

Attaching a Kensington-style cable lock

You can use a Kensington-style cable lock to secure your computer to a desk, table, or other non-permanent fixture. The cable lock attaches to the security-lock slot at the rear of your computer. Depending on the type selected, the cable lock can be operated with a key or combination. You can order such a cable lock directly from Lenovo by searching for *Kensington* at: <https://support.lenovo.com>

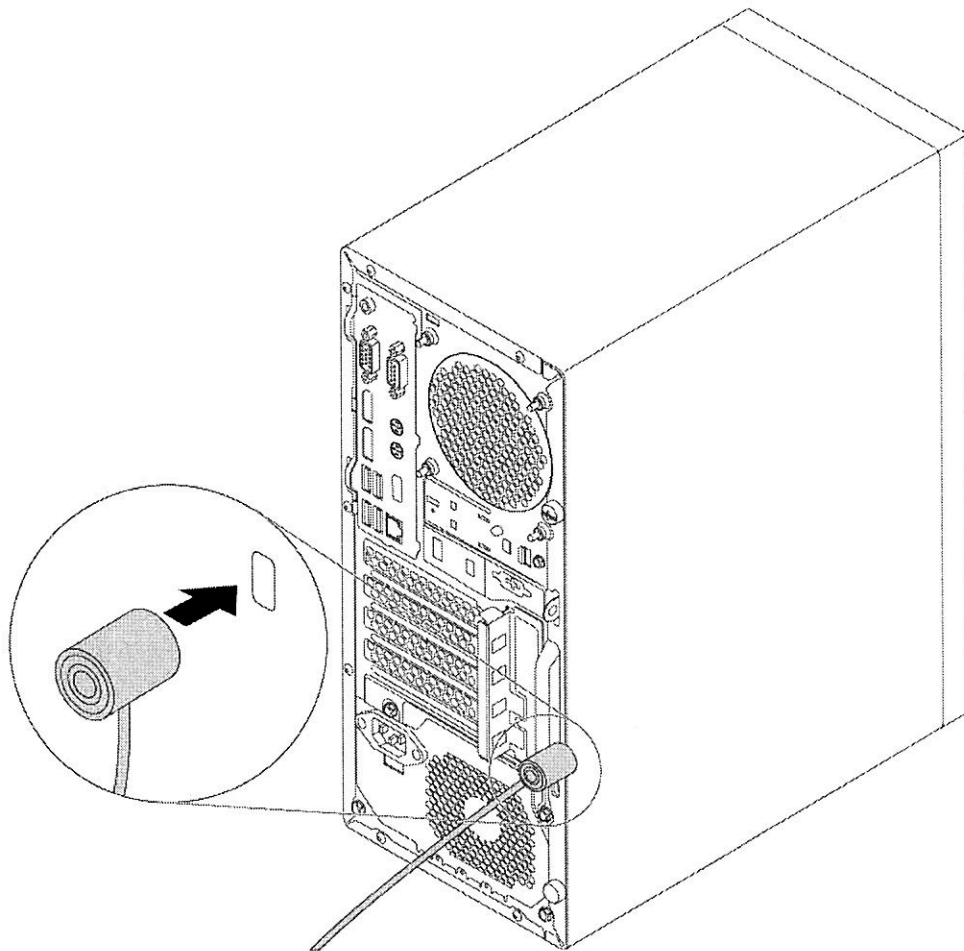


Figure 9. Kensington-style cable lock

Attaching a cable lock

A cable lock can be used to secure devices, such as the keyboard and the mouse, by locking the device cables to your computer. The cable lock attaches to the cable-lock slots on the rear of your computer.

To attach a cable lock, do the following:

1. Insert the clip **1** into the cable-lock slot **2**.
2. Pull the cables you want to lock through the dents in the cable lock.
3. Press the clip **2** into the cable-lock slot **3** until it snaps into position.

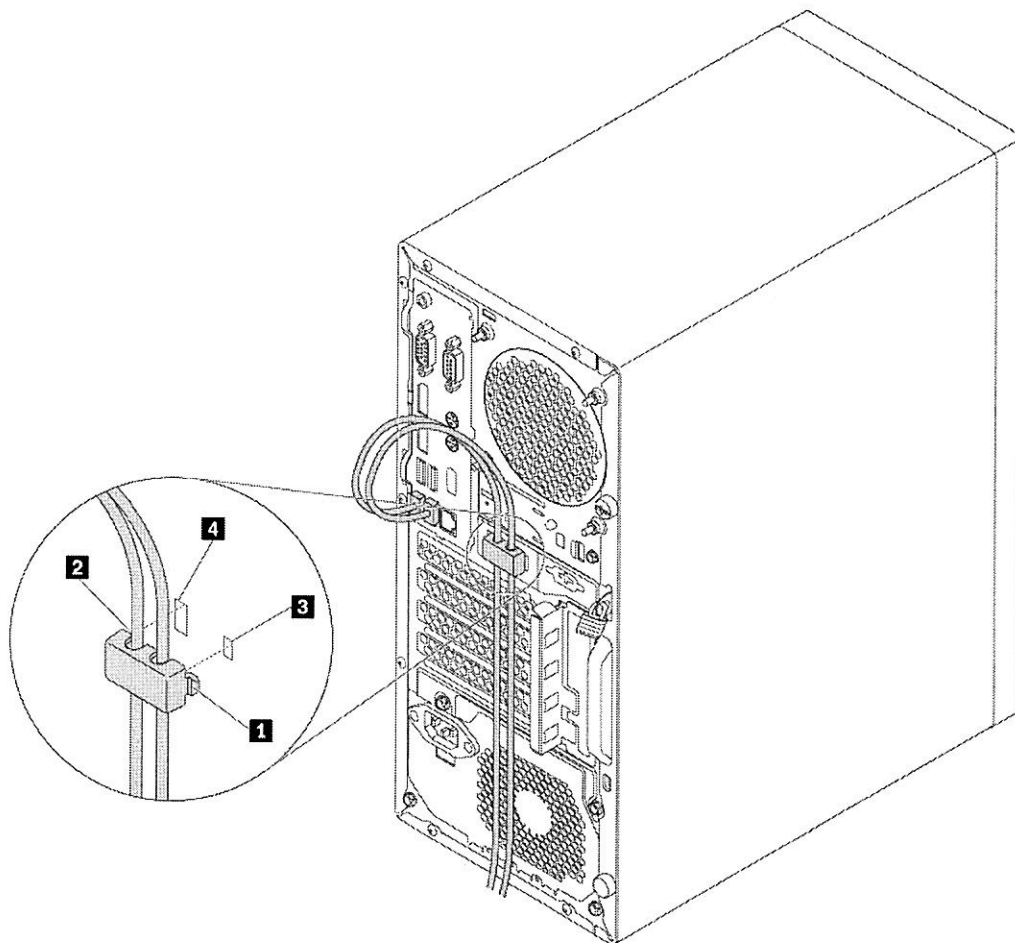


Figure 10. Installing a cable lock

Viewing and changing security settings in the Setup Utility program

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

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 35.
2. Select **Security**.
3. Follow the instructions on the right side of the screen to view and change security settings. You can refer to “Using the Setup Utility program” on page 35 to get basic information about some major security settings.
4. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

Using passwords and Windows accounts

You can use BIOS passwords and Windows accounts to prevent unauthorized access to your computer and data. To use the BIOS passwords or the Windows accounts, do the following:

- To use BIOS passwords, see “Using BIOS passwords” on page 38.
- To use Windows accounts, do the following:

1. Click the Start button to open the Start menu.
2. Click **Settings** → **Accounts**.
3. Follow the instructions on the screen.

Using the cover presence switch

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

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

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

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

1. Properly remove or install your computer cover. See Chapter 7 “Hardware removal and installation” on page 55.
2. Start and then exit the Setup Utility program. See “Starting the Setup Utility program” on page 35 and “Exiting the Setup Utility program” on page 41.

Using firewalls

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

To use Windows Firewall, do the following:

1. Click the Start button to open the Start menu.
2. Click **Windows System** → **Control Panel**.
3. View Control Panel by Large icons or Small icons, and then click **Windows Defender Firewall**.
4. Follow the instructions on the screen.

Protecting data against viruses

Your computer is preinstalled with an antivirus program to help you guard against, detect, and eliminate viruses.

Lenovo provides a full version of antivirus software on your computer with a free 30-day subscription. After 30 days, you must renew the license to continue receiving the antivirus software updates.

Note: Virus definition files must be kept up-to-date to guard against new viruses.

For more information about how to use your antivirus software, refer to the help system of your antivirus software.

Using the Smart USB Protection function

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 or modify 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, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Security → Smart USB Protection** and press Enter.
3. Select the desired setting and press Enter.
4. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

Computrace Agent software embedded in firmware (for selected models)

The Computrace Agent software is an IT asset management and computer theft recovery solution. The software detects if changes have been made on the computer, such as hardware, software, or the computer call-in location. You might have to purchase a subscription to activate the Computrace Agent software.

