt automatic voltage-sensing power supply
Electrical input	<ul style="list-style-type: none"> • Input voltage: From 100 V ac to 240 V ac • Input frequency: 50/60 Hz

Specifications	Description
Adaptability for power supply	<ul style="list-style-type: none"> Mainland China: 220 V±22 V, 50 Hz±1 Hz Adaptive voltage positioning: 90 V to 264 V, 50/60 Hz With voltage selection switch: 90 V to 264 V, 50 Hz±1 Hz
CPU	<ul style="list-style-type: none"> For Ubuntu 22.04: To view the microprocessor information of your computer, enter Settings and click About. For Ubuntu 24.04: To view the CPU information of your computer: <ol style="list-style-type: none"> Open the system menu from the top-right corner and click . Click System → About.
Memory	<ul style="list-style-type: none"> Double data rate 5 (DDR5) error correction code (ECC) registered dual in-line memory module (RDIMMs) Maximum memory capacity: Up to 512 GB (8 x 64 GB if available)
Storage device	<ul style="list-style-type: none"> 3.5-inch hard disk drive (HDD) 2280 Gen 4 M.2 solid-state drive (SSD) in flex module 2280 Gen 4 or Gen 5 M.2 SSD in onboard M.2 SSD slots <p>Type Disks in the search box and use the Disks application to view the storage drive capacity of your computer.</p> <p>Note: The storage drive capacity indicated by the system is less than the nominal capacity.</p>
Expansion	<ul style="list-style-type: none"> Memory slots Optional storage drive bay* Flex bay* Storage drive bay Onboard M.2 SSD slots PCI-Express slots
Network features	<ul style="list-style-type: none"> 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

The Intel Xeon® or Intel Core™ CPU families compatible with this ThinkStation computer feature an integrated memory controller. The memory controller provides the CPU with direct access to the system memory. Therefore, the system memory speed will be determined by the memory module type, frequency, size (capacity), the number of memory modules installed, and the CPU model.

Notes:

- Your computer comes with 4800 MT/s memory modules and will run at lower speed due to platform limitations.
- The actual system memory speed of the memory modules varies depending on the CPU model. For example, your computer comes with 4800 MT/s memory modules, but the CPU only supports up to 4400 MT/s memory modules. Then the system memory speed will be no faster than 4400 MT/s.
- The CPU models supported in your computer might vary. For a list of supported CPU models, contact the Lenovo Customer Support Center.
- Ensure that you use the same type and capacity for memory modules and follow the installation order shown in the following illustration.

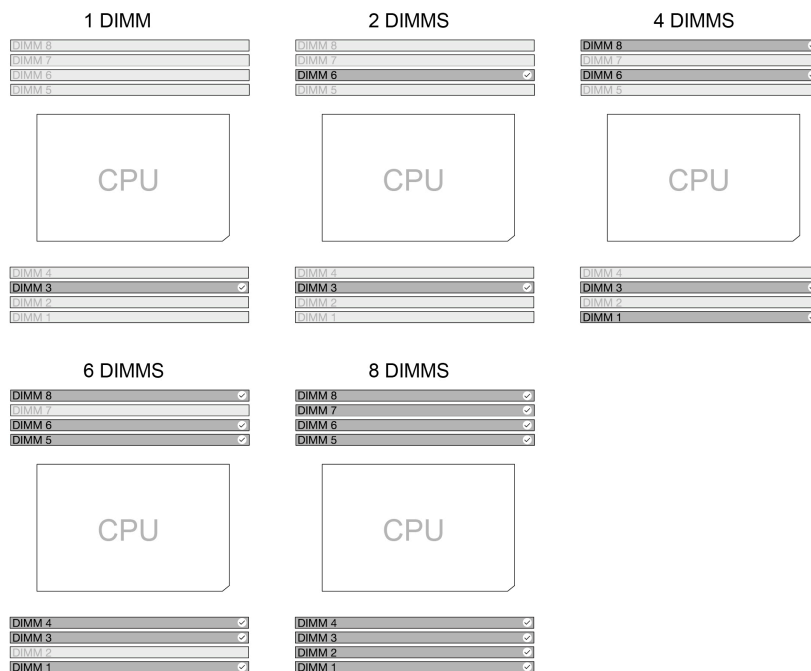


Figure 1. Memory module order

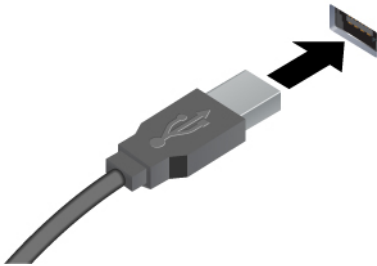


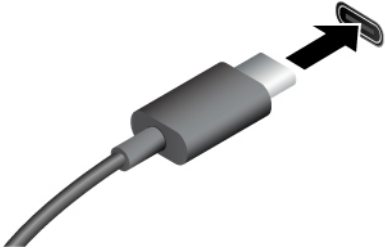


Refer to the following information about the system memory speed:

- **Memory module types:**
 - DDR5 ECC RDIMMs
- **Memory module speed:**

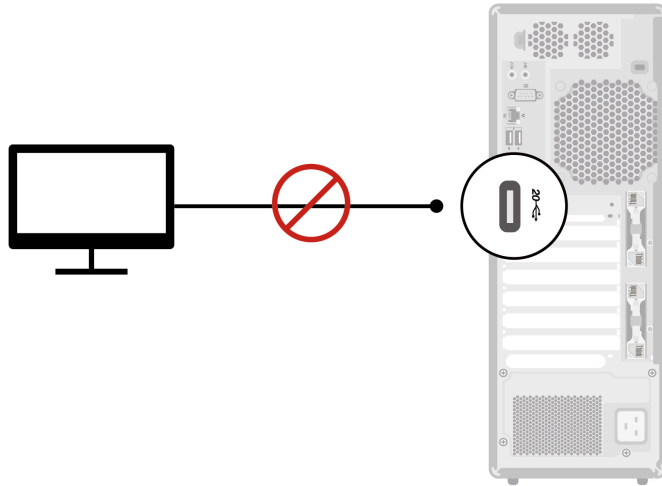
- 1 x DIMM / 2 x DIMMs / 4 x DIMMs configurations run at DDR5-4800;
- 6 x DIMMs / 8 x DIMMs configurations run at DDR5-4400.

USB specifications

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

Connector name	Description
 <ul style="list-style-type: none"> •  USB-A 2.0 connector •  USB-A 3.2 Gen 2 connector 	<p>Connect USB-A compatible devices, such as a USB-A keyboard, USB-A mouse, USB-A storage device, or USB-A printer.</p>
 <ul style="list-style-type: none"> •  USB-C (3.2 Gen 2) connector •  USB-C (3.2 Gen 2x2) connector 	<ul style="list-style-type: none"> • Charge USB-C compatible devices with the output voltage and current of 5 V and 3 A. • Connect to USB-C accessories to help expand your computer functionality. To purchase USB-C accessories, go to https://www.lenovo.com/accessories.

Note: Do not connect your external display to the USB-C connector on the rear panel. Otherwise, the external display will not work and the USB-C connector may get damaged.

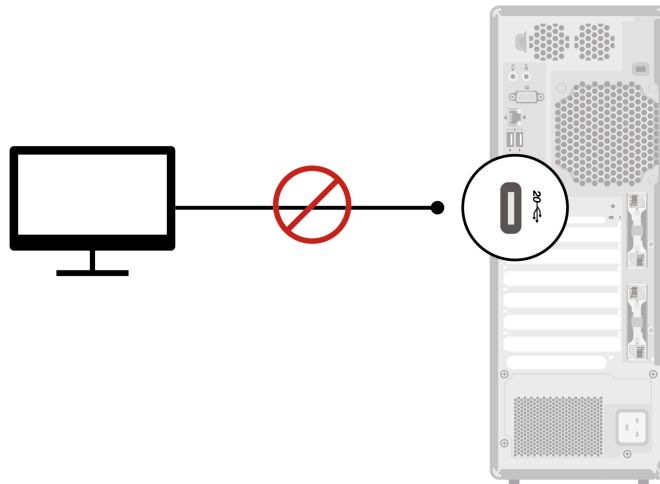


Chapter 2. Get started

Connect an external display

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

Note: Do not connect your external display to the USB-C connector on the rear panel. Otherwise, the external display will not work and the USB-C connector may get damaged.



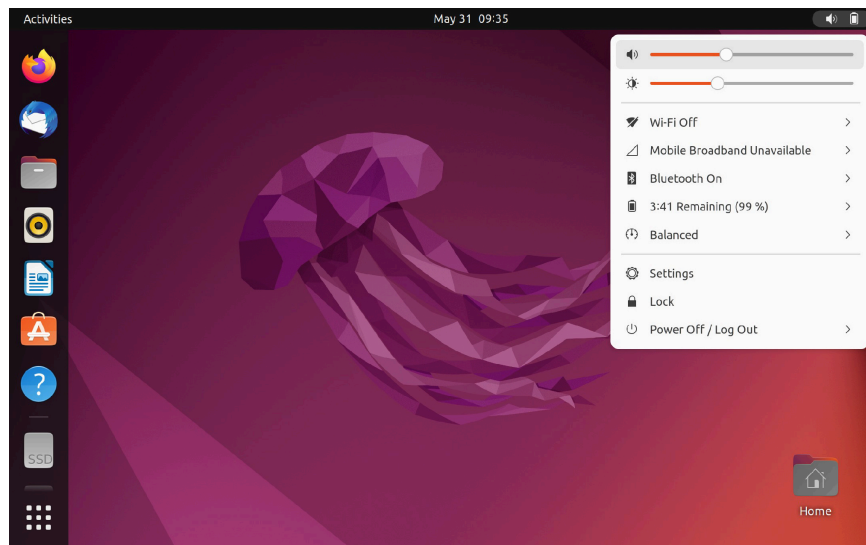
Change display settings

Right-click a blank area on the desktop and select **Display settings**. Then, you can change display settings as you prefer.

Get started with Ubuntu Desktop (22.04 LTS)

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

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



Launch an app

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

Launch settings

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

Get started with Ubuntu Desktop (24.04 LTS)


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

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

Launch an app

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

Launch settings

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

Access networks in Ubuntu Desktop

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

Connect to the wired Ethernet

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

Note: For models with an Intel X710-T2L Ethernet adapter, it's recommended to prepare a Shielded Twisted Pair (STP) Category 6A Ethernet cable for Ethernet connection on the adapter.

Connect to Wi-Fi networks (22.04 LTS) (for selected models)

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

1. Open the system menu from the top-right corner and expand the Wi-Fi section of the menu.
2. Click **Select Network**. A list of available wireless networks is displayed.
3. Select a network available for connection. Provide required information, if needed.

Connect to Wi-Fi networks (24.04 LTS) (for selected models)

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

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

Transfer data

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

Connect to a Bluetooth-enabled device (22.04 LTS) (for selected models)

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



1. Turn on Bluetooth on the computer.
 - a. Open the system menu from the top-right corner and then click **Settings → Bluetooth**.
 - b. In the Bluetooth section enable Bluetooth with the toggle button at the top.
2. Any discoverable devices will be shown in the **Devices** list.
3. Select a Bluetooth device, and then follow the on-screen instructions.

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

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



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

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

Use a media card (for selected models)

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

Install a media card

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

Remove a media card

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

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

Set the power plan

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

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

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

To set the power plan:

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

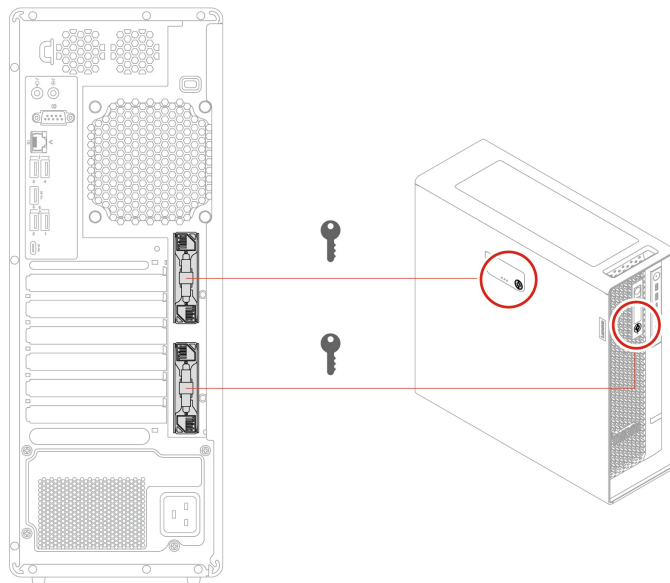
Security solutions

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.

Lock the computer

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

Key lock

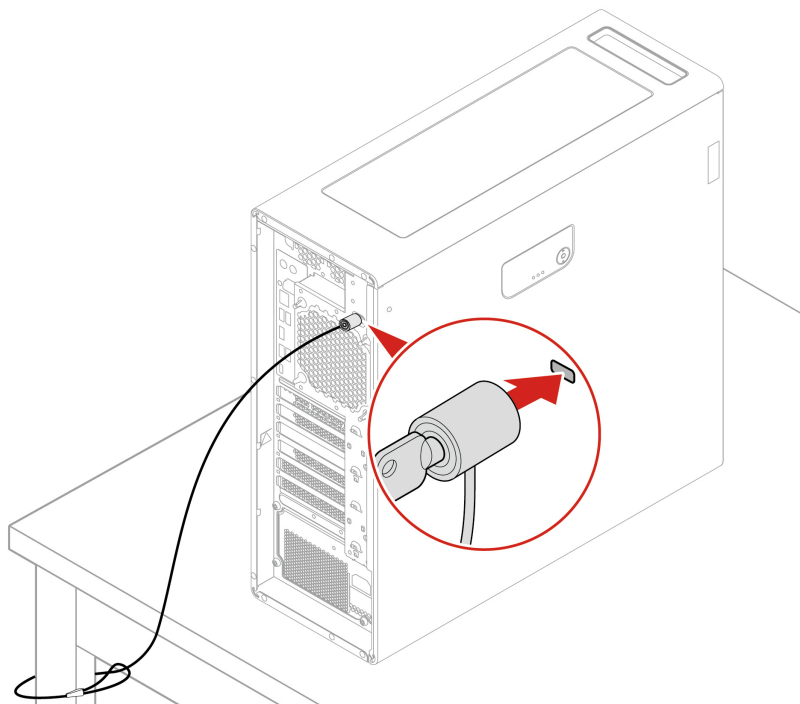


- Locks
 - Locks for side cover and flex module prevent unauthorized access to the inside of your computer chassis or storage drives.

- The storage drive in the flex module can be hot-swappable, which means that you can install or replace the drive without even turning off your computer. Therefore, lock the flex module to prevent unexpected removal.
- Keys
 - The keys are attached to the rear of the machine. For security, store the keys in a secure place when you are not using them.
 - The keys can be carved with numbers, for example, **00**, **01**, **02**, and **03**. The key can unlock locks that are carved with the same number on the same computer or on other computers.

Security lock

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



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 (for selected models)**

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.

Use BIOS security solutions

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

Wipe the storage drive data (for selected models)

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

To wipe the storage drive data:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Security** → **secure wipe** → **Enabled**.

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

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

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

Cover presence switch

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

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

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

If the cover presence switch is enabled and the computer cover is not correctly installed or closed, an error message will be displayed when you turn on the computer. To bypass the error message and log in to the operating system:

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

Intel BIOS guard

The Intel BIOS Guard module cryptographically verifies all BIOS updates. This hardware-based security helps prevent software and malware attacks on the computers BIOS.

Smart USB Protection

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

- **Disabled** (default setting): You can use the USB storage devices without limitation.
- **Read Only**: You cannot copy data from the computer to the USB storage devices. However, you can access data on the USB storage devices.
- **No Access**: You cannot access the USB storage devices from the computer.

To configure the Smart USB Protection function:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Security** → **Smart USB Protection** and press Enter.

3. Select the desired setting and press Enter.
4. Press F10 or Fn+F10 to save the changes and exit.

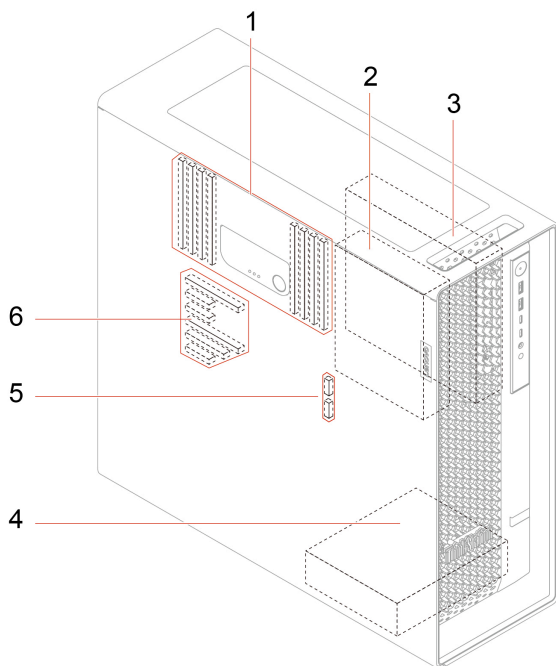
Absolute Persistence (for computers purchased outside mainland China)

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

Chapter 3. Explore your computer

Expand your computer

You can enhance your computer capacity and performance by adding various devices according to the following rules:



Item	Description
1. Memory slots	Depending on your computer model, you can install up to eight memory modules in the memory slots.
2. Optional storage drive bay	You can install a 3.5-inch HDD in the optional storage drive bay. Note: If you want to install a storage drive into the optional-storage-drive bay, contact the Lenovo Customer Support Center for help.
3. Flex bay	In flex bay, you can install one of the following devices: <ul style="list-style-type: none">• One 15-in-1 media card reader• One flex module In the flex module, you can install a 2280 Gen 4 M.2 SSD (hot-swappable).
4. Storage drive bay	You can install one or two 3.5-inch HDDs in the storage drive bay.