Trusted Platform Module (TPM)

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

Chapter 5. Advanced configuration

This chapter provides information to help you further configure the computer.

Using the Setup Utility program

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

Note: The operating system settings might override any similar settings in the Setup Utility program.

Starting the Setup Utility program

To start the Setup Utility program, do the following:

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

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

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

Changing the display language of the Setup Utility program

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

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

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. From the main interface, locate **System Language** and press Enter.
3. Select the display language according to your needs.

Enabling or disabling a device

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

To enable or disable a device, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Devices**.
3. Select the device you want to enable or disable and press Enter.
4. Select the desired setting and press Enter.
5. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

Enabling or disabling the automatic power-on of your computer

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

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

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Power → Automatic Power On** and press Enter.
3. Select the feature you want to enable or disable and press Enter.
4. Select the desired setting and press Enter.
5. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

Enabling or disabling the ErP LPS compliance mode

Lenovo computers meet the eco-design requirements of the ErP Lot 3 regulation. For more information, go to:

<https://www.lenovo.com/ecodeclaration>

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

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

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Power → Enhanced Power Saving Mode** and press Enter.
3. Select **Enabled** or **Disabled** depending on your needs, and then press Enter. If you select **Enabled**, you also need to disable the Wake on LAN feature. See "Enabling or disabling the automatic power-on of your computer" on page 36.
4. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

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

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

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

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Power → After Power Loss** and press Enter.
3. Select **Power On** and press Enter.
4. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

Enabling or disabling the eSATA mode for the SATA 4 connector

The SATA 4 connector supports the eSATA mode. Before using the front-access storage enclosure, ensure that the eSATA mode is enabled and the SATA cable of the front-access storage enclosure is connected to

the SATA 4 connector on the system board. To verify the cable connection, see "Preparing your computer" on page 56 and "Parts on the system board" on page 7 for more information.

To enable or disable the eSATA mode, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Devices → ATA Drive Setup** and press Enter.
3. Select **SATA Drive 4 Hot-Plug Support** and press Enter.
4. Select **Enabled** or **Disabled** as desired and press Enter.
5. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed and press Enter.

Switching between better acoustic and better thermal performance

You can adjust the acoustic and thermal performance of your computer through the **ICE Performance Mode** menu. Two choices are available:

- **Better Acoustic Performance** (default setting): This computer works with less noise at a normal thermal level.
- **Better Thermal Performance**: The computer works at a better thermal level with normal acoustic performance.

To switch between better acoustic performance and better thermal performance, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Power → Intelligent Cooling Engine (ICE)** and press Enter.
3. Select **ICE Performance Mode** and press Enter.
4. Select **Better Acoustic Performance** or **Better Thermal Performance** as desired and press Enter.
5. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

Enabling or disabling the system to record thermal alert logs

When the ICE thermal alert feature is enabled, if a critical thermal situation occurs, an alert log is written into the Windows system log. The alert log can help you identify thermal problems, such as malfunctioning fans, abnormally high temperature, or poor cooling performances.

To enable or disable the system to record thermal alert logs, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Power → Intelligent Cooling Engine (ICE)** and press Enter.
3. Select **ICE Thermal Alert** and press Enter.
4. Select the desired setting and press Enter.
5. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

Enabling or disabling the configuration change detection

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

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

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

2. Select **Security → Configuration Change Detection** and press Enter.
3. Select the desired setting and press Enter.
4. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

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

- Press F2 or Fn+F2 (depending on the keyboard settings).
- Start and then exit the Setup Utility program. See “Starting the Setup Utility program” on page 35 and “Exiting the Setup Utility program” on page 41.

Changing the BIOS settings before installing a new operating system

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

To change the BIOS settings, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 35.
2. From the main interface, select **Exit → OS Optimized Defaults** and press Enter.
3. Depending on the operating system to be installed, do one of the following:
 - To install the Windows 10 (64-bit) operating system, select **Enabled** and press Enter.
 - To install an operating system other than Windows 10 (64-bit), select **Disabled** and press Enter.
4. Select **Yes** in the window displayed and press Enter to confirm your selection.
5. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

Using BIOS passwords

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

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

Password types

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

- Power-on password
When a power-on password is set, you are prompted to enter a valid password each time the computer is turned on. The computer cannot be used until the valid password is entered.
- Administrator password
Setting an administrator password deters unauthorized users from changing configuration settings. If you are responsible for maintaining the configuration settings of several computers, you might want to set an administrator password.
When an administrator password is set, you are prompted to enter a valid password each time you try to access the Setup Utility program. The Setup Utility program cannot be accessed until a valid password is entered.
If both the power-on password and administrator password are set, you can enter either password. However, you must use your administrator password to change any configuration settings.
- Hard disk password

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

Notes:

- Even if the storage drive is removed from one computer and installed in another, the hard-disk password is still valid.
- If the hard disk password is forgotten, there is no way to reset the password or recover data from the storage drive.

Password considerations

A password can be any combination of up to 64 alphabetic and numeric characters. For security reasons, it is recommended to use a strong password that cannot be easily compromised.

Note: The Setup Utility program passwords are case-sensitive.

To set a strong password, consider the following guidelines:

- Have at least eight characters in length
- Contain at least one alphabetic character and one numeric character
- Not be your name or your user name
- Not be a common word or a common name
- Be significantly different from your previous passwords

Setting, changing, or deleting a password

To set, change, or delete a password, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 35.
2. Select **Security**.
3. Depending on the password type, select **Set Power-On Password**, **Set Administrator Password**, or **Hard Disk Password** and press Enter.
4. Follow the instructions on the right side of the screen to set, change, or delete a password.

Note: A password can be any combination of up to 64 alphabetic and numeric characters. For more information, see “Password considerations” on page 39.

5. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

Erasing lost or forgotten passwords (clearing CMOS)

This section provides instructions on how to erase lost or forgotten passwords, such as a user password.

Note: The instructions in this section do not apply to the hard disk password.

To erase a lost or forgotten password, do the following:

1. Remove any media from the drives and turn off all connected devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See Chapter 7 “Hardware removal and installation” on page 55.
3. Locate the Clear Complementary Metal Oxide Semiconductor (CMOS) /Recovery jumper on the system board. See “Hardware locations” on page 1.

4. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
5. Reinstall the computer cover and connect the power cord. See Chapter 7 "Hardware removal and installation" on page 55.
6. Turn on the computer and leave it on for approximately 10 seconds. Then, turn off the computer by holding the power button for approximately five seconds.
7. Repeat step 1 and step 2.
8. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
9. Reinstall the computer cover and connect the power cord.
10. Turn on the computer and the monitor. When the logo screen is displayed, press F1 or Fn+F1.
11. To prevent data loss, ensure that BIOS settings are restored to an earlier point.

Selecting a startup device

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

Changing the startup device sequence permanently

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

1. Depending on the type of the storage device, do one of the following:
 - If the storage device is internal, go to step 2.
 - If the storage device is a disc, ensure that your computer is turned on. Then, insert the disc into the optical drive.
 - If the storage device is an external device other than a disc, connect the storage device to the computer.
2. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
3. Select **Startup**.
4. Follow the instructions on the right side of the screen to change the startup device sequence.
5. To save settings and exit the Setup Utility program, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed, and press Enter.

Selecting a temporary startup device

Note: Not all discs and storage drives are bootable.

To select a temporary startup device, do the following:

1. Depending on the type of the storage device, do one of the following:
 - If the storage device is internal, go to step 2.
 - If the storage device is a disc, ensure that your computer is turned on. Then, insert the disc into the optical drive.
 - If the storage device is an external device other than a disc, connect the storage device to the computer.
2. Turn on or restart the computer. Before Windows starts up, repeatedly press and release F12 or Fn+F12 (depending on the keyboard settings) until Startup Device Menu is displayed.
3. Select the desired storage device and press Enter. The computer then starts up from the device you select.

If you want to select a permanent startup device, select **Enter Setup** on Startup Device Menu and press Enter to start the Setup Utility program. For more information about how to select a permanent startup device, see "Changing the startup device sequence permanently" on page 40.

Exiting the Setup Utility program

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

- If you want to save the new settings, press F10 or Fn+F10 (depending on the keyboard settings). Then, select **Yes** in the window displayed and press Enter.
- If you do not want to save the new settings, select **Exit → Discard Changes and Exit** and press Enter. Then, select **Yes** in the window displayed and press Enter.

Updating and recovering the BIOS

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

Updating the BIOS

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

To update the BIOS, do the following:

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

Note: If you want to update the BIOS from a flash update disc, the installation instructions might not provide the instructions on how to record the update disc. See "Recording a disc" on page 20.

Recovering from a BIOS update failure

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

1. Remove any media from the drives and turn off all connected devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See Chapter 7 "Hardware removal and installation" on page 55.
3. Locate the Clear CMOS /Recovery jumper on the system board. See "Hardware locations" on page 1.
4. Remove any parts and cables that impede your access to the Clear CMOS /Recovery jumper.
5. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
6. Reinstall the parts and cables that were removed.
7. Reinstall the computer cover and reconnect any cables that were disconnected. See Chapter 7 "Hardware removal and installation" on page 55.
8. Turn on the computer and insert the BIOS update disc into the optical drive. Wait a few minutes. The recovery process begins. After the recovery process is completed, your computer will shut down automatically.

Note: If the computer does not start up from the disc, select the disc as the startup device. See “Selecting a temporary startup device” on page 40.

9. Repeat steps 1–4.
10. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
11. Repeat step 6 and step 7.
12. Turn on the computer and the monitor. When the logo screen is displayed, press F1 or Fn+F1.
13. To prevent data loss, ensure that BIOS settings are restored to an earlier point.

Configuring RAID

This chapter provides information about how to configure Redundant Array of Independent Disks (RAID) for your computer.

An Introduction to RAID

RAID is a technology that provides increased storage functions and reliability through redundancy.

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

RAID drive groups configured according to certain RAID levels also improve data storage reliability and fault tolerance compared with single-drive storage systems. Data loss resulting from a drive failure can be prevented by reconstructing missing data from the remaining drives.

Note: For RAID 0, the missing data resulting from a drive failure cannot be reconstructed.

RAID Level

Your computer must have the minimum number of SATA storage drives installed for the supported level of RAID below:

- RAID 0: striped disk array
 - Consists of at least two SATA storage drives
 - Supported strip size: 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB
 - Better performance without fault tolerance
- RAID 1: mirrored disk array
 - Consists of two SATA storage drives
 - Improved reading performance and 100% redundancy

To install an additional storage drive, refer to “Type-1 storage-drive cage” on page 107.

Configuring the system BIOS to enable SATA RAID functionality

This section describes how to configure the system BIOS to enable SATA RAID functionality.

Note: Use the arrow keys on the keyboard to make selections.

To enable SATA RAID functionality, do the following:

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



2. Select **Devices → ATA Drive Setup** and press Enter.
3. Select **Configure SATA as** and press Enter.
4. Select **RAID** and press Enter.
5. Press F10 or Fn+F10 (depending on the keyboard) to save the new settings and exit the Setup Utility program.

Configuring RAID in UEFI mode

This section provides instructions on how to configure RAID in UEFI mode.

Creating RAID volumes in UEFI mode

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

To create RAID volumes, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Devices → ATA Drive Setup** and press Enter.
3. Select **Intel (R) Rapid Storage Technology** and press Enter.
4. Select **Create RAID Volume** and press Enter.
5. Select **Name** and press Enter. When prompted, type a proper RAID Volume name in the field.
6. Select **RAID Level** and press Enter. When prompted, select a RAID level in the field.
7. Use the arrow keys and the space key to mark individual physical storage drives to be added in the RAID volume.
8. Select **Strip Size** and press Enter. When prompted, select a strip size in the field.
9. Select **Capacity** and type a volume size in the field.
10. Select **Create Volume** and press Enter to initiate volume creation.

Deleting RAID volumes in UEFI mode

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

To delete RAID volumes, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Devices → ATA Drive Setup** and press Enter.
3. Select **Intel (R) Rapid Storage Technology** and press Enter.
4. Select the RAID volume to be deleted and press Enter.
5. Select **Delete** and press Enter.
6. Select **Yes** to confirm the deletion of the selected RAID volume. Deleting a RAID volume will reset the storage drives to non-RAID.

Resetting storage drives to non-RAID in UEFI mode

To reset your storage drives to non-RAID, do the following:

1. Start the Setup Utility program. See "Starting the Setup Utility program" on page 35.
2. Select **Devices → ATA Drive Setup** and press Enter.
3. Select **Intel (R) Rapid Storage Technology** and press Enter.
4. Select the RAID volumes and press Enter to view the detailed information. Select the storage drives you want to reset to non-RAID and then press Enter.

5. Select **Reset to Non-RAID** and press Enter.
6. Select **Yes** to reset the storage drives to non-RAID.

Configuring RAID in legacy mode

This section provides instructions on how to configure RAID in legacy mode.

Creating RAID volumes in legacy mode

To create RAID volumes, do the following:

1. Press Ctrl+I when prompted to enter the Intel (R) Rapid Storage Technology configuration utility during the computer startup.
2. Use the up and down arrow keys to select **Create RAID Volume** and press Enter.
3. Type a proper RAID Volume name in the **Name** field and press Tab.
4. Use the arrow keys to select a RAID level in the **RAID Level** field and press Tab.
5. If appropriate, use the arrow keys to select a Stripe Size in the **Stripe Size** field and press Tab.
6. Type a volume size in the **Capacity** field and press Tab.
7. Press Enter to initiate volume creation.
8. When prompted, press Y to accept the warning message and create the volume.
9. Return to step 2 to create additional RAID volumes, or select **Exit** and press Enter.
10. Press Y when prompted to confirm the exit.

Deleting RAID volumes in legacy mode

To delete RAID volumes, do the following:

1. Press Ctrl+I when prompted to enter the Intel (R) Rapid Storage Technology configuration utility during the computer startup.
2. Use the up and down arrow keys to select **Delete RAID Volume** and press Enter.
3. Use the arrow keys to select the RAID volume to be deleted and press Delete.
4. When prompted, press Y to confirm the deletion of the selected RAID volume. Deleting a RAID volume will reset the storage drives to non-RAID.

Resetting storage drives to non-RAID in legacy mode

To reset your storage drives to non-RAID, do the following:

1. Press Ctrl+I when prompted to enter the Intel (R) Rapid Storage Technology configuration utility during the computer startup.
2. Use the up and down arrow keys to select **Reset Disks to Non-RAID** and press Enter.
3. Use the arrow keys and the space key to mark individual physical storage drives to be reset, and then press Enter to complete the selection.
4. When prompted, press Y to confirm the reset action.

Chapter 6. Troubleshooting, diagnostics, and recovery

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

Basic procedure for resolving computer problems

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

1. Ensure that:
 - a. The cables for all connected devices are connected correctly and securely.
 - b. All connected devices that require ac power are connected to properly grounded, functioning electrical outlets.
 - c. All connected devices are enabled in the BIOS settings of your computer. See "Enabling or disabling a device" on page 35.

If these actions do not resolve your problem, continue with the next step.
2. Use an antivirus program to see if your computer has been infected by a virus. If the program detects a virus, remove the virus. If the antivirus program does not resolve your problem, continue with the next step.
3. Go to "Troubleshooting" on page 45 and follow the instructions for the type of problem you are experiencing. If these troubleshooting instructions do not resolve your problem, continue with the next step.
4. Run the diagnostic program. See "Diagnosing problems" on page 53. If the diagnostic program does not resolve your problem, continue with the next step.
5. Recover your operating system. See "Recovery information" on page 53.
6. If none of these actions solve your problem, contact the Lenovo Customer Support Center. For a list of Lenovo Support phone numbers, go to <https://pcsupport.lenovo.com/supportphonelist>. For more information about help, service, and technical assistance, see Chapter 8 "Getting information, help, and service" on page 125.

Troubleshooting

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

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

Startup problems

Problem	Solution
The computer does not start up when you press the power button.	• Ensure that the power cord is correctly connected to the rear of the computer and to a working electrical outlet. • If the computer has a secondary power switch on the rear of the computer, ensure that it is switched on. • The power indicator on the front of the computer is on. • The computer voltage matches the voltage available at the electrical outlet for your country or region.
The operating system does not start up from the correct storage drive or fails to start up	• Ensure that all storage drive signal cables and power cables are connected correctly. • Ensure that the storage drive the computer starts up from is listed as the first startup device in UEFI BIOS. • In rare cases, the storage drive with the operating system might get corrupted or damaged. In such cases, you might need to replace the storage drive. • If the computer is installed with an Optane memory: – Ensure that the Optane memory is not removed. – Ensure that the Optane memory is not damaged. Check the Optane memory using diagnostic tools.
The computer beeps multiple times before the operating system starts up.	Ensure that no keys are stuck.