Item	Description
5. Onboard M.2 SSD slots	<p>This computer supports the following types of M.2 SSD:</p> <ul style="list-style-type: none"> • 2280 Gen 4 M.2 SSD • 2280 Gen 5 M.2 SSD <p>You can install one or two M.2 SSDs in onboard M.2 SSD slots. For better performance, it's recommended that you install M.2 SSDs of the same generation.</p>
6. PCI-Express slot	You can install compatible PCIe cards (up to six) in the PCIe card slots.

* for selected models

Related topics

- “Memory module” on page 39
- “Optional HDD and its cage” on page 47
- “Flex module” on page 49
- “Flex bay cage” on page 48
- “15-in-1 media card reader” on page 48
- “M.2 SSD in flex module” on page 50
- “Onboard M.2 SSD and its heatsink kit” on page 52
- “PCIe card and extender” on page 67

UEFI BIOS

What is UEFI BIOS

Note: The operating system settings might override any similar settings in UEFI BIOS.

UEFI BIOS is the first program that the computer runs when the computer is turned on. UEFI BIOS initializes the hardware components and loads the operating system and other programs. Your computer comes with a setup program with which you can change UEFI BIOS settings.

Enter the BIOS menu

Restart the computer. When the logo screen is displayed, press F1 or Fn+F1 to enter the BIOS menu.

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

Navigate in the BIOS interface

Attention: The default configurations are already optimized for you in **boldface**. Improper change of the configurations might cause unexpected results.

Depending on your keyboard, you can navigate in the BIOS interface by pressing the following keys, or combinations of Fn and the following keys:

Key	Function
F1 or Fn+F1	General Help
Esc or Fn+Esc	Exit the submenu
↑ ↓ or Fn+↑ ↓	Locate an item
← → or Fn+← →	Move keyboard focus
+/- or Fn+ +/-	Change value
Enter	Enter the submenu
F9 or Fn+F9	Setup Defaults
F10 or Fn+F10	Save and exit

Change the display language of UEFI BIOS

UEFI BIOS supports three or four display languages: English, French, simplified Chinese, and Russian (for selected models).

To change the display language of UEFI BIOS:

1. Select **Main** → **Language** and press Enter.
2. Set the display language as desired.

Change the display mode of UEFI BIOS (for selected models)

You can use UEFI BIOS in the graphic mode or the text mode according to your needs.

The keys on the keyboard used to perform various tasks are displayed at the bottom of the screen. In addition to the keyboard, you also can use the mouse to make selections.

To change the display mode of UEFI BIOS:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Main** → **Setup Mode Select** and press Enter.
3. Set the display mode as desired.

Set the system date and time

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Main** → **System Time & Date** and press Enter.
3. Set the system date and time as desired.
4. Press F10 or Fn+F10 to save the changes and exit.

Change the priority boot order

If the computer does not boot from a device as expected, you can change the boot priority order permanently or select a temporary boot device.

Change the priority boot order permanently

1. Depending on the type of the storage device, do one of the following:
 - If the storage device is internal, go to step 2.

- If the storage device is a disc, ensure that the computer is on or turn on the computer. Then, insert the disc into the optical drive.
 - If the storage device is an external device other than a disc, connect the storage device to the computer.
2. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
 3. Select **Startup → Priority Boot Order**, and then follow the on-screen instructions to change the boot priority order.
 4. You can also select the first priority device group by selecting **Startup → First Boot Device**, and then follow the on-screen instructions to select the first boot device within this group. Your computer will boot from the first boot device before trying the boot priority order you set in the previous step.
 5. Press F10 or Fn+F10 to save the changes and exit.

Select a temporary boot device

Note: Not all discs and storage drives are bootable.

1. Depending on the type of the storage device, do one of the following:
 - If the storage device is internal, go to step 2.
 - If the storage device is a disc, ensure that the computer is on or turn on the computer. Then, insert the disc into the optical drive.
 - If the storage device is an external device other than a disc, connect the storage device to the computer.
2. Restart the computer. When the logo screen is displayed, press F12 or Fn+F12.
3. Select **Boot Menu** and press Enter.
4. Select the storage device as desired and press Enter.

If you want to change the boot priority order permanently, select **Enter Setup** on Startup Device Menu and press Enter to enter the BIOS menu.

Enable or disable the configuration change detection feature

If you enable configuration change detection, when the POST detects configuration changes of some hardware devices (such as storage drives or memory modules), an error message will be displayed when you turn on the computer.

To enable or disable the configuration change detection feature:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. Select **Security → Configuration Change Detection** and press Enter.
3. Enable or disable the feature as desired.
4. Press F10 or Fn+F10 to save the changes and exit.

To bypass the error message and log in to the operating system, press F2 or Fn+F2. To clear the error message, enter the BIOS menu, save and then exit.

Enable or disable the automatic power-on feature

The Automatic Power On item in UEFI BIOS provides various options for you to make your computer start up automatically.

To enable or disable the automatic power-on feature:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.

2. Select **Power** → **Automatic Power On** and press Enter.
3. Select the feature as desired and press Enter.
4. Enable or disable the feature as desired.
5. Press F10 or Fn+F10 to save the changes and exit.

Change BIOS settings before installing a new operating system

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

To change the BIOS settings:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1.
2. From the main interface, select **Security** → **Secure Boot** and press Enter.
3. Depending on the operating system to be installed, do one of the following:
 - To install the Windows 10 (64-bit) and most of Linux operating system, select **Enabled** for **Secure Boot**.
 - To install an operating system that does not support secure boot, select **Disabled** for **Secure Boot**.
4. Press F10 or Fn+F10 to save the changes and exit.

Update UEFI BIOS

When you install a new program, device driver, or hardware component, you might need to update UEFI BIOS. You can update the BIOS from your operating system or a flash update disc (supported only on selected models).

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

- Using the built-in software update service:
 - For Ubuntu operating system, Ubuntu software update will check the LVFS site for any firmware updates and notify you when updates are available.
 - For IGEL operating system (for selected models), update, downgrade, or reinstall the UEFI BIOS using the IGEL Universal Management Suite (UMS). See [Universal Firmware Update in the IGEL UMS](#).
- From the Lenovo Support Web site:
 1. Go to <https://pcsupport.lenovo.com>.
 2. Download the flash BIOS update driver for the operating system version or the ISO image version (used to create a flash update disc). Then, download the installation instructions for the flash BIOS update driver you have downloaded.
 3. Print the installation instructions and follow the instructions to update the BIOS.

Reset system to factory default

This feature allows you to reset the UEFI BIOS to the factory default settings, including all UEFI BIOS settings and internal data. It helps you wipe user data in case that you want to dispose of or reuse your computer.

1. Restart the computer. When the logo screen is displayed, press F1 to enter the UEFI BIOS menu.
2. Select **Security** → **Reset system to Factory Default** and press Enter.
3. Several warning windows might be displayed. Do the following before resetting the system to the factory default settings:
 - a. Deactivate the Absolute Persistence Module.
 - b. Remove the NVMe password if you have set one.

4. For computer models with RAID settings, a window is displayed to remind you of data damage. Select **Yes** to proceed.
5. A window is displayed to confirm all UEFI BIOS settings will be reset. Select **Yes** to proceed.

Note: If the **Intel AMT control** and **Absolute Persistence(R) Module** are permanently disabled, these settings cannot be reset successfully.

6. Enter the supervisor password, system management password or power-on password in the window prompted.

Your computer will restart immediately. It takes a few minutes to complete the initialization process. Your computer screen might be blank during this process. This is normal and you should not interrupt it.

View UEFI BIOS Event logs

The UEFI BIOS Event log viewer provides the brief information about UEFI BIOS events. Do the following to view the logs:

1. Restart the computer. When the logo screen is displayed, press F1.
2. Select **Main → BIOS Event log**. Then, press Enter. The UEFI BIOS Event log interface is displayed.
3. Navigate the interface by pressing the following keys, and then check details by selecting each item.
 - ↑ ↓: Move keyboard focus
 - PgUp / PgDn: Scroll page
 - Enter: Select
 - F3: Exit

The following UEFI BIOS event logs might be listed on your screen depending on UEFI BIOS activities. Each log consists of a date, a time, and a description of the event.

- **Power On** event: This log shows the Power On Self Test (POST) routine has started with the power-on process. It includes the power-on reason, the boot mode, and the shutdown reason.
- **Subcomponent Code Measurement** event: This log shows the subcomponent code measurement has worked. It includes the validation result of each component.
- **System Preboot Authentication** event: This log shows what credential is provided to gain preboot authentication. It includes the installed password, the password type, the input device, and the authentication result.
- **BIOS Password Change** event: This log shows the change history of the UEFI BIOS passwords. It includes the password type, the type and result of the event.
- **Subcomponent Self-healing** event: This log shows the information about the subcomponent where the recovery event occurred. It includes the cause and result of the event, and the recovered firmware version.
- **BIOS Setup Configuration Change** event: This log shows the change history of the UEFI BIOS Setup configuration. It includes the item name and value.
- **Device Change** event: This log shows the change history of devices. It includes the cause and type of the event.
- **System Boot** event: This log shows which device was utilized to boot the system. It includes the boot option, the description, and the file path list.
- **System Tamper** event: This log shows the occurrence of system tamper events. It includes the cause and type of the event.
- **POST Error** event: This log shows the occurrence of errors during the POST routine. It includes the error code.

- **Flash Update** event: This log shows the occurrence of flash update. It includes the cause and result of the event, and the updated firmware version.
- **Capsule Update** event: This log shows the occurrence of UEFI capsule firmware update. It includes the cause and result of the event, and the updated firmware version.
- **Log Cleared** event: This log shows UEFI BIOS event logs are cleared. It includes the cause and result of the event.
- **Shutdown / Reboot** event: This log shows the UEFI BIOS is successfully shut down or the system is rebooted. It includes the cause and type of the event.

Chapter 4. CRU replacement

What is CRU

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

- **Self-service CRUs:** Refer to parts that can be replaced easily by customers themselves or by trained service technicians at an additional cost.
- **Optional-service CRUs:** Refer to parts that can be replaced by customers with a greater skill level. Trained service technicians can also provide service to replace the parts under the type of warranty designated for the customer's 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.

Self-service CRUs

- Common lock kit for side cover*
- Customized PCIe extender*
- Flex bay cage*
- Flex bay dummy cover*
- Flex bay fan*
- Flex module*
- Front fan
- HDD*
- HDD bracket*
- HDD fan*
- ID badge*
- Keyboard*
- M.2 SSD*
- M.2 SSD and box*
- M.2 SSD heatsink kit
- M.2 SSD holder
- Memory module
- Memory fan duct

- Memory fan
- Mouse*
- NVLINK retainer*
- Optional HDD cage*
- Optional HDD cage bracket*
- PCIe bracket
- Power cord
- Power distribution board and bracket
- Power supply assembly*
- Power supply unit cover*
- Random lock kit for side cover*
- Rear fan
- Side cover
- Super capacitor module*
- Top cover
- Think LED holder
- Think LED cable
- ThinkStation logo badge

Optional-service CRUs

- 15-in-1 media card reader bezel kit*
- Fiber modules of some Ethernet adapter cards*
- Front panel I/O assembly
- Internal Speaker
- NVLINK Bridge*
- PCBA of 15-in-1 media card reader*
- PCIe card

* for selected models

System board illustration

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

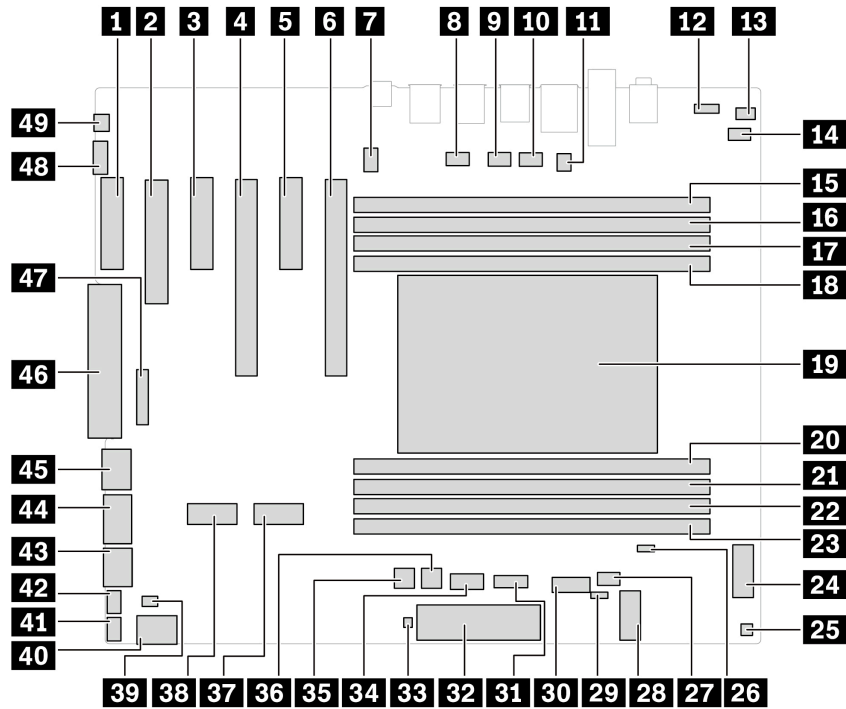


Figure 2. System board illustration

Item	Description	Item	Description
1	PCIe x4 card slot	2	PCIe x8 card slot
3	PCIe x4 card slot	4	PCIe x16 card slot
5	PCIe x4 card slot	6	PCIe x16 card slot
7	CPU fan connector	8	Rear fan connector
9	Memory duct fan connector 1	10	Memory duct fan connector 2
11	Serial port connector	12	VROC connector
13	Speaker connector	14	Cover presence switch connector
15	Memory slot 1	16	Memory slot 2
17	Memory slot 3	18	Memory slot 4
19	CPU socket	20	Memory slot 5
21	Memory slot 6	22	Memory slot 7
23	Memory slot 8	24	Flex bay connector
25	Thermal sensor connector	26	Clear CMOS connector
27	Flex bay fan connector	28	Wi-Fi card connector
29	Recovery jumper	30	SATA 3 connector
31	ALT_TPM slot	32	Front panel connector
33	Drive-act connector for RAID card	34	15-in-1 media card reader connector

Item	Description	Item	Description
35	HDD power connector 1	36	HDD power connector 2
37	M.2 card slot 1	38	M.2 card slot 2
39	Think LED logo connector	40	SATA 2 connector
41	Front fan connector	42	HDD Fan connector
43	SATA 1 connector	44	750-watt PSU power connector
45	CPU power connector	46	Auxiliary power connector
47	BMC connector	48	Thunderbolt cable connector
49	Thunderbolt power connector		

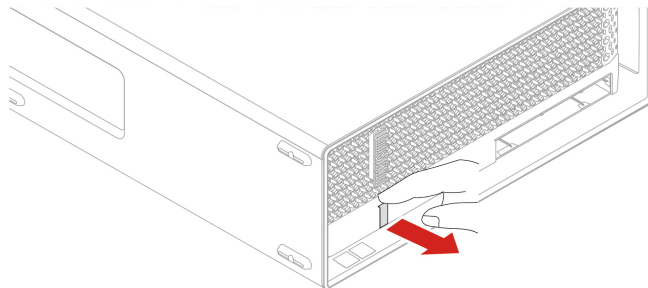
ID badge

Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

Removal steps

Remove the ID badge.



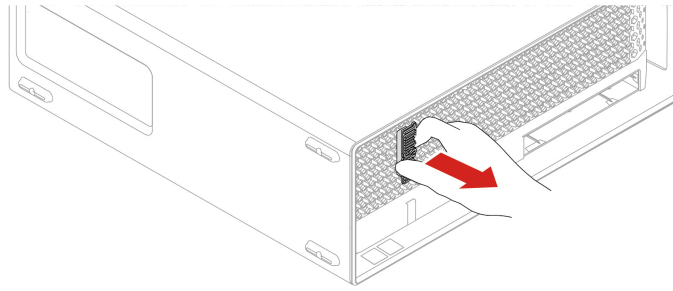
ThinkStation logo badge

Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

Removal steps

Remove the ThinkStation logo badge.



Side cover

Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.



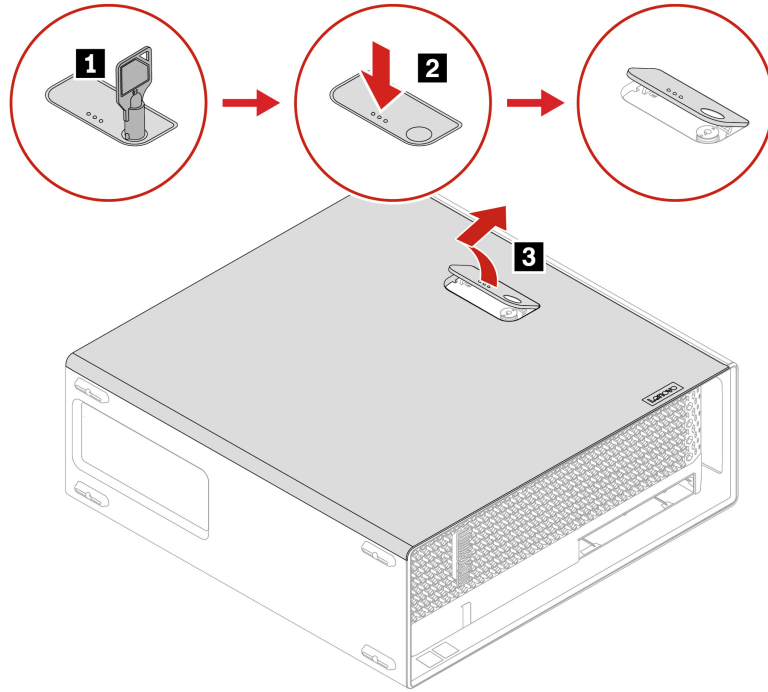
Before you open the computer cover, turn off the computer and wait several minutes until the computer is cool.

For access, do the following:

1. Turn off the computer and remove all connected devices and cables.
2. Unlock any locking device that secures the computer cover.
3. Place a soft, clean towel or cloth on the desk or surface. Hold the sides of your computer and gently lay it down so that the screen is against the surface and the computer cover is facing up.
4. Press the handle of the side cover so that the handle is lifted.

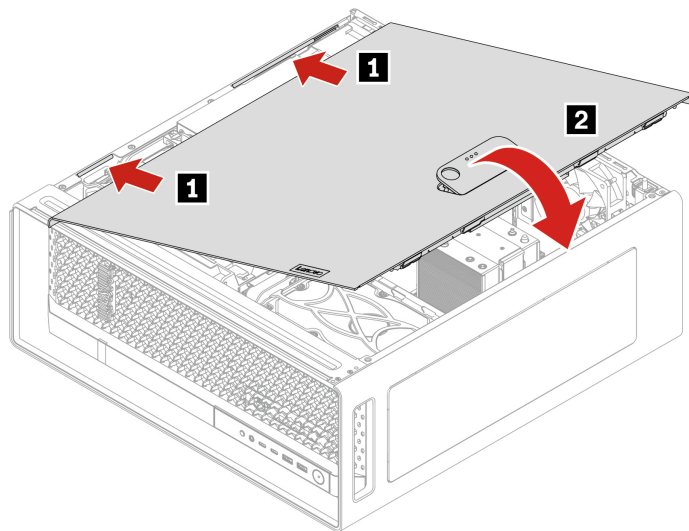
Removal steps

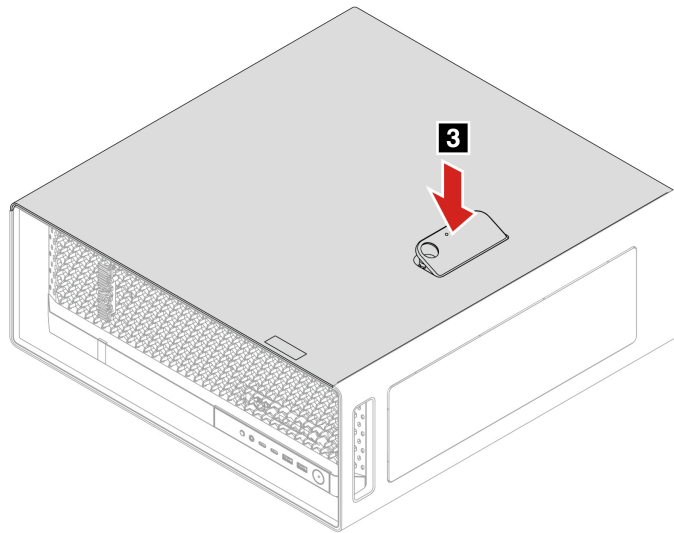
Remove the side cover.



Installation steps

Install the side cover.



**Notes:**

- If a locking device is available, use it to lock the computer after installing the computer cover.
- Depending on your computer model, some of the hardware parts in the replacing section might not be available.

Top cover

Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

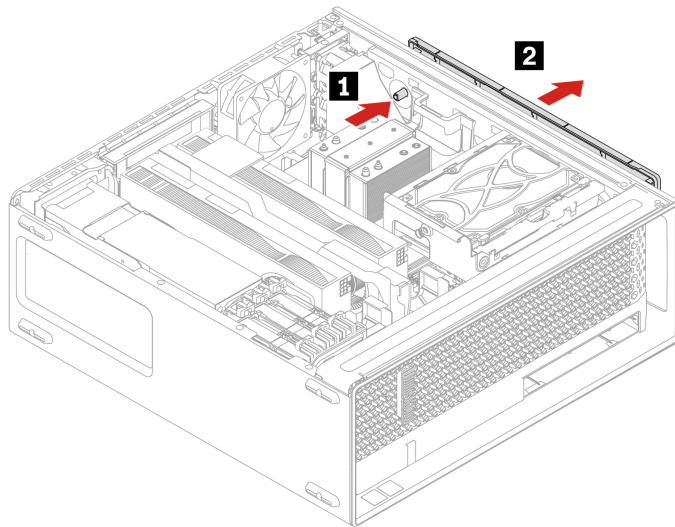


Before you open the computer cover, turn off the computer and wait several minutes until the computer is cool.

For access, remove the “Side cover” on page 29.

Removal steps

Remove the top cover.



Front panel I/O assembly

Prerequisite

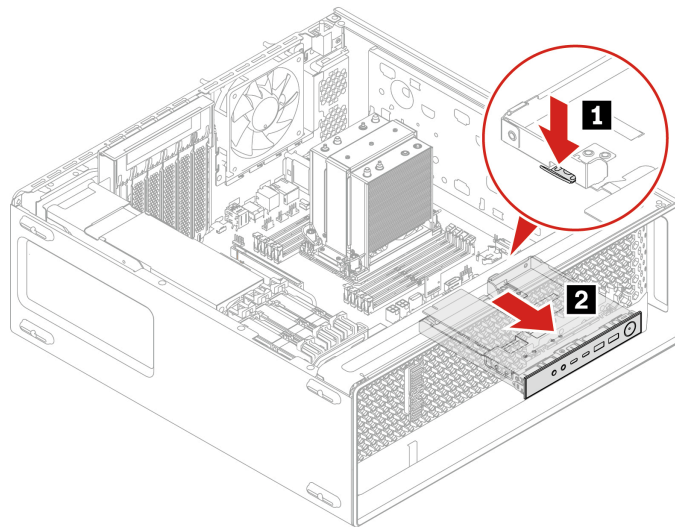
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, do the following:

1. Remove the “Side cover” on page 29.
2. Remove the “Optional HDD and its cage” on page 47.
3. Remove the “Flex bay fan” on page 44.

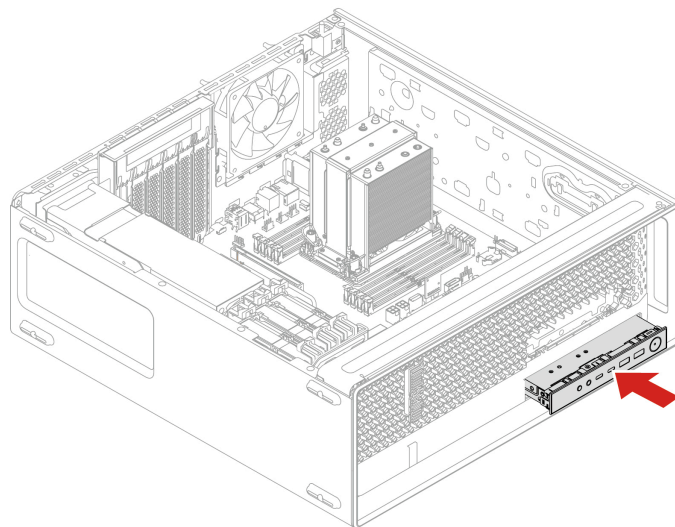
Removal steps

Remove the front panel I/O assembly.



Installation steps

Install the front panel I/O assembly.



Internal speaker

Prerequisite

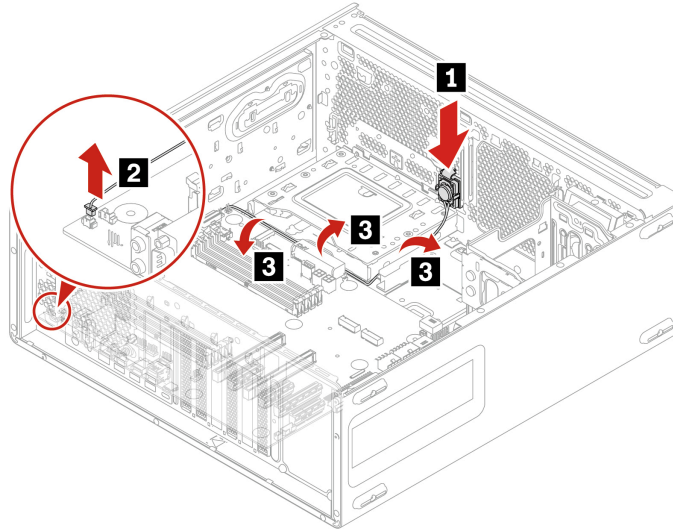
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, do the following:

1. Remove the “Side cover” on page 29.
2. Remove the “Rear fan” on page 42.

Removal steps

Remove the internal speaker.



Think LED cable

Prerequisite

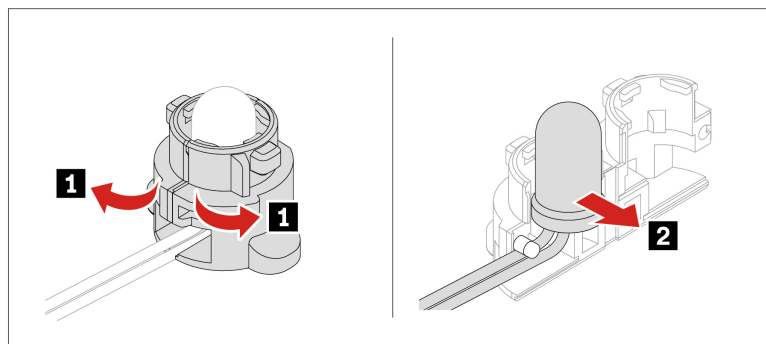
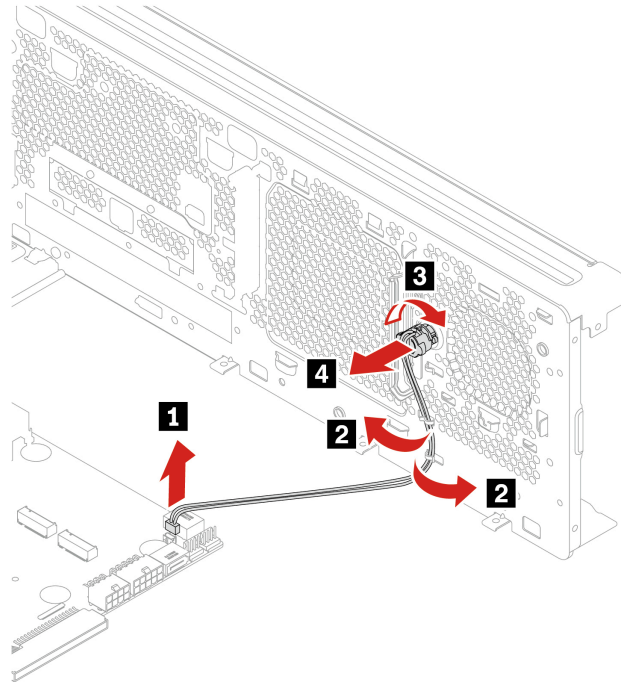
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, do the following:

1. Remove the “Side cover” on page 29.
2. Remove the “Front fan” on page 41.

Removal steps

Remove the Think LED cable.



Power supply assembly

Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

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



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

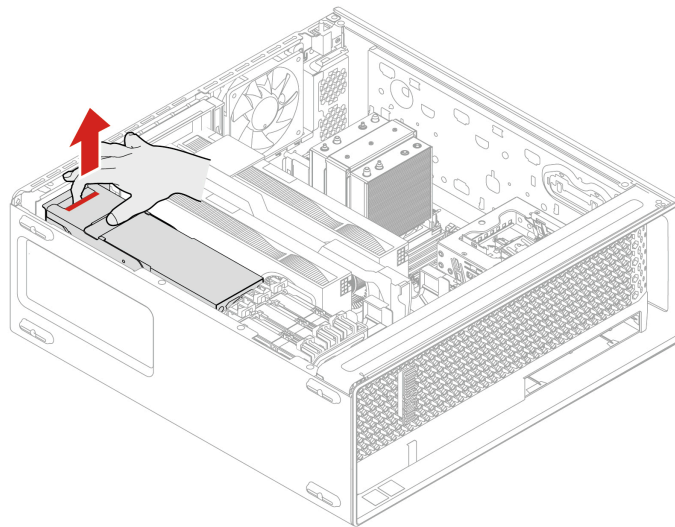


Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

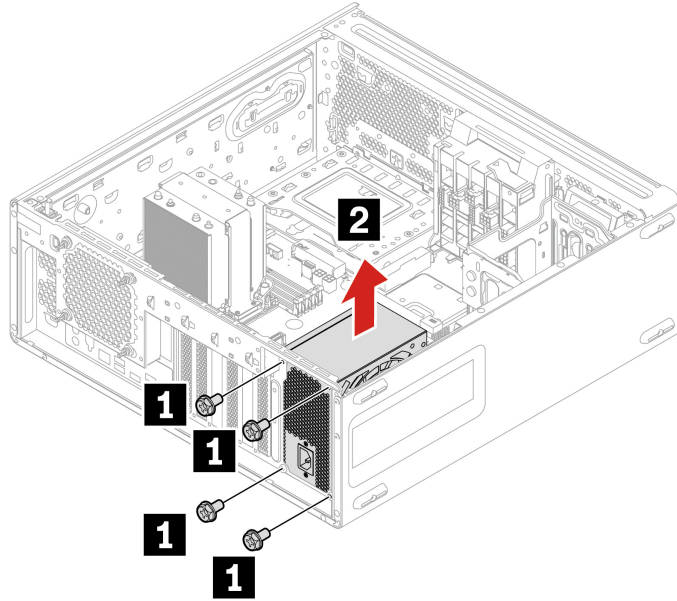
For access, remove the “Side cover” on page 29.

Removal steps

- For 1000-watt power supply assembly:



- For 750-Watt power supply assembly:



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

Power supply unit cover

Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.



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

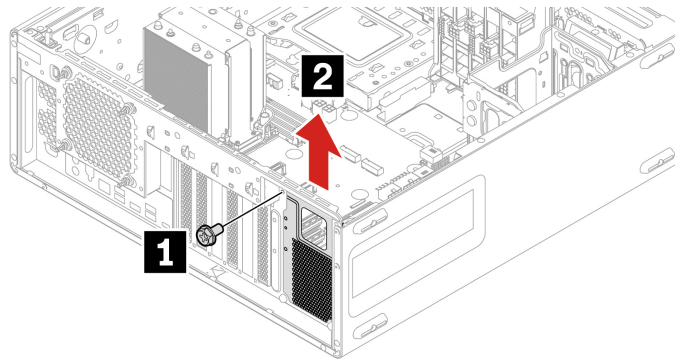
For access, do the following:

1. Remove the “Side cover” on page 29.
2. Remove the “Power supply assembly” on page 35.

Removal steps

Remove the power supply unit cover.

Note: Depending on your computer model, the power supply unit cover only comes with 1000-watt power supply assembly.



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

Power distribution board and bracket

Prerequisite

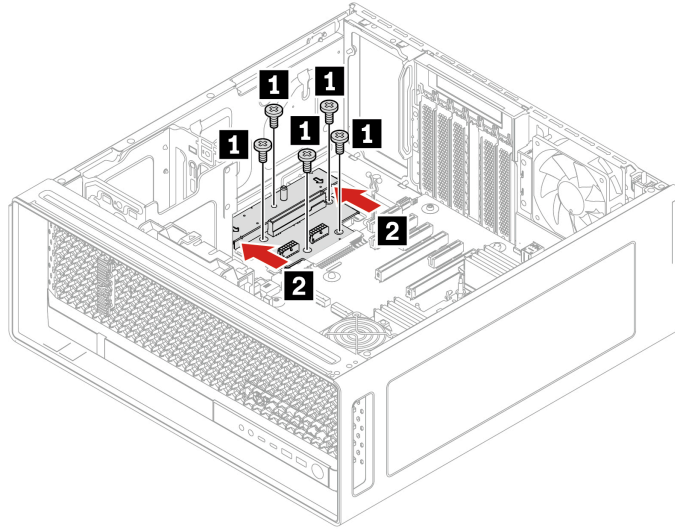
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, do the following:

1. Remove the “Side cover” on page 29.
2. Remove the “Power supply assembly” on page 35.

Removal steps

Remove the power distribution board and bracket.



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

Memory module

Prerequisite

Before you start, read *Generic Safety and Compliance Notices*, and print the following instructions.

Notes:

- To remove or install the memory module, wait at least 20 seconds after disconnecting power cords from the system. It allows the system to be completely discharged of electricity.
- Ensure that you follow the installation order for memory modules shown in the following illustration.