Audio problems

Problem	Solution
The audio cannot be heard on the Windows operating system.	- If you are using powered external speakers that have an On/Off control, ensure that: - The On/Off control is set to the On position. - The speaker power cable is connected to a properly grounded, functional ac electrical outlet. - If your external speakers have a volume control, ensure that the volume is not set too low. - Click the volume icon in the Windows notification area on the taskbar. Check the speaker and volume settings. Do not mute the speaker or set the volume at a very low level. - If your computer has a front audio panel, ensure that the volume is not set too low. - Ensure that your external speakers (and headphones, if used) are connected to the correct audio connector on the computer. Most speaker cables are color-coded to match the audio connector. Note: When external-speaker or headphone cables are connected to the audio connector, the internal speaker, if present, is disabled. In most cases, if an audio adapter is installed in one of the expansion slots, the audio function built into the system board is disabled. Therefore, you must use the audio connectors on the audio adapter. - Ensure that the program you are running is designed for use in the Microsoft Windows operating system. If the program is designed to run in DOS, the program does not use the Windows sound feature. The program must be configured to use SoundBlaster Pro or SoundBlaster emulation. - Ensure that the audio device drivers are correctly installed.
The sound does not come from the headset or headphones.	- Exit the application that uses the sound device (for example, Windows Media Player). - Right-click the volume icon in the Windows notification area on the taskbar. - Click Playback devices. - Select the headset or headphones, and then click Set Default. - Click OK.
The sound comes from one of the external speakers.	- Ensure that the speaker cable is inserted completely into the connector on the computer. - Ensure that the cable that connects the left speaker to the right speaker is securely connected. - Ensure that the balance settings are set correctly. - Right-click the volume icon in the Windows notification area on the taskbar. Then, click Open Volume Mixer and select the desired speaker. - Click the speaker icon on top of the volume control, and then click the Levels tab.

Network problems

Note: The Wi-Fi and Bluetooth features are optional.

Problem	Solution
The computer cannot connect to an Ethernet LAN.	• Connect the cable from the Ethernet connector to the RJ45 connector of the hub. • Enable the Ethernet LAN feature in UEFI BIOS. • Enable the Ethernet LAN adapter. 1. Go to Control Panel and view by large icons or small icons. 2. Click Network and Sharing Center → Change adapter settings. 3. Right-click the Ethernet LAN adapter icon and click Enable. • Update or reinstall the Ethernet LAN driver. • Install all networking software that is necessary for your network environment. Check with your LAN administrator for the necessary networking software. • Set the same duplex for the switch port and the adapter. If you configured the adapter for full duplex, ensure that the switch port is also configured for full duplex. Setting a wrong duplex mode might degrade performance, cause data loss, or result in lost connections.
When a Gigabit Ethernet model computer is used at a speed of 1000 Mbps, the Ethernet LAN connection fails or errors occur.	Connect the network cable to the Ethernet connector using Category 5 wiring and a 100 BASE-T hub/switch (not 100 BASE-X).
The Wake On LAN (WOL) feature does not work.	Enable the Wake On LAN feature in UEFI BIOS.
The Wi-Fi feature does not work.	• Enable the Wi-Fi feature in UEFI BIOS. • Enable all Wi-Fi devices. 1. Right-click the Start button to open the Start context menu. 2. Click Device Manager. Type the administrator password or provide confirmation, if prompted. 3. Expand Network adapters to display all network devices. 4. Right-click each Wi-Fi device, and then click Enable device. • Enable the Wi-Fi feature in Windows Settings. 1. Open the Start menu. 2. Click Settings → Network & Internet → Wi-Fi. 3. Enable the Wi-Fi feature. • Update or reinstall the Wi-Fi driver.

Problem	Solution
The Bluetooth feature does not work.	• Enable the Bluetooth feature in UEFI BIOS. • Enable all Bluetooth devices. 1. Right-click the Start button to open the Start context menu. 2. Click Device Manager. Type the administrator password or provide confirmation if prompted. 3. Expand Bluetooth to display all Bluetooth devices. Right-click each Bluetooth device, and then click Enable device. 4. Expand Network adapters to display all network devices. Right-click each Bluetooth device, and then click Enable device. • Turn on the Bluetooth radio. 1. Open the Start menu. 2. Click Settings → Devices → Bluetooth & other devices. 3. Turn on the Bluetooth switch to enable the Bluetooth feature. • Update or reinstall the Bluetooth driver.
Sound does not come from the Bluetooth headset or headphones.	1. Exit the application that uses the sound device (for example, Windows Media Player). 2. Right-click the volume icon in the Windows notification area on the taskbar. 3. Click Playback devices. 4. If you are using the headset profile, select Bluetooth Hands-free Audio, and then click Set Default. If you are using the AV profile, select Stereo Audio, and then click Set Default. 5. Click OK.

Performance problems

Problem	Solution
Excessive fragmented files exist on the storage drives.	Note: Depending on the volume of the storage drives and amount of data stored on the storage drives, the disk-defragmentation process might take up to several hours. 1. Close any open programs and windows. 2. Open the Start menu. 3. Click Windows System → File Explorer → This PC. 4. Right-click your C drive and then click Properties. 5. Click the Tools tab. 6. Click Optimize. Select the drive as desired, and then click Optimize. 7. Follow the on-screen instructions.
The free storage drive space is insufficient.	• Clean out your Inbox, Sent Items, and Deleted Items folders from your e-mail application. • Clean up your C drive. 1. Open the Start menu. 2. Click Windows System → File Explorer → This PC. 3. Right-click your C drive and then click Properties. 4. Check the amount of free space, and then click Disk Cleanup. 5. A list of unnecessary file categories is displayed. Select the category you want to delete, and then click OK. • Disable some Windows features or remove some unnecessary programs. 1. Go to Control Panel and view by large icons or small icons. 2. Click Programs and Features. 3. Do one of the following: – To disable some Windows features, click Turn Windows features on or off. Follow the on-screen instructions. – To remove some unnecessary programs, select the program you want to remove, and then click Uninstall/Change or Uninstall.
The free memory space is insufficient.	• Right-click a blank area on the taskbar and open Task Manager. Then, end some tasks you are not performing. • Install additional memory modules.

Storage drive problems

Problem	Solution
Some or all storage drives are missing from the BIOS menu.	• Ensure that the signal cables and power cables for all the storage drives are connected correctly. • Ensure that the computer is configured correctly to support the storage drives. – If the computer is installed with SATA storage drives, ensure that the SATA storage drive enablement module (one to five storage drives) is installed. – If the computer is installed with SAS storage drives, ensure that the SAS storage drive enablement module (one to five storage drives) or the LSI MegaRAID SAS adapter is installed.

CD or DVD problems

Problem	Solution
A CD or DVD does not work.	• Ensure that the optical drive supports the CD or DVD. • Ensure that the disc is inserted correctly, with its label up. • Ensure that the disc you are using is clean. To remove dust or fingerprints, wipe the disc clean with a soft cloth from the center to the outside. Wiping a disc in a circular motion might cause loss of data. • Ensure that the power cable and signal cable are securely connected to the drive. • Ensure that the disc you are using is not scratched or damaged. Try inserting another disc that you know works. • If you have multiple CD or DVD drives installed (or a combination of CD and DVD drives), try inserting the disc into the other drive. In some cases, only one of the drives is connected to the audio subsystem.
A bootable recovery medium, such as the Product Recovery CD, cannot be used to start your computer.	Ensure that the CD or DVD drive is set as the top priority of the boot priority order in UEFI BIOS. Note: On some computer models, the startup sequence is permanently set and cannot be changed.
A black screen is displayed instead of the DVD video.	• Restart the DVD player program. • Try a lower screen resolution or color depth. • Close any open files, and then restart the computer.
A DVD movie does not play.	• Ensure that the disc surface is clean and not scratched. • Check the disc or package for regional coding. You might need to purchase a disc with coding for the region where you are using the computer.
No audio or only an intermittent audio comes out while a DVD movie is playing.	• Check the volume control settings on the computer and on your speakers. • Ensure that the disc surface is clean and not scratched. • Check all cable connections to and from the speakers. • Use the DVD menu for the video to select a different audio track.

Problem	Solution
The playback is slow or choppy.	• Disable any background programs, such as AntiVirus or Desktop Themes. • Ensure that video resolution is less than 1152 x 864 pixels.
A message indicating invalid disc or no disc found is displayed.	• Ensure that the disc is in the drive with the shiny side of the disc facing down. • Ensure that video resolution is less than 1152 x 864 pixels. • Ensure that the DVD or CD is inserted into an appropriate optical drive. For example, do not insert a DVD into a CD-only drive.

Serial connector problems

Problem	Solution
The serial connector cannot be accessed.	• Connect the serial cable from the serial connector on the computer to the serial device. If the serial device has its own power cord, connect the power cord to a grounded electrical outlet. • Turn on the serial device and keep the device online. • Install any programs supplied with the serial device. Refer to the documentation that comes with the serial device for more information. • If you added one serial-connector adapter, ensure that the adapter is installed correctly.

USB device problems

A USB device cannot be accessed.