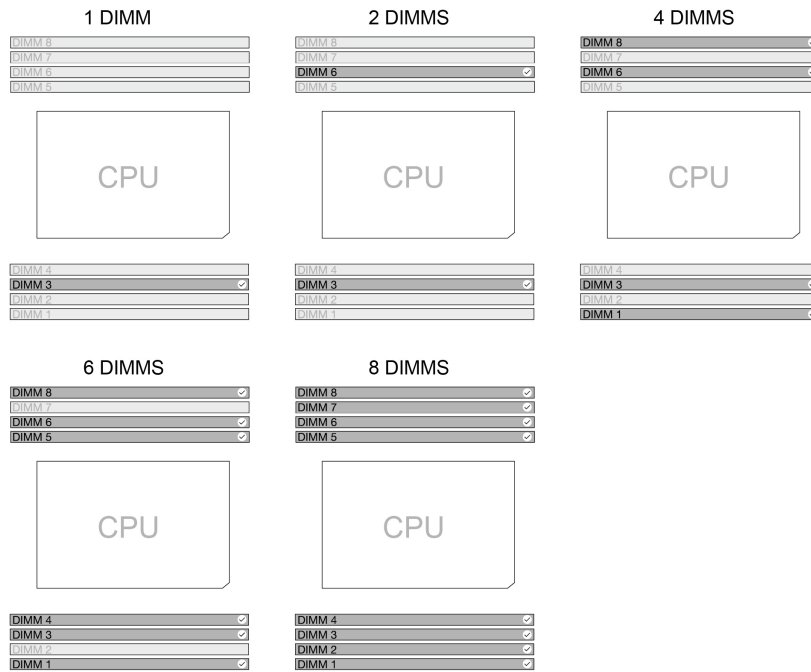


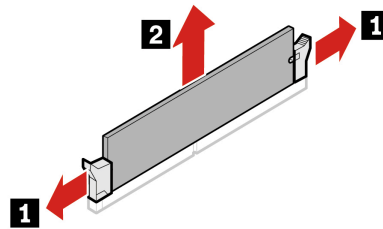
Figure 3. Memory module order

For access, do the following:

1. Remove the “Side cover” on page 29.
2. Remove the “Memory fan duct” on page 42.

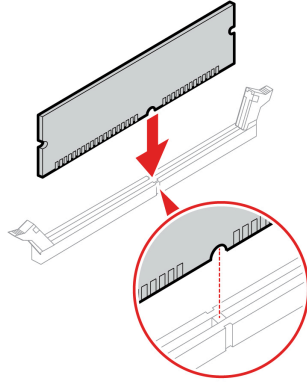
Removal steps

Remove the memory module.



Installation steps

Install the memory module.



Fans

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

Front fan

Prerequisite

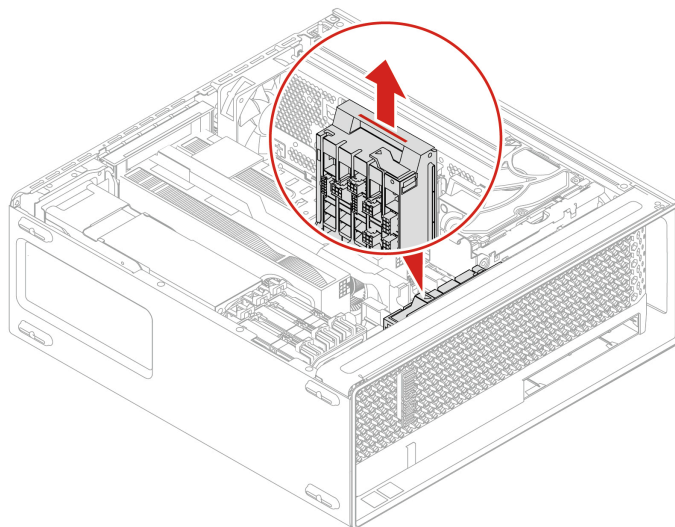
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, do the following:

1. Remove the “Side cover” on page 29.
2. Remove the “Super capacitor module” on page 65.
3. Remove the “PCIe card and extender” on page 67.

Removal steps

Remove the front fan.



Rear fan

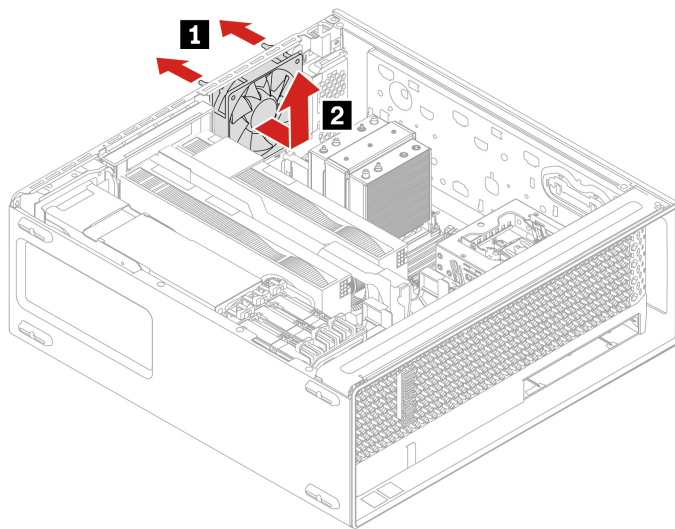
Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, remove the “Side cover” on page 29.

Removal steps

Remove the rear fan.



Memory fan duct

Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

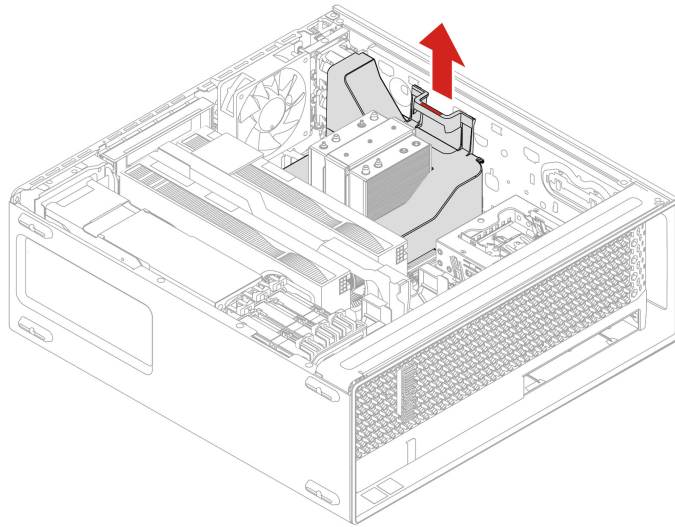


Before you touch the memory fan duct, wait several minutes until the component is cool.

For access, remove the “Side cover” on page 29.

Removal steps

Remove the memory fan duct.



Memory fan

Prerequisite

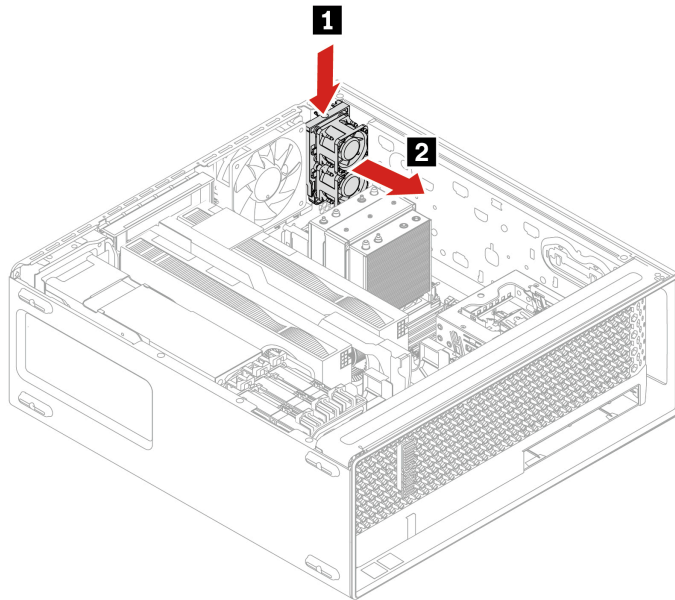
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, do the following:

1. Remove the “Side cover” on page 29.
2. Remove the “Memory fan duct” on page 42.

Removal steps

Remove the memory fan.



HDD fan

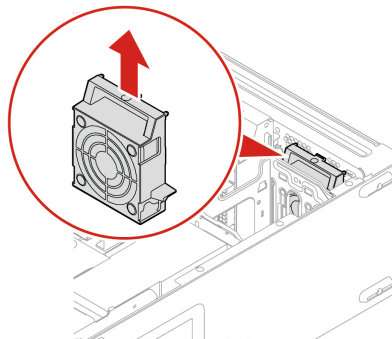
Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, remove the “Side cover” on page 29.

Removal steps

Remove the HDD fan.



Flex bay fan

Prerequisite

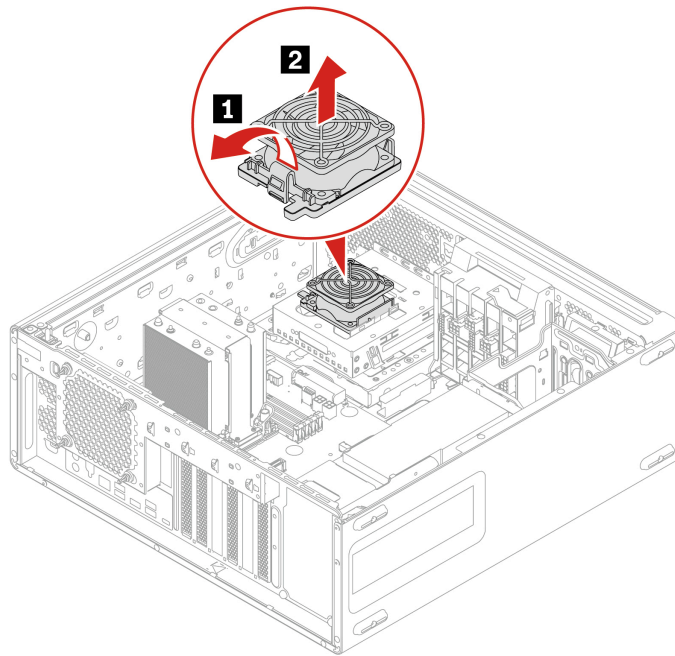
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, do the following:

1. Remove any media from the drives and turn off all connected devices and the computer.
2. Disconnect all power cords from electrical outlets and disconnect all cables from the computer.
3. Remove the “Side cover” on page 29.
4. Remove the “Optional HDD and its cage” on page 47.

Removal steps

Remove the flex bay fan.



Storage drives

By reading this section, you will learn to replace storage drives in your computer.

HDD and its bracket

Prerequisite

Before you start, read *Generic Safety and Compliance Notices*, and print the following instructions.

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

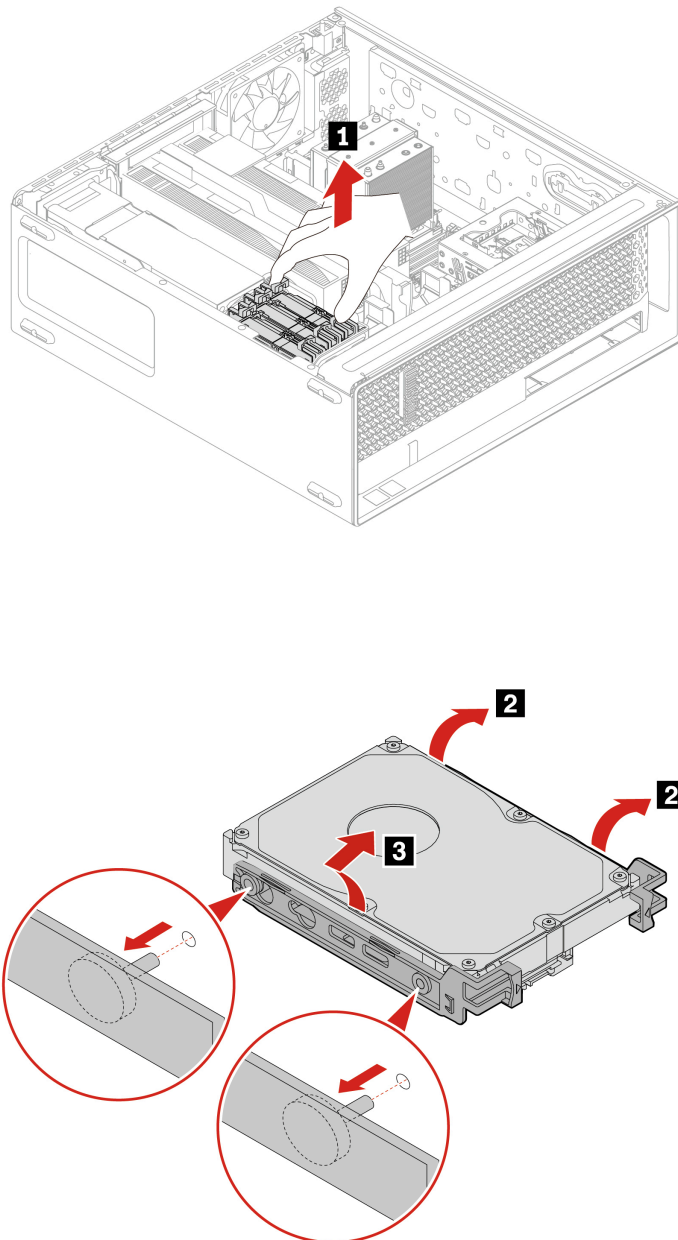
- Replace the internal storage drive only for repair. The internal storage drive is not designed for frequent changes or replacement.
- Before replacing the internal storage drive, make a backup copy of all the data that you want to keep.
- Do not touch the contact edge of the internal storage drive.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

For access, remove the “Side cover” on page 29.

Removal steps

Remove the HDD and its bracket.



Optional HDD and its cage

Prerequisite

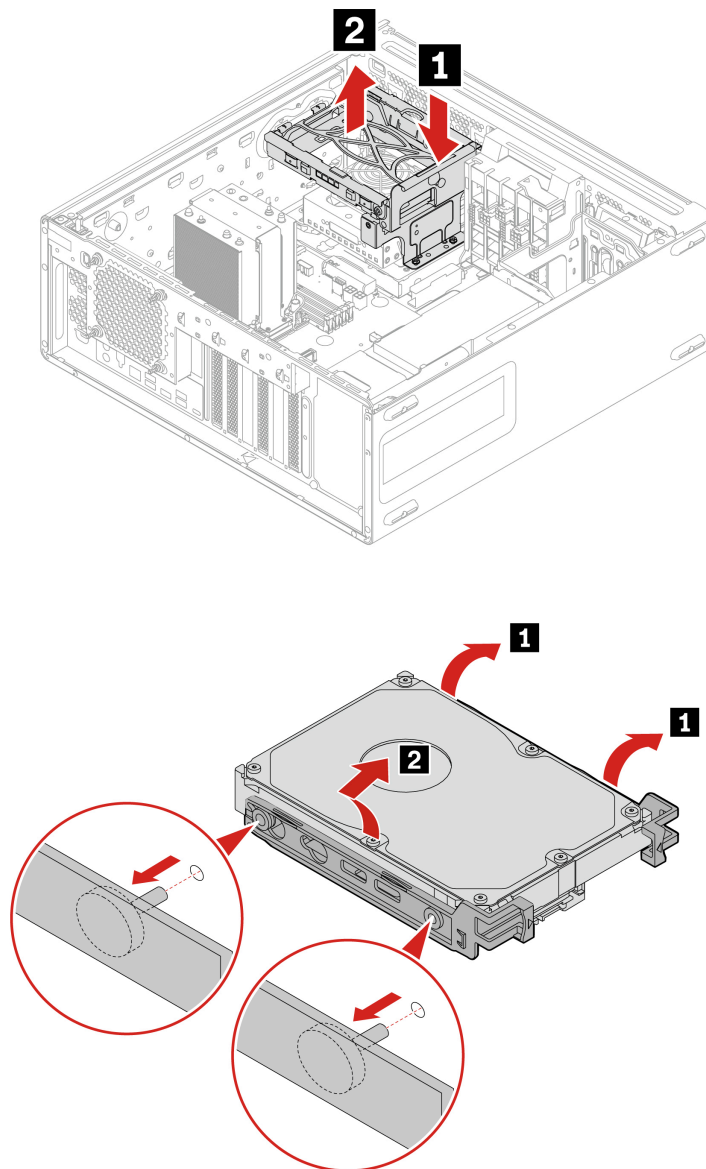
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, do the following:

1. Remove any media from the drives and turn off all connected devices and the computer.
2. Disconnect all power cords from electrical outlets and disconnect all cables from the computer.
3. Remove the “Side cover” on page 29.

Removal steps

Remove the optional HDD.



Flex bay cage

Prerequisite

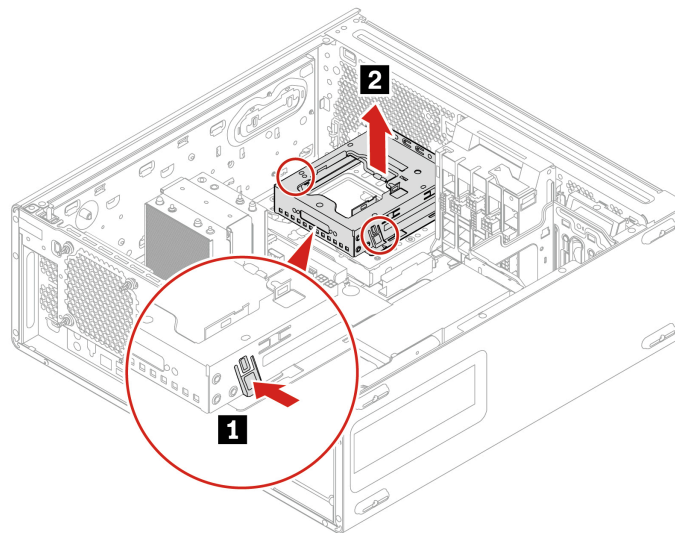
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, do the following:

1. Remove any media from the drives and turn off all connected devices and the computer.
2. Disconnect all power cords from electrical outlets and disconnect all cables from the computer.
3. Remove the “Side cover” on page 29.
4. Remove the “Optional HDD and its cage” on page 47.
5. Remove the “Flex bay fan” on page 44.
6. Remove the “Flex module” on page 49.
7. Remove the “15-in-1 media card reader” on page 48, if any.