Solutions:

- Connect the USB cable from the USB connector to the USB device. If the USB device has its own power cord, connect the power cord to a grounded electrical outlet.
- Turn on the USB device and keep the device online.
- Install any device drivers or programs supplied with the USB device. Refer to the documentation that comes with the USB device for more information.
- Disconnect and reconnect the USB connector to reset the USB device.
- Ensure that the Smart USB Protection function is disabled. To configure the Smart USB Protection function, see "Using the Smart USB Protection function" on page 34.

Software problems

Problem	Solution
Some programs do not work as expected.	1. Check whether the problem is caused by a program. a. Ensure that the software is compatible with the computer. Refer to the information supplied with the software for more information. b. Verify that other software works correctly on the computer. c. Verify that the software you are using works on another computer. 2. If the problem is caused by a program: • Refer to the printed documentation that comes with the program or the help system of the program. • Update the program. • Uninstall the program and then reinstall it. To download a program that is preinstalled on your computer, go to https://support.lenovo.com and follow the on-screen instructions.

Diagnosing problems

Many computer problems can be solved without outside assistance. If you experience a problem with your computer, the first place to start is the troubleshooting information in your computer documentation. If you suspect a software problem, see the documentation, including readme files and help information systems, that come with the operating system or program. ThinkStation computers come with the Lenovo Vantage program that you can use to help you identify hardware problems.

Diagnosing problems with Lenovo Vantage

Lenovo Vantage is preinstalled on your computer and is ready to run.

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

Lenovo Vantage supports the hardware scan function. It combines diagnostic tests, system information collection, security status, and support information, along with hints and tips for optimal system performance.

The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. You can get the latest technical information and download device drivers and updates from the Lenovo Support Web site at: <https://support.lenovo.com>

Recovery information

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

Note: If a device does not work correctly after recovering the operating system, update the device driver. See "Keeping your computer current" on page 24.

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

- Use Windows recovery solutions.

- Use recovery solutions in Windows Settings.
 1. Click the Start button to open the Start menu.
 2. Click **Settings → Update & Security → Recovery**.
 3. Follow the instructions on the screen to choose the appropriate recovery solution.
- Use System Restore to restore system files and settings to an earlier point.
 1. Click the Start button to open the Start menu.
 2. Click **Windows System → Control Panel**.
 3. View Control Panel by Large icons or Small icons, and then click **Recovery → Open System Restore**.
 4. Follow the instructions on the screen.
- Use the File History tool to restore your files from a backup.

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

1. Click the Start button to open the Start menu.
 2. Click **Windows System → Control Panel**.
 3. View Control Panel by Large icons or Small icons, and then click **File History → Restore personal files**.
 4. Follow the instructions on the screen.
- Use the Windows recovery environment by doing one of the following:
 - After several consecutive failed boot attempts, the Windows recovery environment might start automatically. Follow the instructions on the screen to choose the appropriate recovery solution.
 - Select the recovery medium you created earlier with the Windows tool as the startup device. See "Selecting a temporary startup device" on page 40. Then, follow the instructions on the screen to choose the appropriate recovery solution.
 - Use the recovery USB key provided by Lenovo to restore the entire storage drive to the factory-default settings.
 - If your computer comes with the recovery USB key, follow the instructions shipped with the USB key.
 - If your computer does not come with the recovery USB key, contact the Lenovo Customer Support Center to order a recovery USB key. See "Calling for service" on page 126.

Chapter 7. Hardware removal and installation

This chapter provides instructions on how to remove and install hardware for your computer.

Handling static-sensitive devices

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

When you handle options and other computer components, take these precautions to avoid static-electricity damage:

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

Customer Replaceable Units

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

- **Self-service CRUs:** Refer to parts that can be installed or replaced easily by customer themselves or by trained service technicians at an additional cost.
- **Optional-service CRUs:** Refer to parts that can be installed or replaced by customers with a greater skill level. Trained service technicians can also provide service to install or 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. See your Lenovo Limited Warranty documentation at https://www.lenovo.com/warranty/llw_02 for full details.

For the CRU information of your computer, refer to the following list.

Self-service CRUs

- Computer cover
- Coin-cell battery
- Cover presence switch

- Dust shield (available on some models)
- Flex module (available on some models)
- Flex storage enclosure (available on some models)
- Front-access storage enclosure (available on some models)
- Front bezel
- Keyboard (available on some models)
- M.2 solid-state drive (available on some models)
- Memory module (vary by computer model)
- Mouse (available on some models)
- Plastic holder (available on some models)
- Power cord
- Slim optical drive (available on some models)
- Storage drives (vary by computer model)
- Type-1 storage-drive cage (available on some models)
- Type-2 storage-drive cage (available on some models)

Optional-service CRUs

- Power supply assembly
- Heat-sink-and-fan assembly
- PCIe card (vary by computer model)

Preparing your computer

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

CAUTION:



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

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

1. Remove any media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Unlock any locking device that secures the computer cover. See “Locking your computer” on page 29.
3. If your computer comes with a dust shield, remove the dust shield from the front bezel as shown.

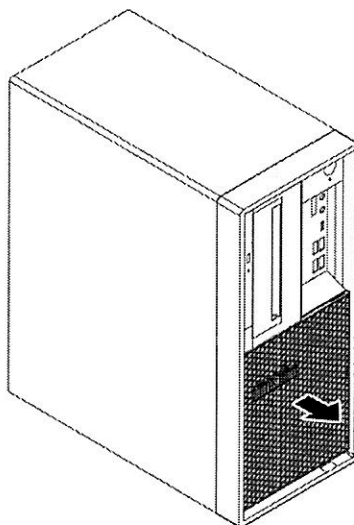


Figure 11. Removing the dust shield

4. Remove the two screws that secure the computer cover. Then, slide the cover to the rear of the computer to remove the cover.

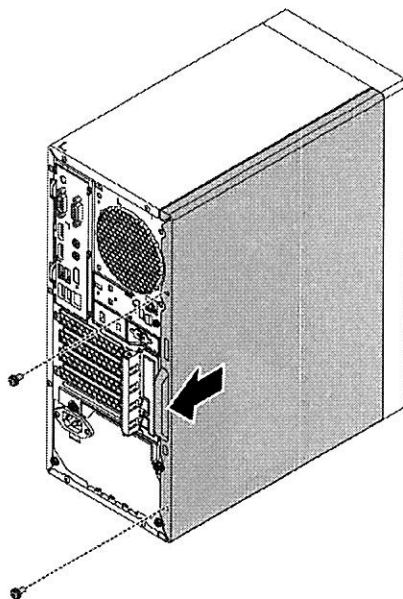


Figure 12. Removing the computer cover

5. Release the three plastic tabs of the front bezel as shown and pivot the front bezel outward to remove it from the computer.

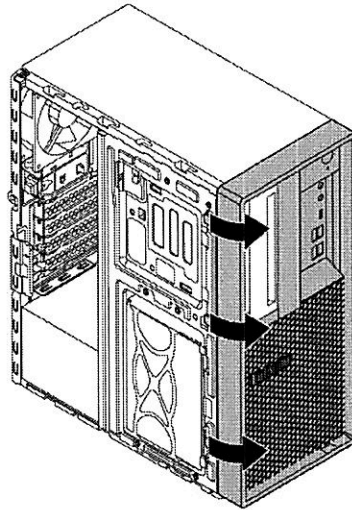


Figure 13. Removing the front bezel

6. Pivot the drive bay assembly outward.

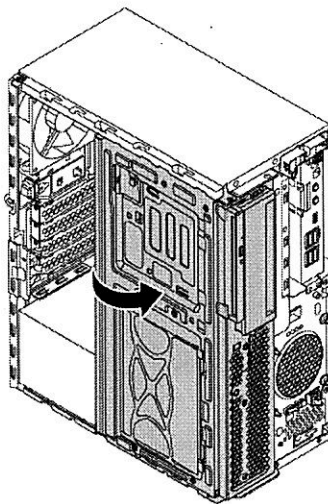


Figure 14. Pivoting the drive bay assembly outward

Notes:

- Depending on your computer model, some of the hardware parts in the removal and installation section might not be available.
- Use computer parts provided only by Lenovo.
- When removing or installing an option, use the appropriate instructions in this section along with the instructions that come with the option.

- In most areas of the world, Lenovo requires the return of the defective CRU. Information about this will come with the CRU or will come a few days after the CRU arrives.

Removing and installing hardware

This section provides instructions on how to remove and install hardware for your computer. You can expand the capabilities of your computer and maintain your computer by removing or installing hardware.

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

External options

You can connect external options to your computer, such as external speakers, a printer, or a scanner. For some external options, you must install additional software in addition to making the physical connection. When installing an external option, see “Hardware locations” on page 1 to identify the required connector. Then, use the instructions that come with the option to help you make the connection and install any software or device drivers that are required for the option.

Slim optical drive

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

To remove or install a slim optical drive, do the following:

1. Prepare your computer. See “Preparing your computer” on page 56.
2. Locate the slim optical drive. See “Computer components” on page 5.
3. To remove the slim optical drive from the drive bay assembly, do the following:
 - a. Disconnect cables from the rear of the slim optical drive.
 - b. Press the release button, and then slide the slim optical drive out of the drive bay assembly.

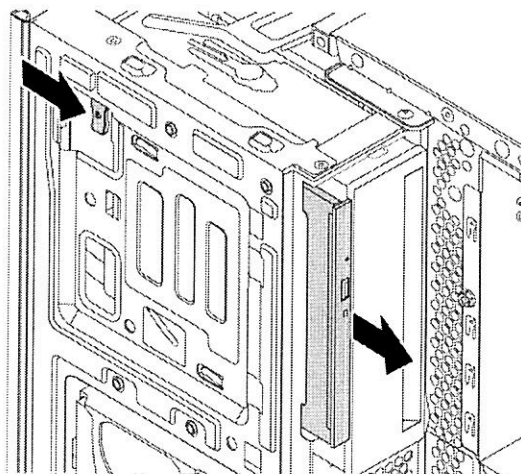


Figure 15. Removing the slim optical drive

- c. Remove the bracket from the slim optical drive.

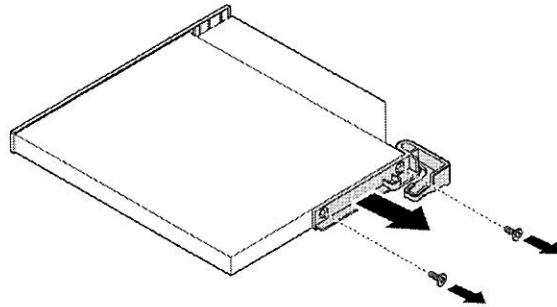


Figure 16. Removing the bracket

- 4. To install a new slim optical drive into the drive bay assembly, do the following:
 - a. If there is a plastic shield installed in the front bezel, remove the plastic shield as shown.

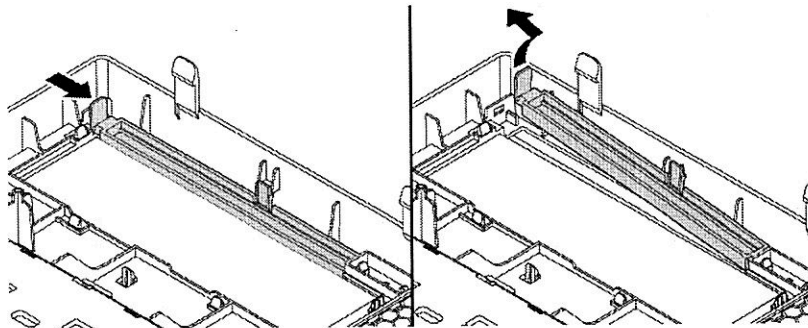


Figure 17. Removing the plastic shield

- b. If there is a metal shield installed in the slim optical drive bay, remove the metal shield as shown.

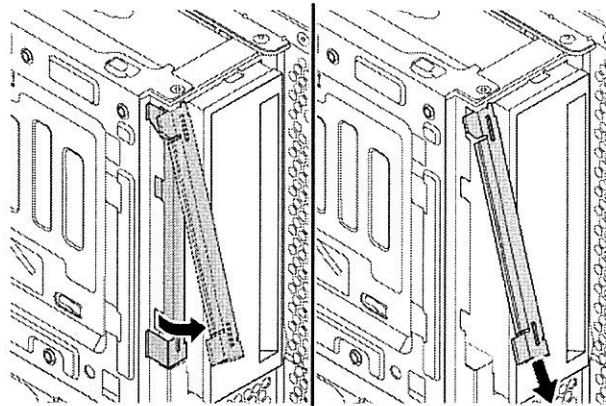


Figure 18. Removing the metal shield

- c. Align the two holes in the bracket with the corresponding holes in the new slim optical drive. Then, install the bracket to the new slim optical drive.

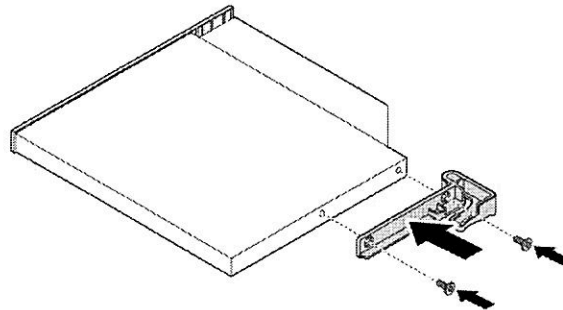


Figure 19. Installing the bracket

- d. Insert the new slim optical drive into the slim optical drive bay until you hear a click. The slim optical drive is secured in place.

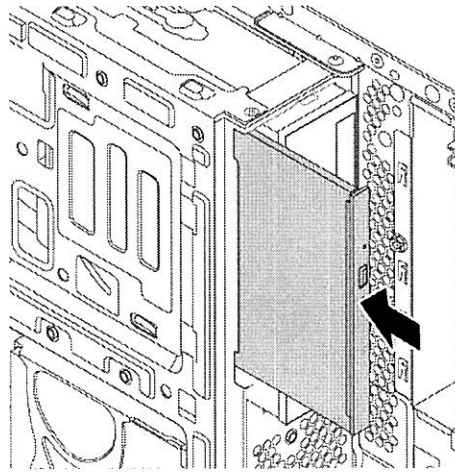


Figure 20. Installing the slim optical drive

- e. Connect the cables to the rear of the new slim optical drive.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 121.

PCIe card

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

Your computer has one PCIe x1 card slot, one PCIe x16 card slot (negotiable link width x4), and one PCIe x16 graphics card slot (graphics card available on some models).

To remove or install a PCIe card, do the following:

1. Prepare your computer. See “Preparing your computer” on page 56.
2. Locate the PCIe card slot. See “Computer components” on page 5.

3. If the PCIe card is held in place by a retaining latch, press the retaining latch **a** as shown to disengage the latch.

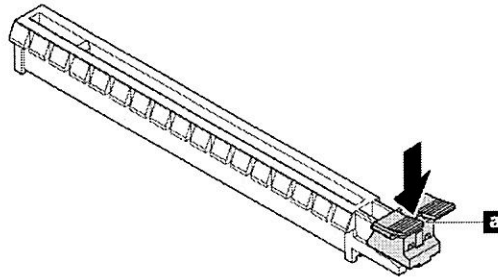


Figure 21. Disengaging the card retaining latch

4. To remove a PCIe card, do the following:
 - a. Rotate the PCIe card retainer to the open position.

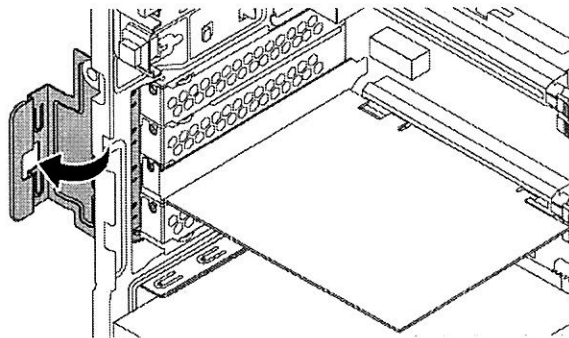


Figure 22. Rotating the PCIe card retainer

- b. Grasp the old card and gently pull it out of the slot.

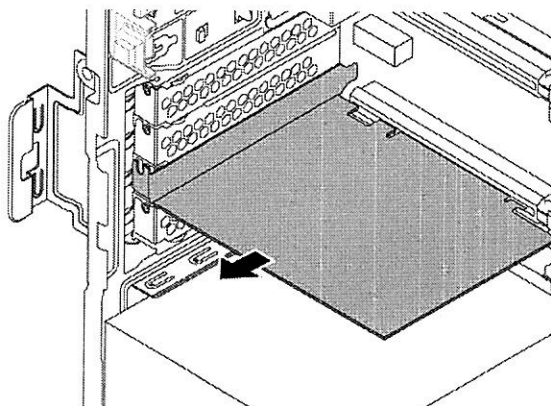


Figure 23. Removing a PCIe card

5. To install a new PCIe card, do the following:
 - a. Remove the new PCIe card from its static-protective package.
 - b. If necessary, remove the appropriate metal slot cover on the rear of the chassis.
 - c. Install the new card into the appropriate slot on the system board. See "Parts on the system board" on page 7.

Note: If you are installing a PCIe x16 graphics card, ensure that the memory-slot retaining clips are closed before you install the card to avoid any interference during the installation.