Removal steps

Remove the flex bay cage.



15-in-1 media card reader

Prerequisite

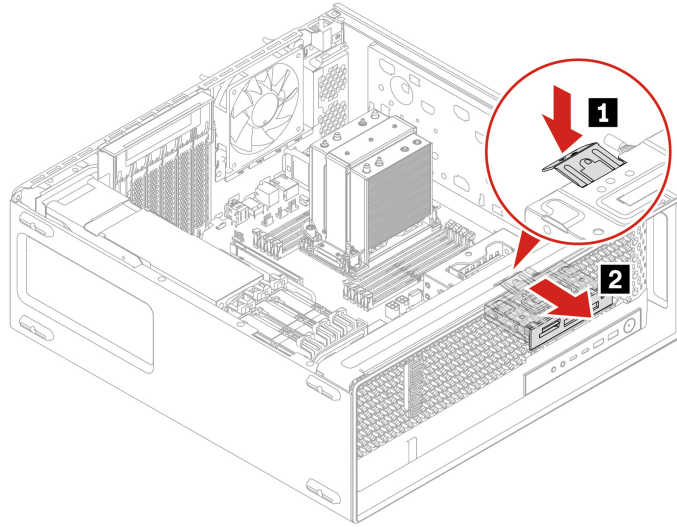
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, do the following:

1. Remove any media from the drives and turn off all connected devices and the computer.
2. Disconnect all power cords from electrical outlets and disconnect all cables from the computer.
3. Remove the “Side cover” on page 29.
4. Remove the “Optional HDD and its cage” on page 47.
5. Remove the “Flex bay fan” on page 44.

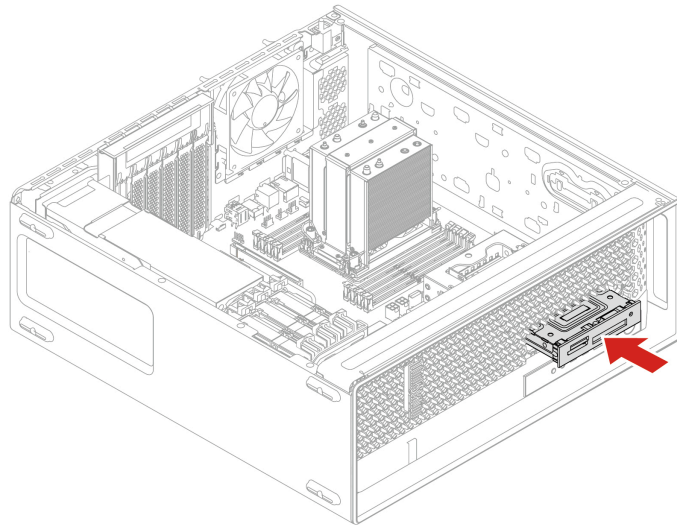
Removal steps

Remove the 15-in-1 media card reader.



Installation steps

Install the 15-in-1 media card reader.



Flex module

Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

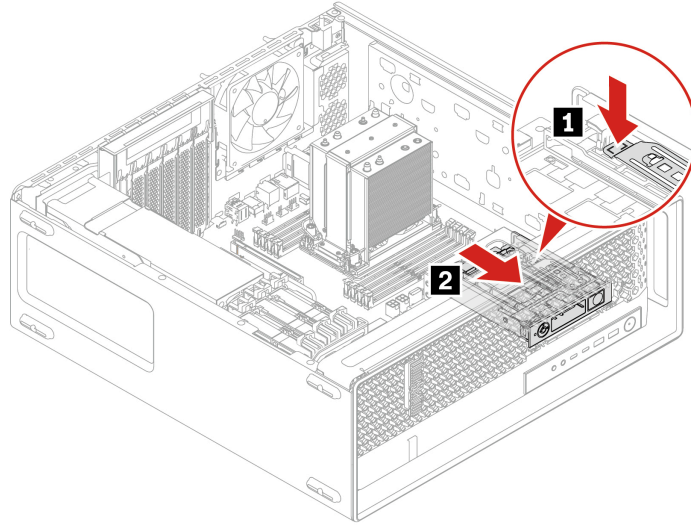
For access, do the following:

1. Remove any media from the drives and turn off all connected devices and the computer.
2. Disconnect all power cords from electrical outlets and disconnect all cables from the computer.

3. Remove the “Side cover” on page 29.
4. Remove the “Optional HDD and its cage” on page 47.
5. Remove the “Flex bay fan” on page 44.

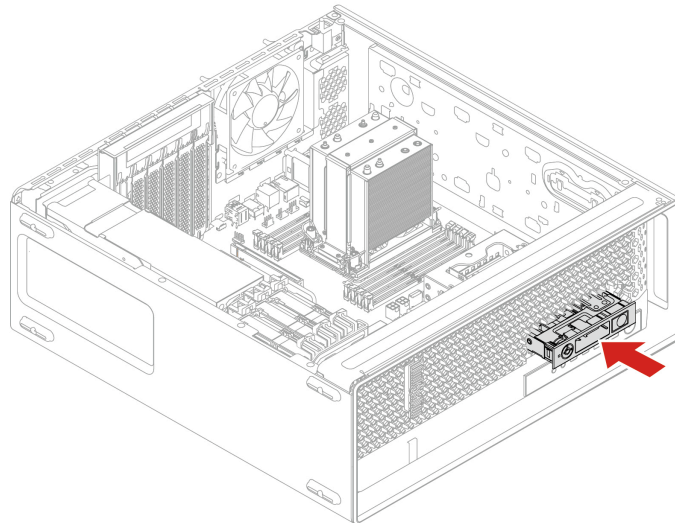
Removal steps

Remove the flex module.



Installation steps

Install the flex module.



M.2 SSD in flex module

You can install or replace a M.2 SSD in the flex module. The flex module supports hot-swappable, which means that you can install or replace the M.2 SSD without even turning off your computer.

To enable hot-swappable function, you need to enable Intel VMD technology on MCIO slot first. Follow below steps:

1. Restart the computer. When the logo screen is displayed, press F1 or Fn+F1 to enter the BIOS menu.
2. Click **Devices** → **Storage Setup** → **Intel(R) VMD Technology**.
3. Select **VMD** under **MCIO slot** configuration.

Notes:

- The storage drive in the flex module is hot-swappable only when the operating system of your computer does not reside on the storage drive installed in the flex module. If the requirements is not met, do not remove or install the storage drive when the computer is turned on. Otherwise, data on the storage drive might get damaged.
- Lock the flex module to prevent the unexpected removal. The keys are attached to the rear of the machine. For security, store the keys in a secure place when you are not using them.

Prerequisite

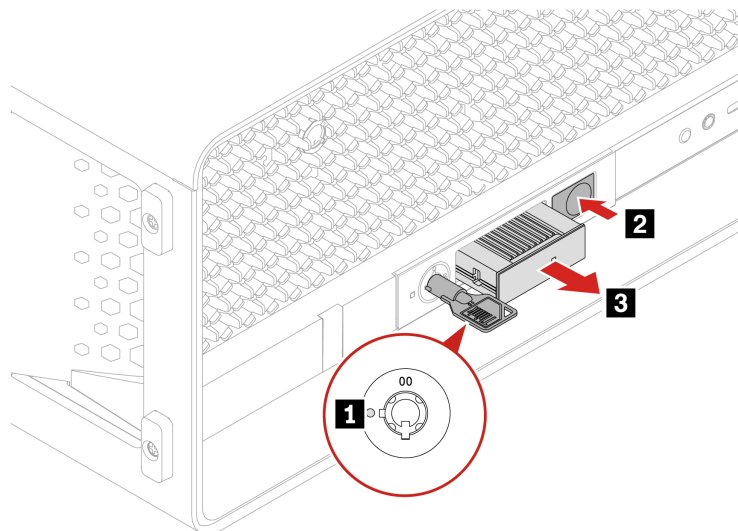
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

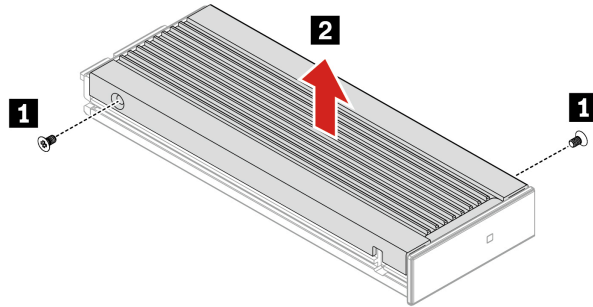
Attention: The internal storage drive is sensitive. Inappropriate handling might cause damage and permanent loss of data. When handling the internal storage drive, observe the following guidelines:

- 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 a 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 a soft material, such as cloth, to absorb physical shocks.

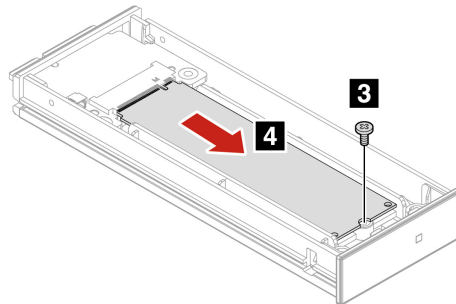
Removal steps

Remove the M.2 SSD.





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



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

Onboard M.2 SSD and its heatsink kit

Prerequisite

Before you start, read *Generic Safety and Compliance Notices*, and print the following instructions.



The heat sink of M.2 SSD might be very hot. Before you open the computer cover, turn off the computer and wait several minutes until the component is cool.

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

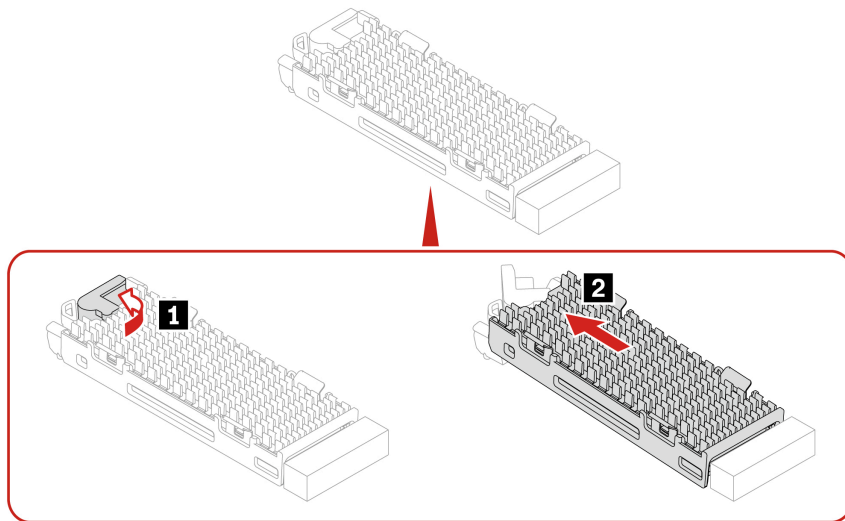
- Replace the internal storage drive only for repair. The internal storage drive is not designed for frequent changes or replacement.
- Before replacing the internal storage drive, make a backup copy of all the data that you want to keep.
- Do not touch the contact edge of the internal storage drive.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

For access, do the following:

1. Remove the “Side cover” on page 29.
2. Remove the “Super capacitor module” on page 65.
3. Remove the “PCIe card and extender” on page 67.

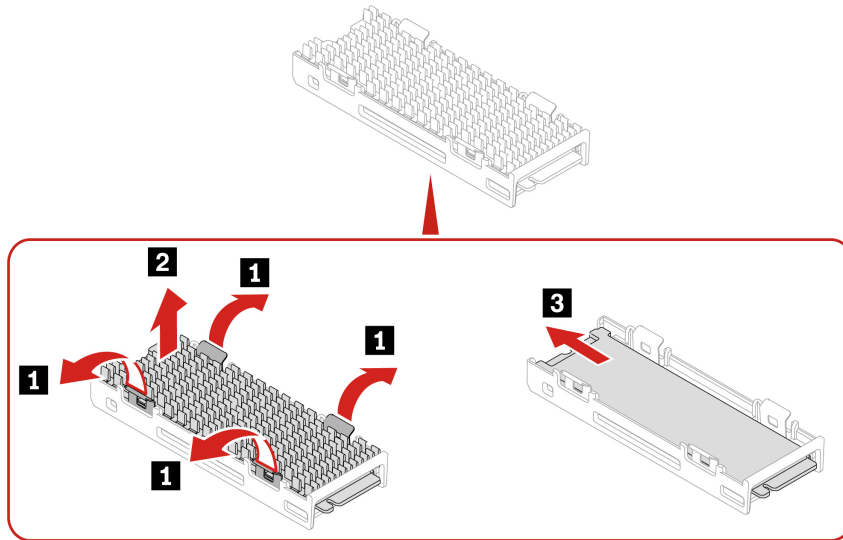
Removal steps

1. Remove the M.2 SSD with its heatsink kit.

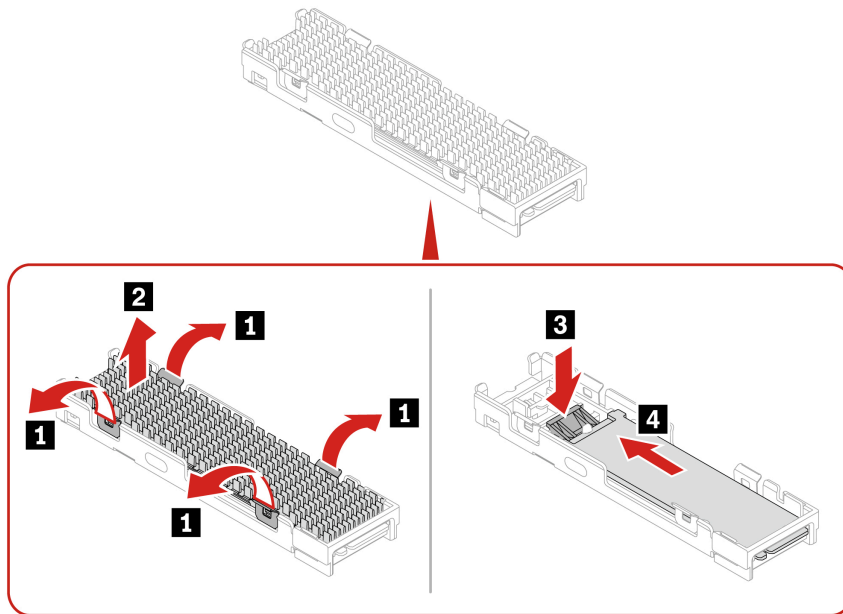


2. Remove the M.2 SSD from its heatsink kit.

- Gen 4 M.2 SSD



- Gen 5 M.2 SSD



Note: Remove the film that covers the thermal pad (if any) when installing the M.2 SSD.

M.2 SSD holder

Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.



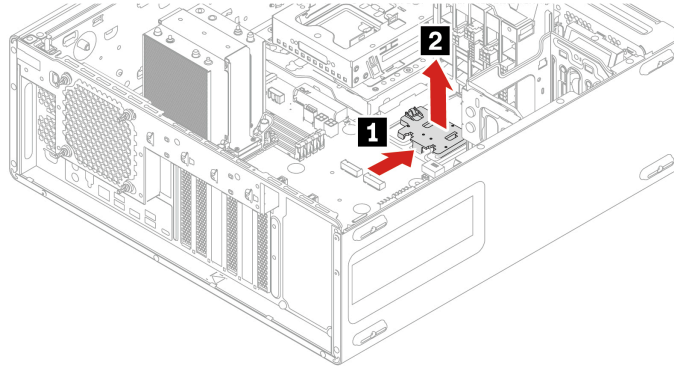
Before you open the computer cover, turn off the computer and wait several minutes until the computer is cool.

For access, do the following:

1. Remove the “Side cover” on page 29.
2. Remove the “Super capacitor module” on page 65.
3. Remove the “PCIe card and extender” on page 67.
4. Remove the “Onboard M.2 SSD and its heatsink kit” on page 52.

Removal steps

Remove the M.2 SSD holder.



M.2 SSD on an M.2 SSD PCIe adapter

Prerequisite

Before you start, read *Generic Safety and Compliance Notices*, and print the following instructions.