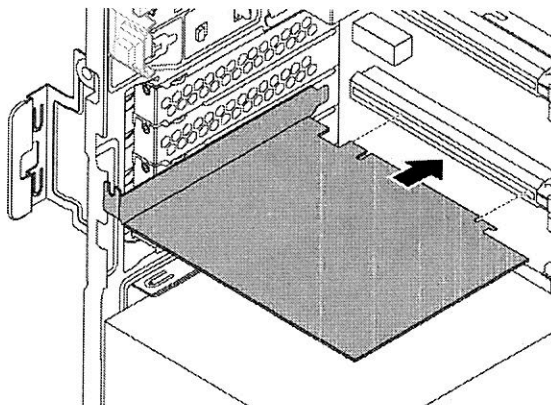


Figure 24. Installing a new PCIe card



d. Rotate the PCIe card retainer to the closed position.

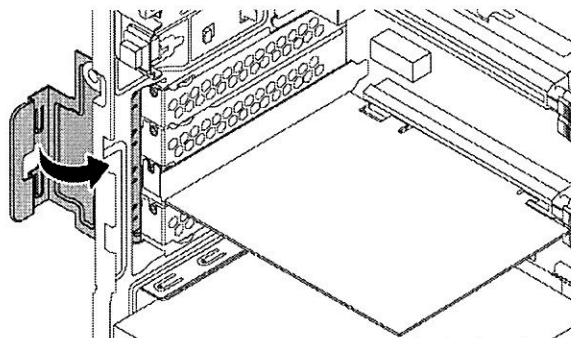


Figure 25. Rotating the PCIe card retainer

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

Full-length PCIe card

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

Your computer has one PCIe x1 card slot, one PCIe x16 card slot (negotiable link width x4), and one PCIe x16 graphics card slot (graphics card available on some models).

To remove or install a full-length PCIe card, do the following:

1. Prepare your computer. See "Preparing your computer" on page 56.
2. Locate the PCIe card slot. See "Computer components" on page 5.

3. If the PCIe card is held in place by a retaining latch, press the retaining latch **a** as shown to disengage the latch.

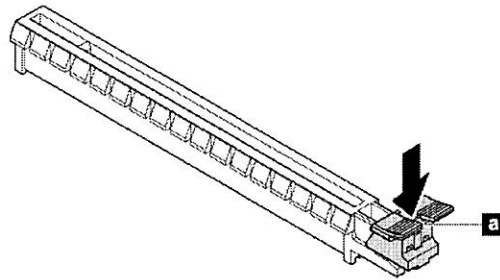


Figure 26. Disengaging the card retaining latch

4. To remove a PCIe card, do the following:
 - a. Rotate the PCIe card retainer to the open position.

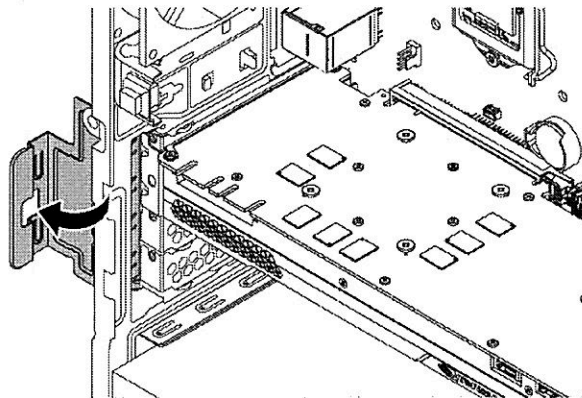


Figure 27. Rotating the PCIe card retainer

- b. Grasp the old card and gently pull it out of the slot.

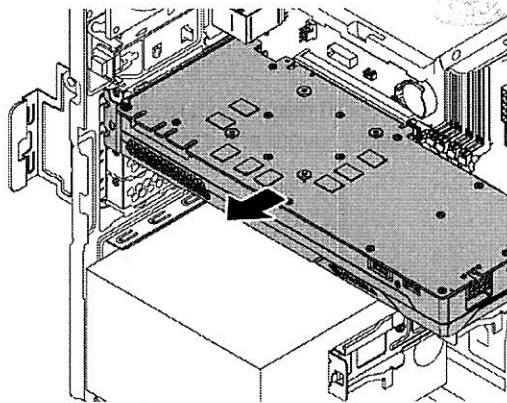


Figure 28. Removing a full-length PCIe card

5. Remove the three screws that secure the bracket to remove it from the PCIe card.

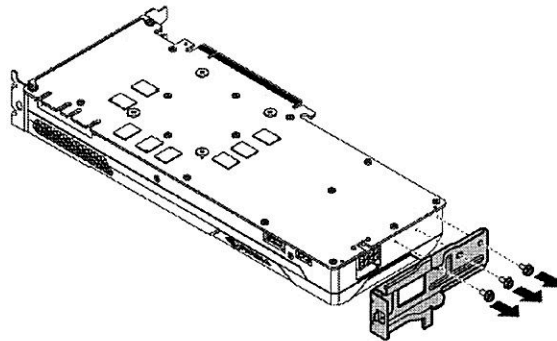


Figure 29. Removing a full-length PCIe card bracket

6. To install a new full-length PCIe card, do the following:
 - a. Remove the new PCIe card from its static-protective package.
 - b. If necessary, remove the appropriate metal slot cover on the rear of the chassis.
 - c. Install the three screws to secure the bracket to the new full-length PCIe card.

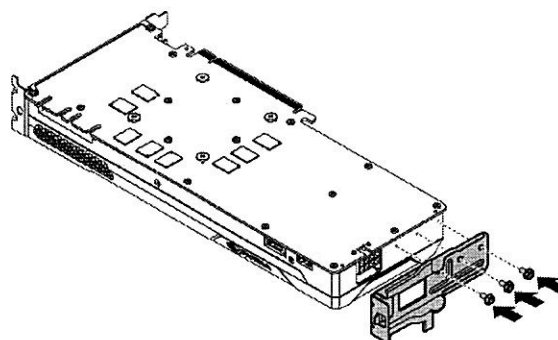


Figure 30. Installing a full-length PCIe card bracket

- d. Install the new card into the appropriate slot on the system board. See “Parts on the system board” on page 7.

Note: If you are installing a PCIe x16 graphics card, ensure that the memory-slot retaining clips are closed before you install the card to avoid any interference during the installation.

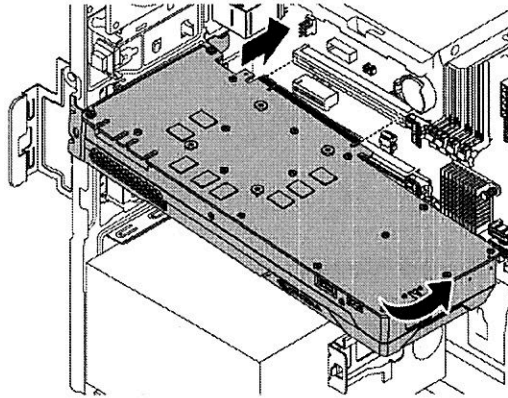


Figure 31. Installing a new full-length PCIe card

- e. Rotate the PCIe card retainer to the closed position.

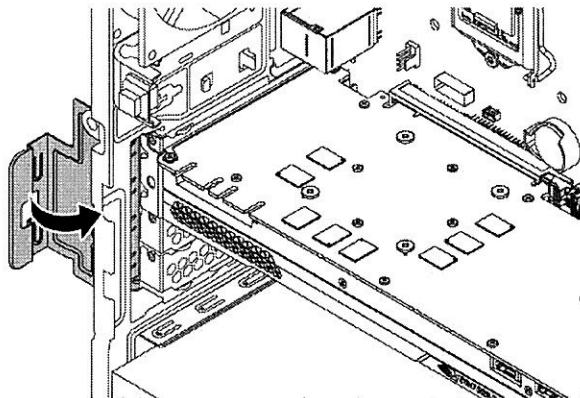


Figure 32. Rotating the PCIe card retainer

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 121.

M.2 solid-state drive

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

The instructions on how to install or replace a M.2 solid-state drive also apply to the Intel Optane memory. Before replacing the Intel Optane memory, ensure that you disable the Intel Optane memory from the Intel Rapid Storage Technology (Intel RST) Console. Otherwise, all data on the storage drive will be lost. For more information, see instructions on <https://www.intel.com/content/www/us/en/support/articles/000023989/memory-and-storage/intel-optane-memory.html>.

An M.2 solid-state drive can be installed on the system board or an M.2 solid-state drive PCIe adapter.

M.2 solid-state drive on the system board

To remove or install an M.2 solid-state drive on the system board, do the following:

1. Prepare your computer. See "Preparing your computer" on page 56.
2. Locate the M.2 solid-state drive slot. See "Parts on the system board" on page 7.
3. Untie the cables that prevent your access to the M.2 solid-state drive slot from the cable clip.
4. To remove an M.2 solid-state drive, do the following:
 - a. Turn the two mounting studs 90-degree counterclockwise to release the heat sink. Then, lift the heat sink off the plastic holder.