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

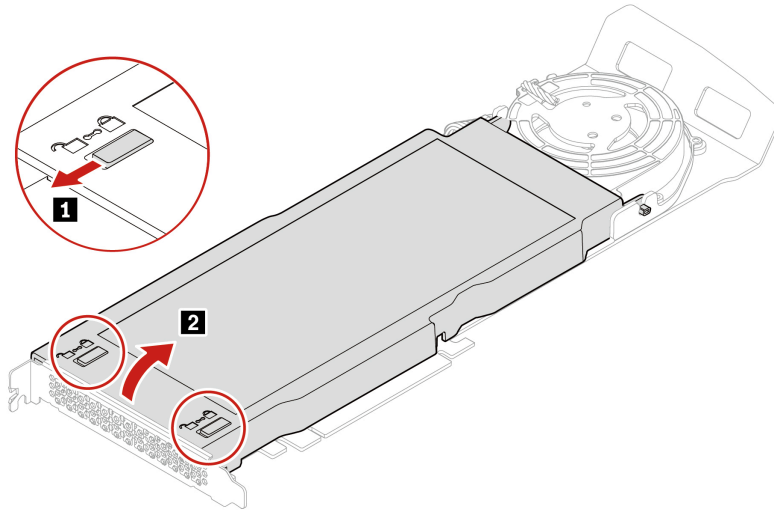
- Replace the internal storage drive only for repair. The internal storage drive is not designed for frequent changes or replacement.
- Before replacing the internal storage drive, make a backup copy of all the data that you want to keep.
- Do not touch the contact edge of the internal storage drive.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

For access, do the following:

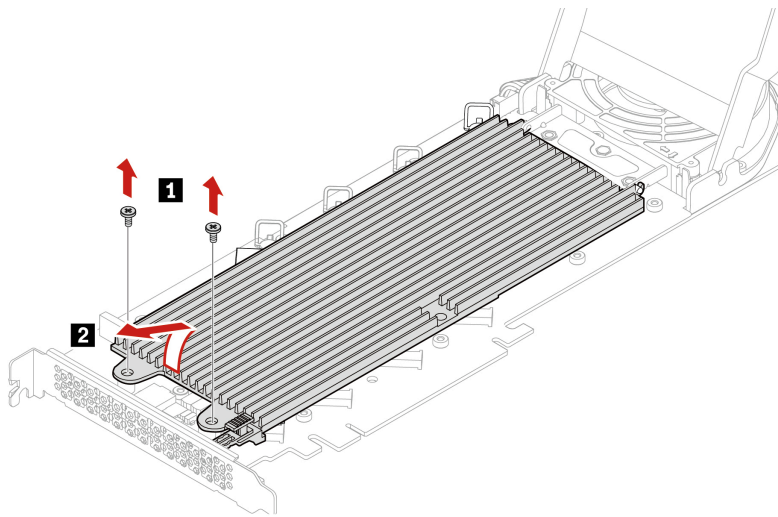
1. Remove the “Side cover” on page 29.
2. Remove the “Super capacitor module” on page 65.
3. Remove the “NVLINK bridge” on page 64, if any.
4. Remove the M.2 SSD PCIe adapter. See “PCIe card and extender” on page 67.

Removal steps of type 1 M.2 SSD on an M.2 SSD PCIe adapter

1. Open the cover.

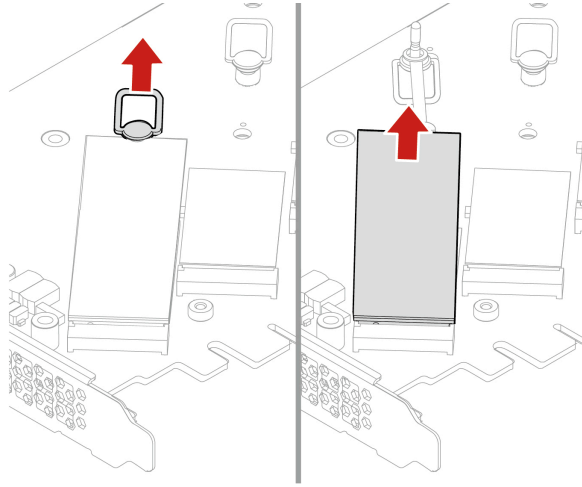


2. Remove the M.2 SSD heat sink.



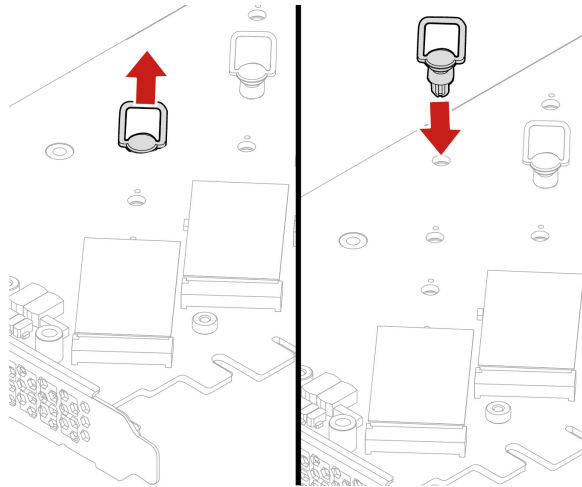
Screw (quantity)	Color	Torque
M3_H5 Zn coated (2)	Black	3.0 ± 0.2 lb/in

3. Pull the handle of the retention latch outward to release the M.2 SSD. Then, remove the M.2 SSD from the PCIe adapter.

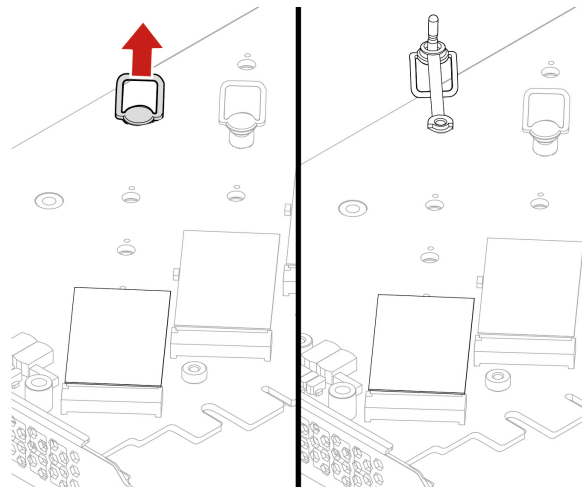


Installation steps of type 1 M.2 SSD on an M.2 SSD PCIe adapter

1. If necessary, move the retention latch to an appropriate location to suit the length of the new M.2 SSD.

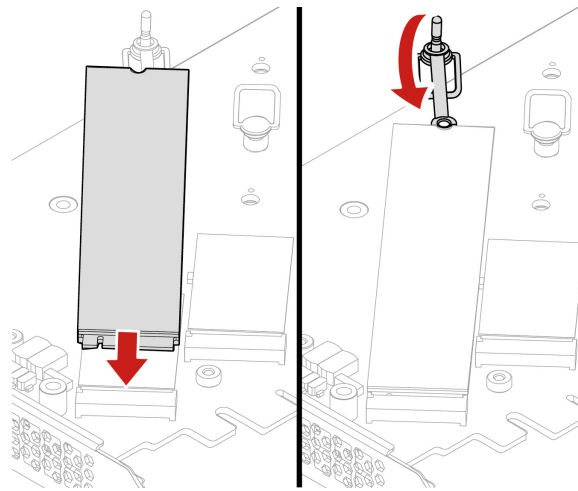
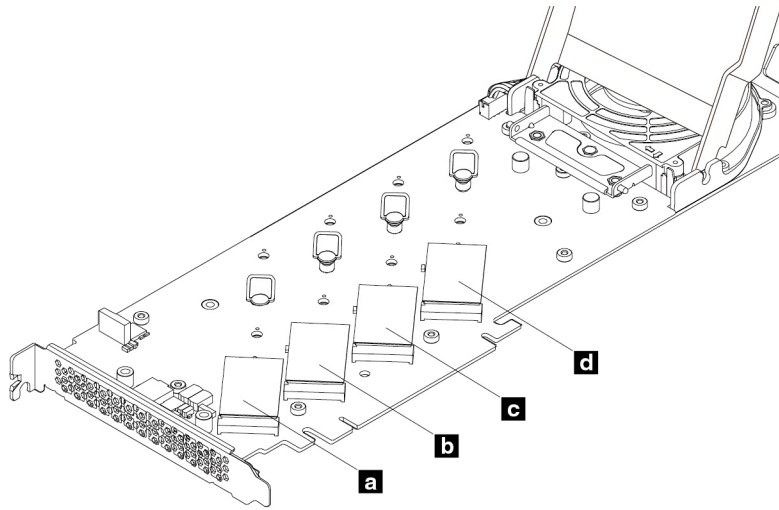


Remove the film on the thermal pad on which you want to install the M.2 SSD. Pull the handle of the retention latch outward to the open position.

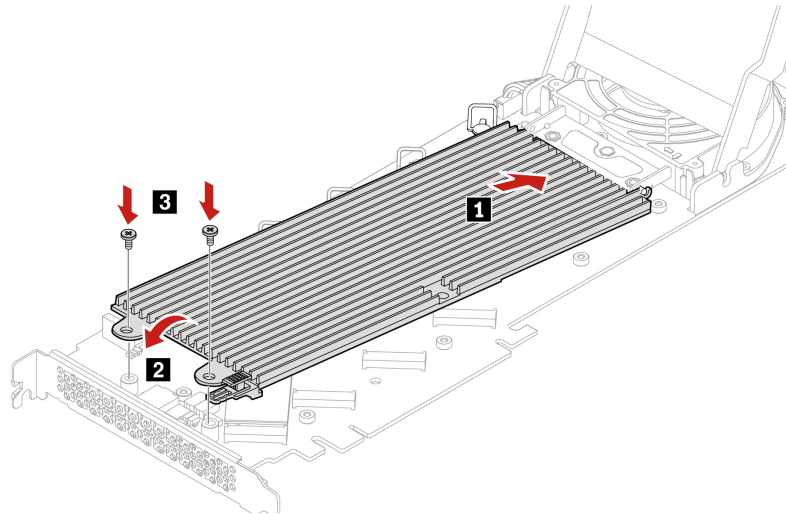


2. Install the M.2 SSD. Then, insert the plug of the retention latch into the hole to secure the new drive. Do not touch the circuit board of the M.2 SSD.

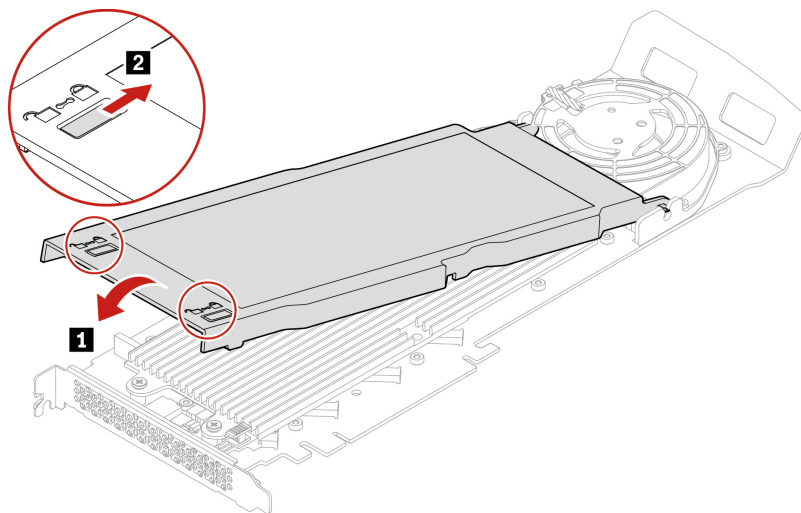
Note: Install M.2 SSD in the alphabetic order as shown.



3. Install the M.2 SSD heat sink.



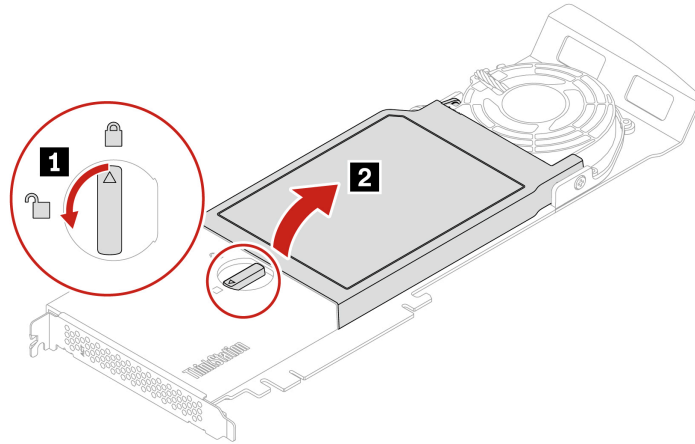
4. Close the cover and lock it.



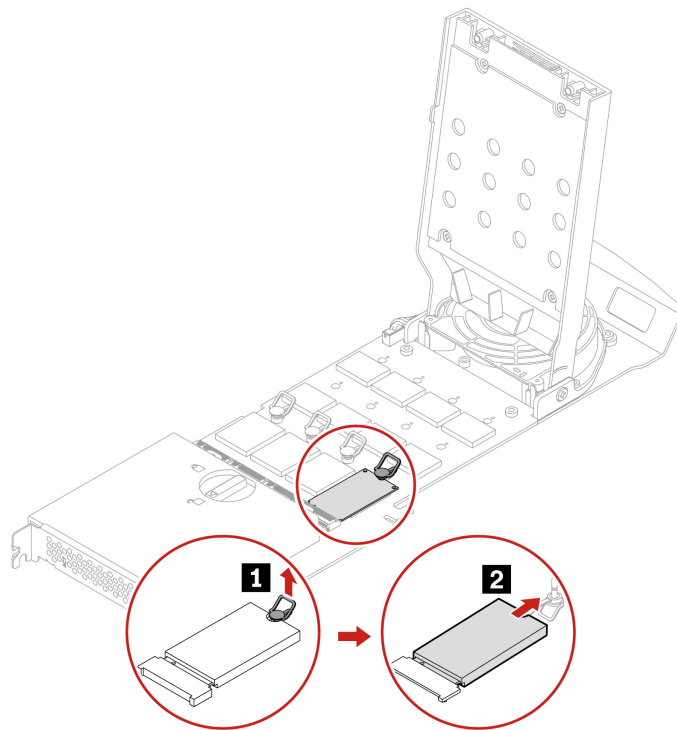
Note: Install the M.2 SSD PCIe adapter in a PCIe x16 card slot on the system board. See “PCIe card installation rule” on page 71.

Removal steps of type 2 M.2 SSD on an M.2 SSD PCIe adapter

1. Rotate the lock to the open position to open the cover.

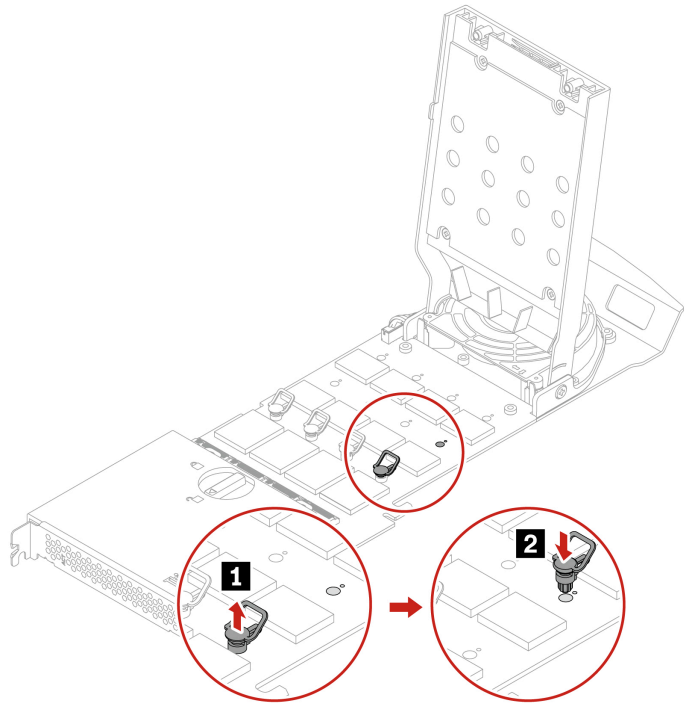


2. Pull the handle of the retention latch outward to release the M.2 SSD. Then, remove the M.2 SSD from the PCIe adapter.

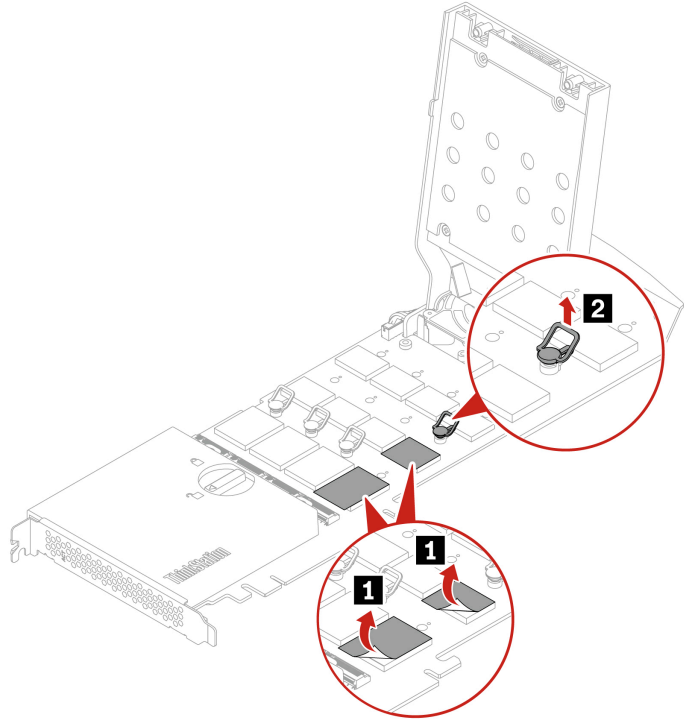


Installation steps of type 2 M.2 SSD on an M.2 SSD PCIe adapter

1. If necessary, move the retention latch to an appropriate location to suit the length of the new M.2 SSD.



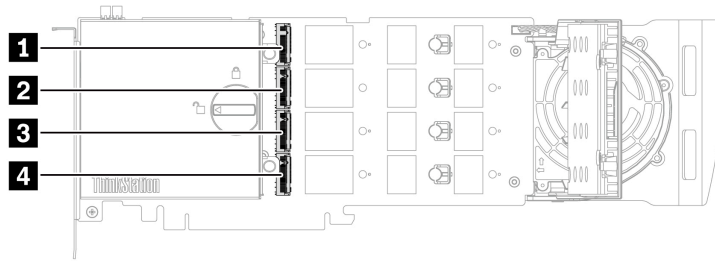
Remove the film on the thermal pad on which you want to install the M.2 SSD. Pull the handle of the retention latch outward to the open position.



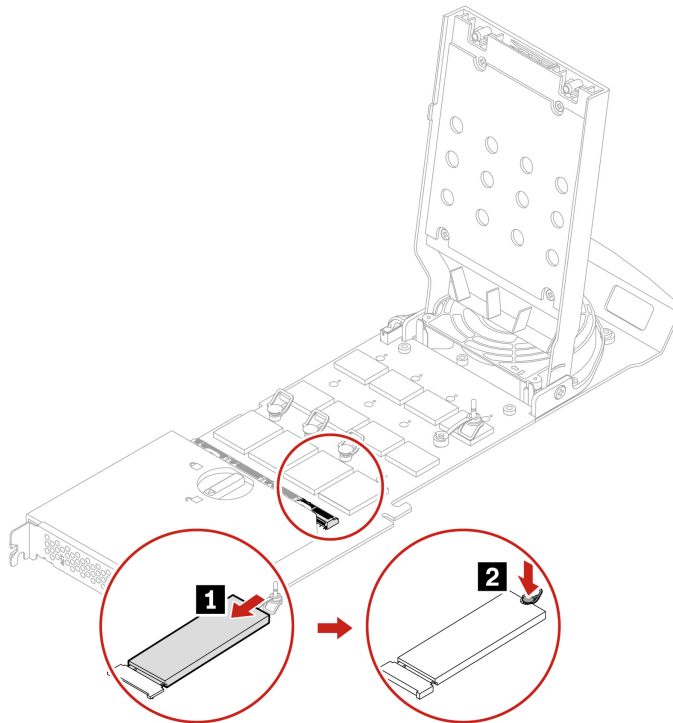
2. Install the M.2 SSD. Then, insert the plug of the retention latch into the hole to secure the new drive. Do not touch the circuit board of the M.2 SSD.

Notes:

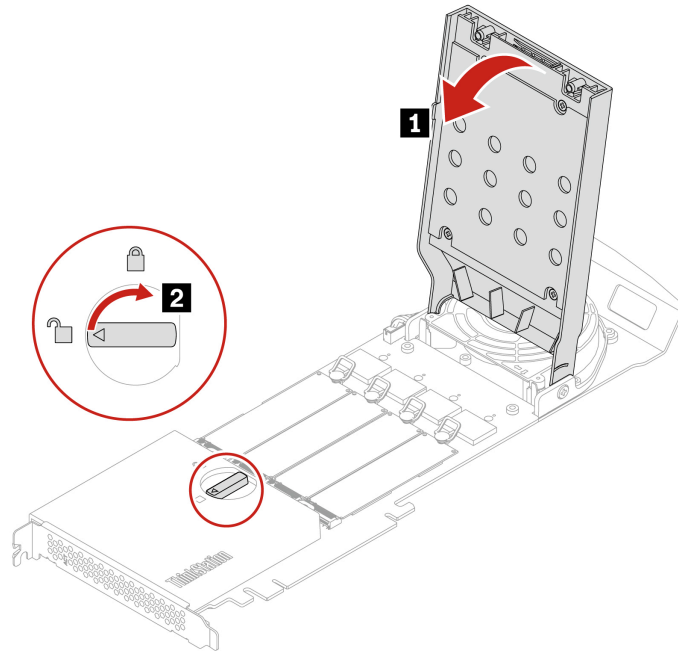
- Install M.2 SSDs in the following order as shown:



- For better performance, it's recommended that the generation of M.2 SSD match with the generation of M.2 SSD PCIe adapter. For example, install Gen 4 M.2 SSD on Gen 4 M.2 SSD PCIe adapter and install Gen 5 M.2 SSD on Gen 5 M.2 SSD PCIe adapter.



3. Rotate the lock to the close position to close the cover.



Note: Install the M.2 SSD PCIe adapter in a PCIe x16 card slot on the system board. See “PCIe card installation rule” on page 71.

PCIe cards

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

NVLINK retainer

Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.



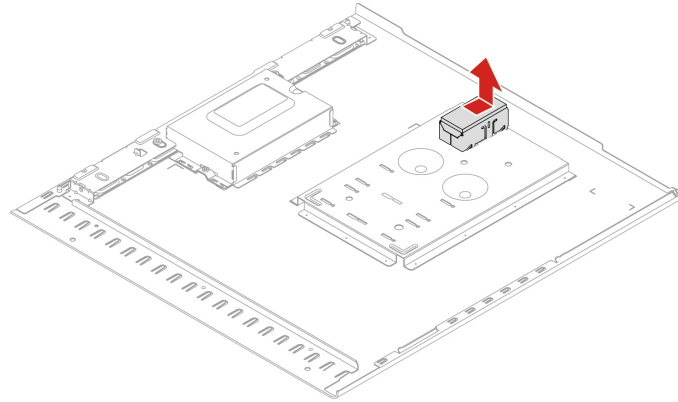
Before you open the computer cover, turn off the computer and wait several minutes until the computer is cool.

For access, remove the “Side cover” on page 29.

Removal steps

Remove the NVLINK retainer.

Note: The NVLINK retainer is only available on some Graphics cards.



NVLINK bridge

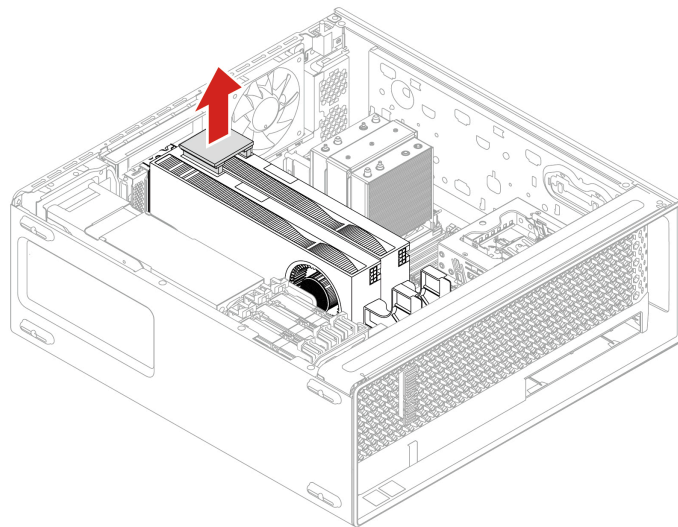
Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, remove the “Side cover” on page 29.

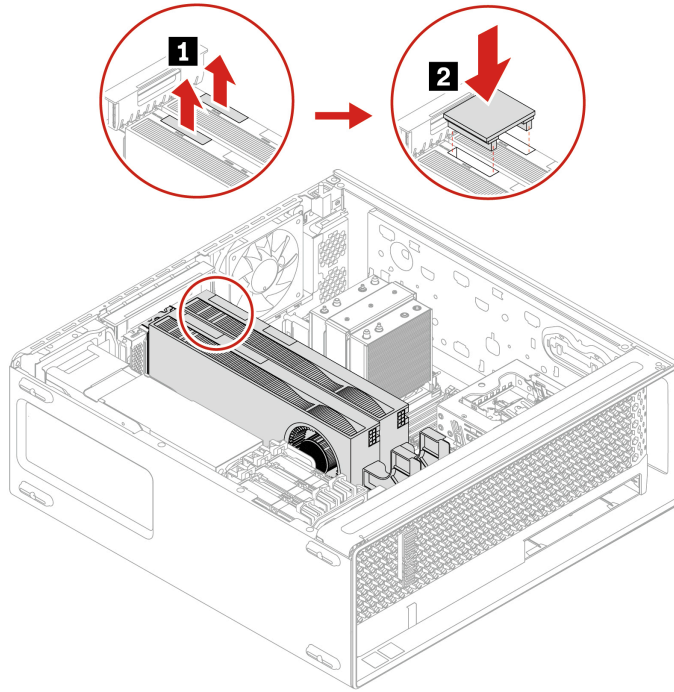
Removal steps

Remove the NVLINK bridge.



Installation steps

Install the NVLINK bridge.



Note: To install NVLINK bridge, make sure you have installed NVLINK retainer.

Super capacitor module

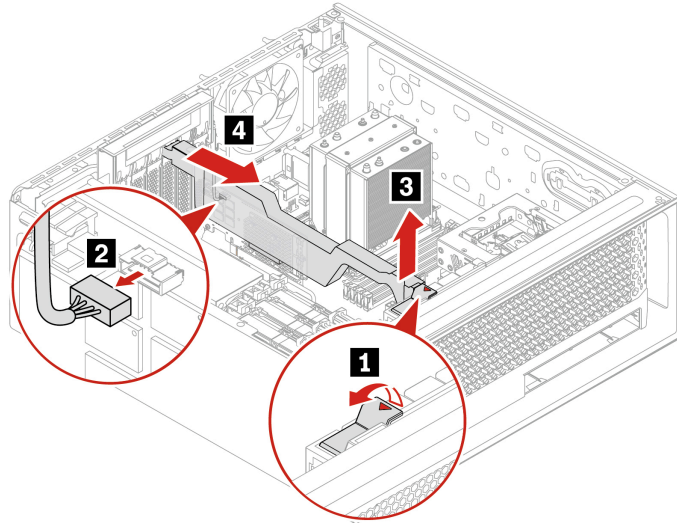
Prerequisite

Before you start, read *Generic Safety and Compliance Notices*, and print the following instructions.

For access, remove the “Side cover” on page 29.

Removal steps

Remove the super capacitor module.



Note: When installing a new super capacitor module, connect the super capacitor module cable to the super capacitor module connector (J14) on the RAID card.

PCIe bracket

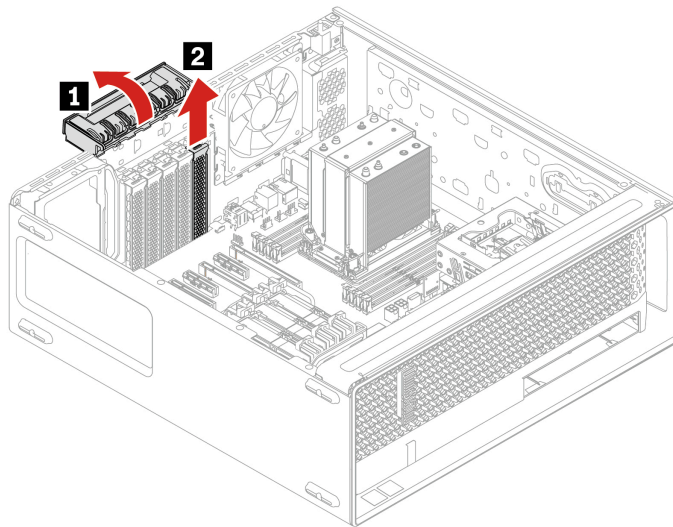
Prerequisite

Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, remove the “Side cover” on page 29.

Removal steps

Remove the PCIe bracket.



PCIe card and extender

Prerequisite

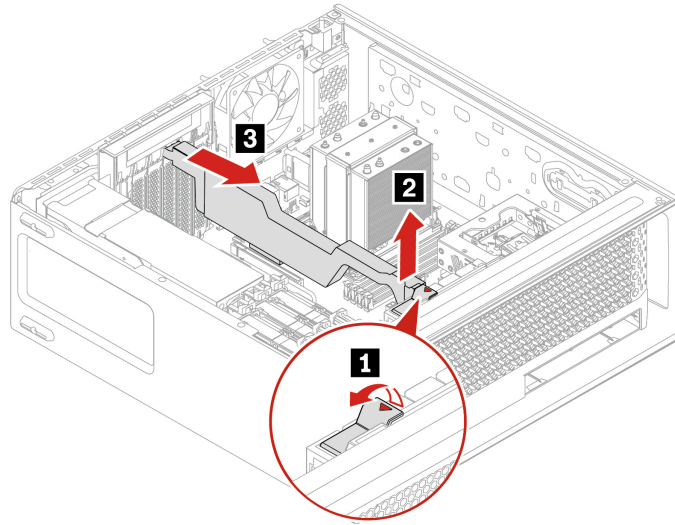
Before you start, read [Generic Safety and Compliance Notices](#), and print the following instructions.

For access, do the following:

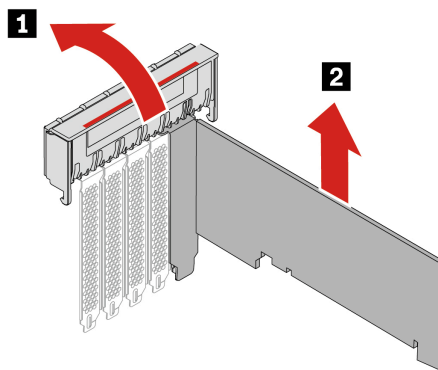
1. Remove the following parts, if any, in order.
 - “Side cover” on page 29
 - “NVLINK bridge” on page 64
2. Record the PCIe card cable routing and connections (if any), then disconnect the cables from the system board.

Replacement steps for half-length PCIe card

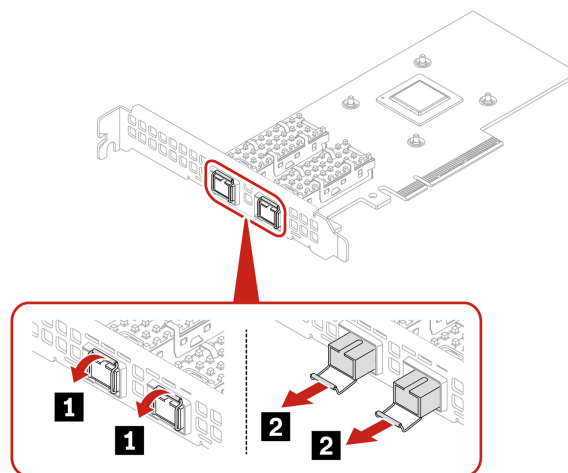
1. Remove the PCIe card retainer. The PCIe card retainer is only available on some PCIe cards.



- 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.



Note: For some Ethernet adapter cards, the following fiber modules can be removed.

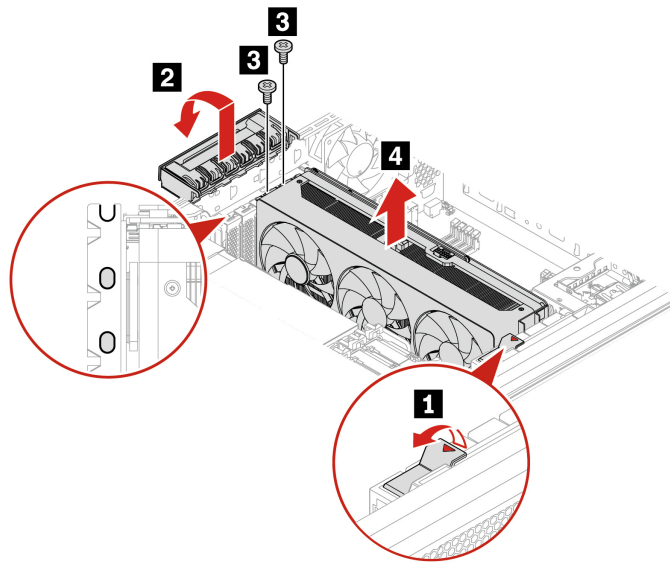


- Install the PCIe card and other removed parts in reverse order.

Note: For PCIe card installation order and special installation rules for certain PCIe cards, see “PCIe card installation rule” on page 71.

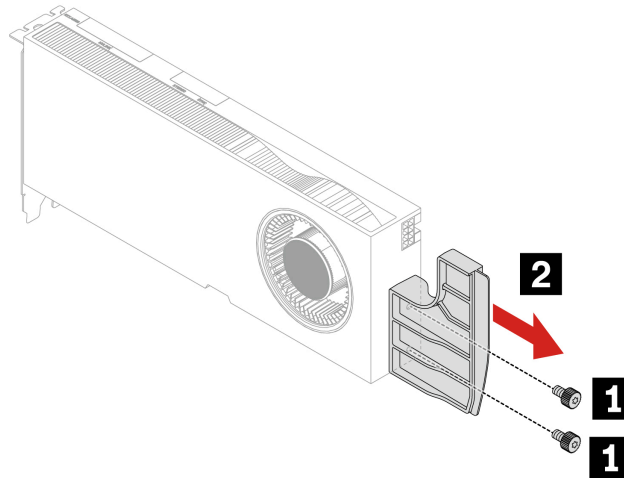
Replacement steps for full-length PCIe card

1. Remove the PCIe card.
 - a. Unlock the front card guide.
 - b. Open the handle.
 - c. Remove the screws that fix the PCIe card to the chassis (if any).
 - d. 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.



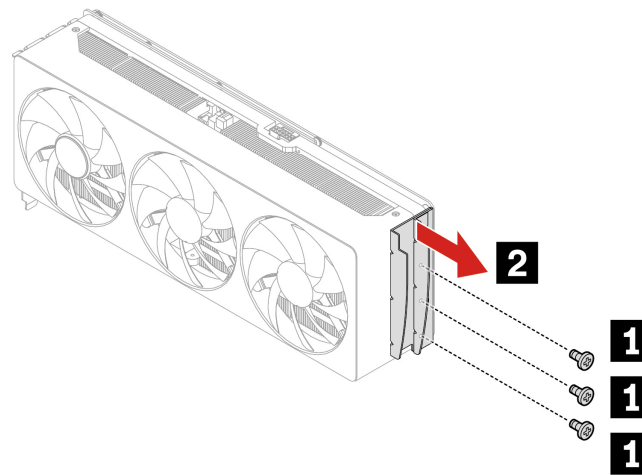
Screw specification	Quantity	Torque
M3.5 x 5 mm, Ni coated, black	2	5 ± 0.5 lb/in

2. Remove the PCIe extender if needed.
 - 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 4080/5080), the PCIe card extender is a customized CRU part. You can remove it according to the following illustration.
 - Type-1



Screw specification	Quantity	Torque
M3 x 5.5 mm, Ni coated, black	2	3-3.5 lb/in

– Type-2

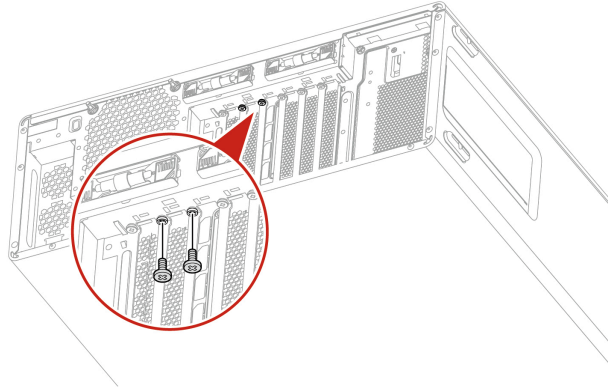


Screw specification	Quantity	Torque
M3 x 5 mm, Ni coated, black	3	3 ± 0.5 lb/in

3. Install the PCIe card and other removed parts in reverse order.

Notes:

- For compatible models without a pre-installed GeForce 5080 PCIe card, you may need a PH2 screwdriver to access two screws above the second and third PCIe brackets on the rear panel, as the card doesn't include chassis mounting screws.



- For PCIe card installation order and special installation rules for certain PCIe cards, see “PCIe card installation rule” on page 71.

PCIe card installation rule

Install PCIe cards according to the following order and special rules for certain PCIe cards.

- **Installation order**

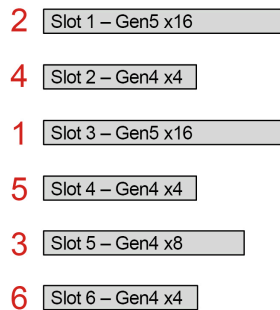


Figure 4. PCIe card installation order

- **Special installation rules for certain PCIe cards**

PCIe card	Installation rules
For all graphic cards	<ul style="list-style-type: none"> – Ensure that at least one graphic card is installed. – If more than two graphic cards is installed, ensure that they are the same.
Nvidia GeForce graphic cards	Install in slot 1.
Gen 3 M.2 SSD PCIe adapter (Medina I)	Install in slot 1.

PCIe card	Installation rules
Gen 4 M.2 SSD PCIe adapter (Medina II)	Install in slot 1.
Gen 5 M.2 SSD PCIe adapter (Medina Gen 5)	Install in slot 1.
NVIDIA ConnectX-6 Ethernet Adapter card	Install in slot 1.
Thunderbolt card	<ul style="list-style-type: none"> – Install in slot 6, slot 4, or slot 2 – Ensure that at least one graphic card with two DisplayPort connectors is installed.
BMC card (for selected models)	Install in slot 5.

Cable connection

When installing PCIe cards, follow the cable connection rule if need.

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

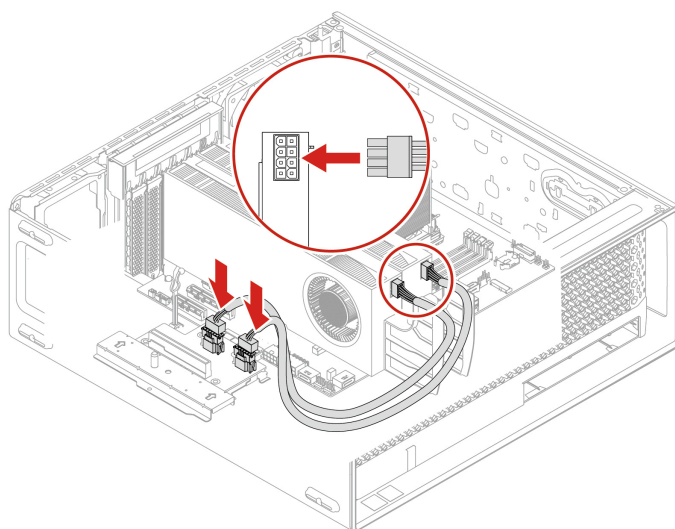


Figure 5. Cable connection for GFX RTX A4500/RTX A5500/RTX A6000/RTX 5880 with 1000-watt power supply assembly

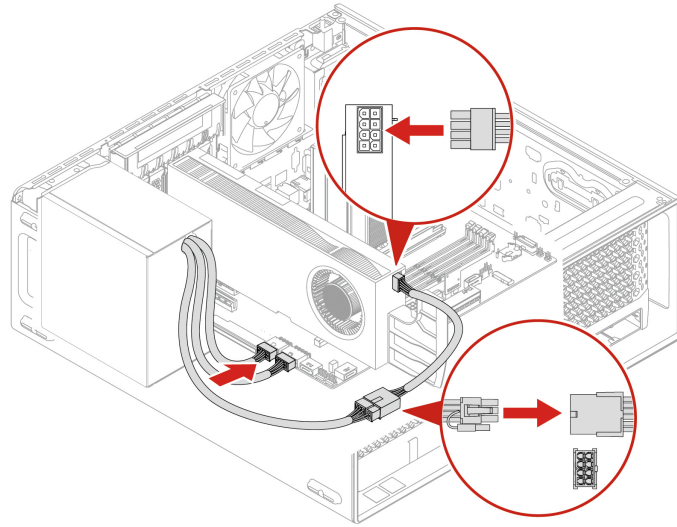


Figure 6. Cable connection for GFX RTX A4500/RTX A5500/RTX A6000/RTX 5880 with 750-watt power supply assembly

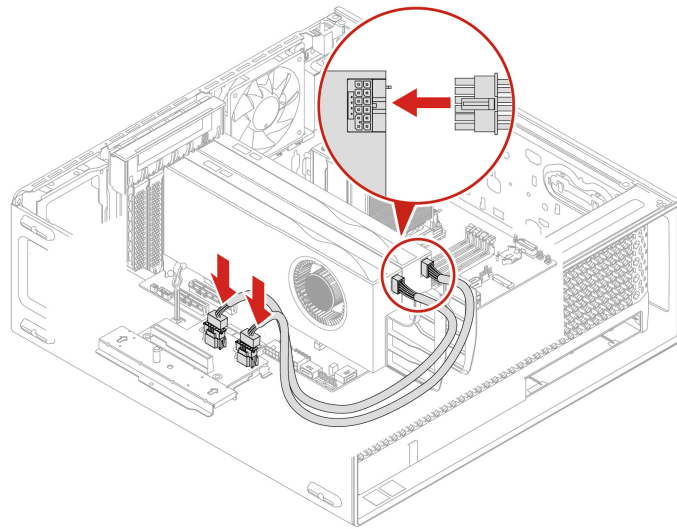


Figure 7. Cable connection for GFX RTX 4000 Ada / RTX 4500 Ada / RTX 5000 Ada with 1000-watt power supply assembly

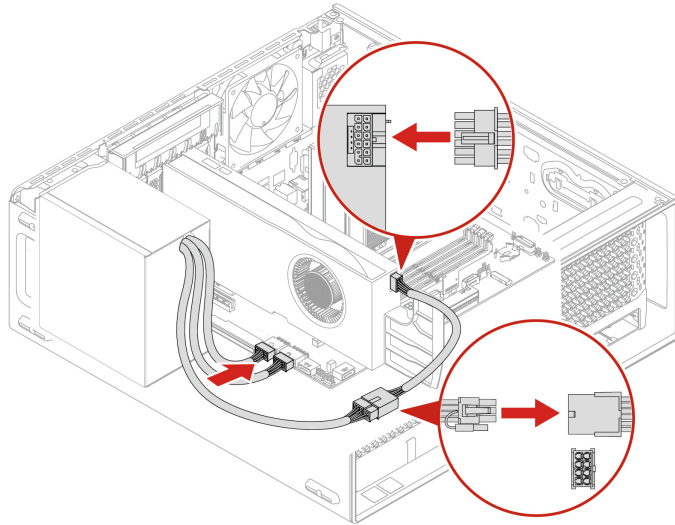


Figure 8. Cable connection for GFX RTX 4000 Ada /RTX 4500 Ada /RTX 5000 Ada with 750-watt power supply assembly

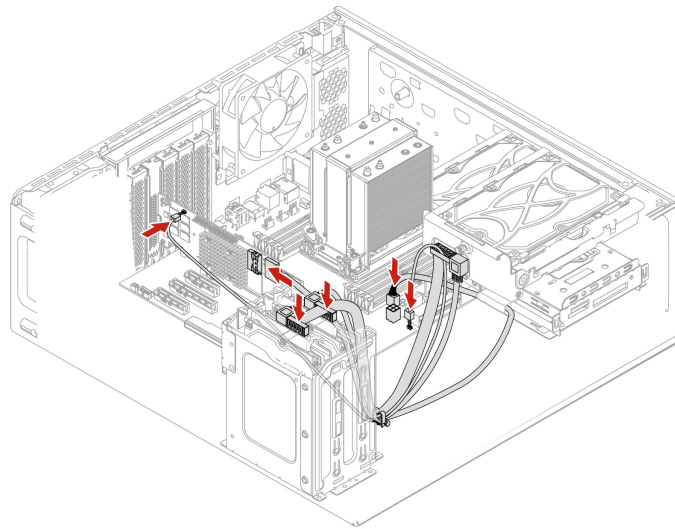


Figure 9. Cable connection for Broadcom 9540-8i RAID card

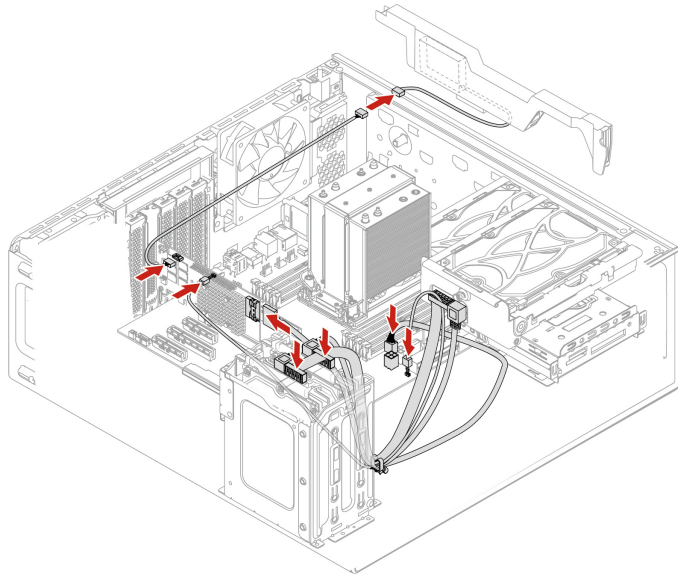


Figure 10. Cable connection for Broadcom 940-8i RAID card

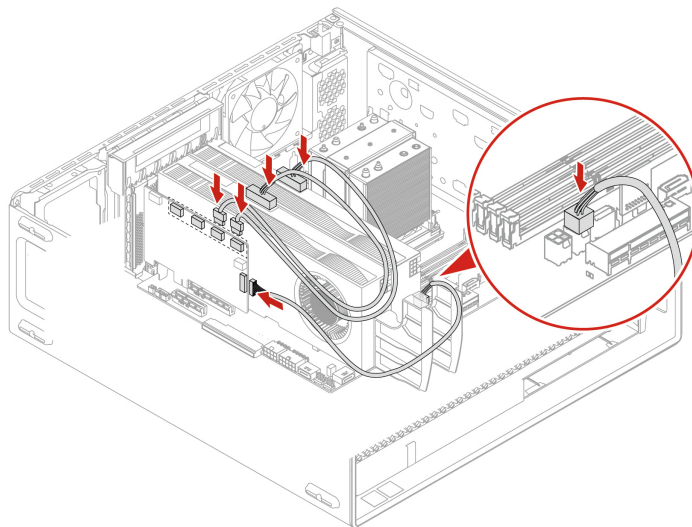


Figure 11. Cable connection for NVIDIA Quadro SYNC II card

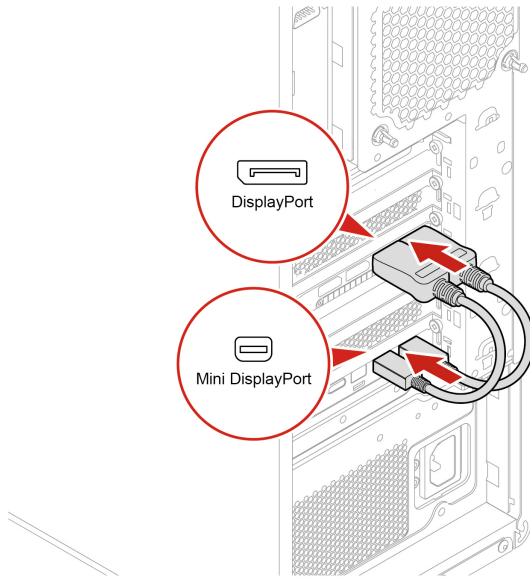


Figure 12. Cable connection for Thunderbolt card

Chapter 5. Help and support

Self-help resources

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

Resources	How to access?
Product documentation: <ul style="list-style-type: none">• <i>Safety and Warranty Guide</i>• <i>Generic Safety and Compliance Notices</i>• <i>Setup Guide</i>• <i>This User Guide</i>• <i>Regulatory Notice</i>	Go to https://support.lenovo.com/documentation and search by product.
Lenovo Support Web site with the latest support information of the following: <ul style="list-style-type: none">• Drivers and software• Diagnostic solutions• Product and service warranty• Product and parts details• Knowledge base and frequently asked questions	https://pcsupport.lenovo.com
Ubuntu help information	https://help.ubuntu.com/lts/ubuntu-help/index.html
IGEL support information	https://support.igel.com/

Lenovo diagnostic tools

For information about Lenovo diagnostic tools, go to:
<https://pcsupport.lenovo.com/lenovodiagnosicsolutions>

Call Lenovo

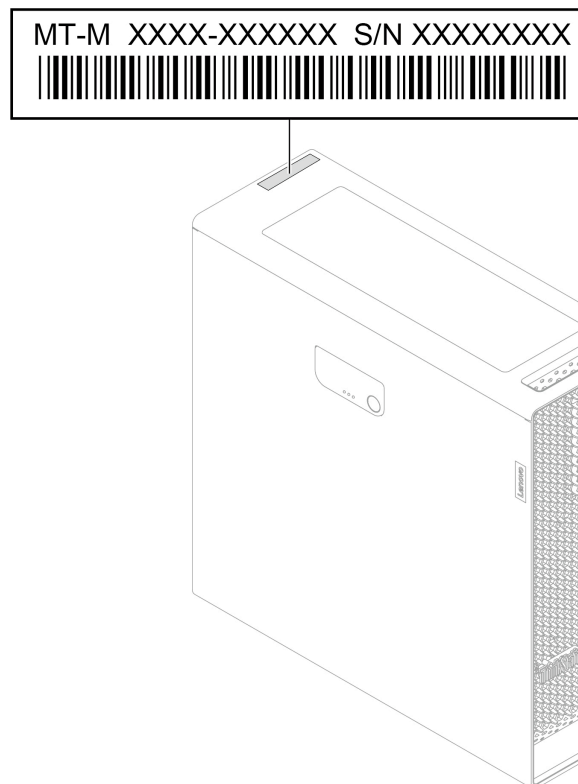
If you have tried to correct the problem yourself and still need help, you can call Lenovo Customer Support Center.

Before you contact Lenovo

Prepare the following 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

The following illustration shows where to find the machine type and serial number of your computer.



Lenovo Customer Support Center

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

Telephone numbers

For a list of the Lenovo Support phone numbers for your country or region, go to:
<https://pcsupport.lenovo.com/supportphonenumberlist>

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

Services available during the warranty period

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

Services not covered

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

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

Purchase 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 name might vary by country or region.

Purchase accessories

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

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

Accessibility features

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

Appendix A. Supplemental information about the Ubuntu operating system

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

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

Access the Lenovo Limited Warranty

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

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

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

```
/opt/Lenovo
```

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

Access the Ubuntu help system

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

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

<https://www.ubuntu.com>

Access IGEL distributions

To learn more about the IGEL operating system, go to <https://www.igel.com/support>.

Get support information

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

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

<https://pcsupport.lenovo.com>

Access open-source information

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

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make a written offer to provide corresponding source code to you) from Lenovo for a period of three years without charge except for the cost of media, shipping, and handling, upon written request to Lenovo. This offer is valid to anyone in receipt of this device.

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

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

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

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

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- For computers purchased in mainland China
<https://newsupport.lenovo.com.cn>
- For computers purchased outside mainland China
<https://pcsupport.lenovo.com>

HEVC Standard

This product may support digital video coding under certain versions of HEVC (High Efficiency Video Coding) standard and, if so, may be covered by patents at <https://accessadvance.com/advance-patent-lists/>.



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