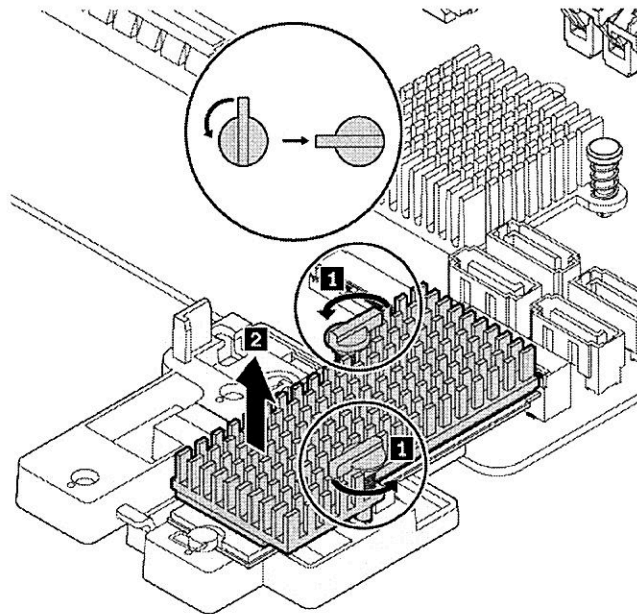


Figure 33. Removing the heat sink from the plastic holder

- b. Pull the handle of the retention latch outward to the open position. The M.2 solid-state drive is released from the secured position and pivots upward. Remove the M.2 solid-state drive out of the slot.

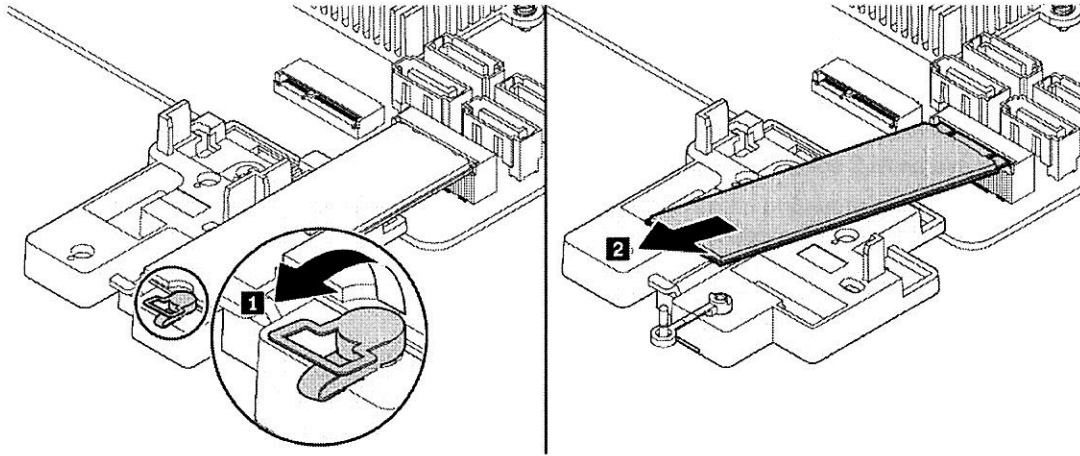


Figure 34. Opening the retention latch and removing the M.2 solid-state drive

5. To install a new M.2 solid-state drive, do the following:
 - a. If necessary, align the four tabs on the rear of the plastic holder with the corresponding holes in the chassis. Then slide the plastic holder toward the system board until it snaps into position.

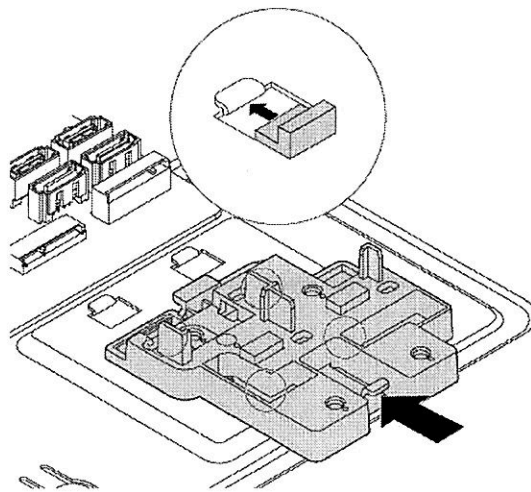


Figure 35. Installing the plastic holder

- b. Locate the hole in the plastic holder to install the retention latch. Align the pin **a** with the corresponding hole **b** in the plastic holder. Then press the retention latch downward into the hole until it snaps into position.

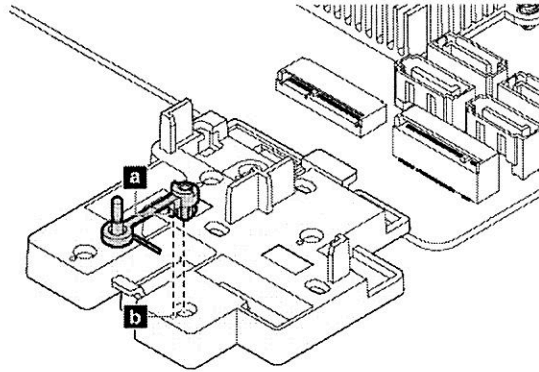


Figure 36. Installing the retention latch

- c. Hold the new M.2 solid-state drive by its edges and ensure that the circuit board side is facing upward. Align the contact edge of the new drive with the key in the corresponding slot. Then carefully insert the new drive into the slot at an angle of about 20 degrees and pivot the new drive downward. Insert the plug of the retention latch into the hole to secure the new drive.

Note: Do not touch the circuit board of the M.2 solid-state drive.

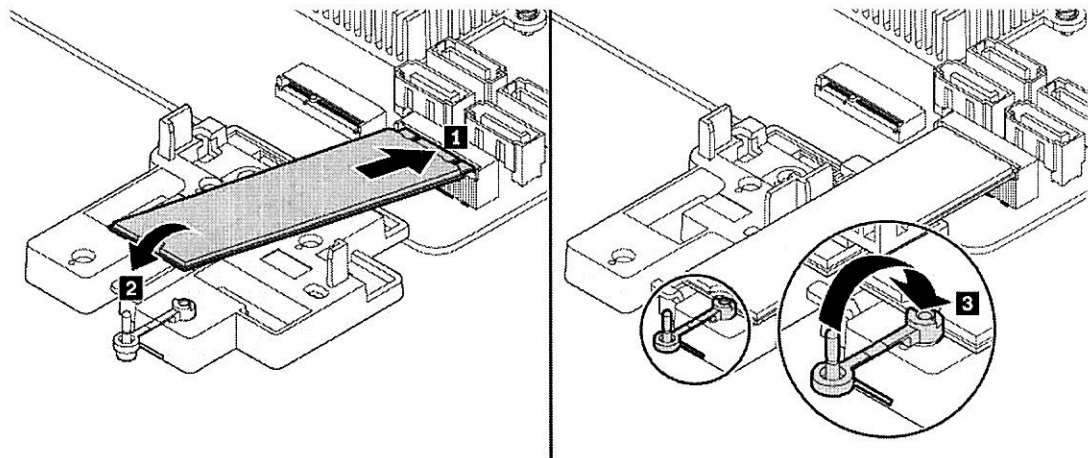


Figure 37. Installing the M.2 solid-state drive

6. If necessary, remove the film that covers the thermal pad at the bottom of the heat sink. Place the heat sink on the M.2 solid-state drive. Ensure that the two mounting studs on the heat sink are in the open position and press the studs on the heat sink into the corresponding holes in the plastic holder as shown. Then, turn the mounting studs 90-degree clockwise to secure the heat sink to the plastic holder.

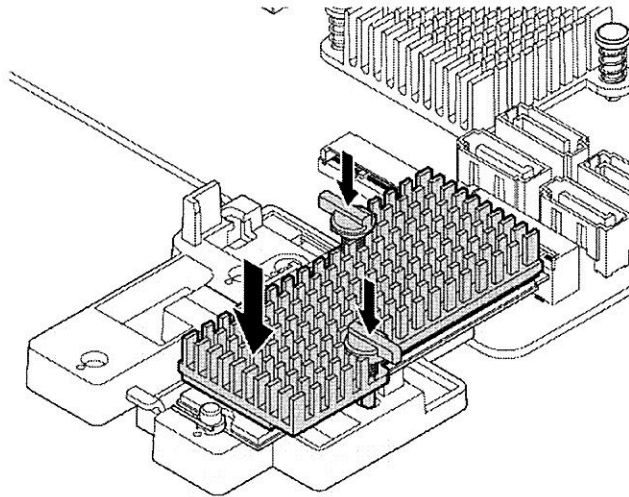


Figure 38. Installing the heat sink onto the plastic holder

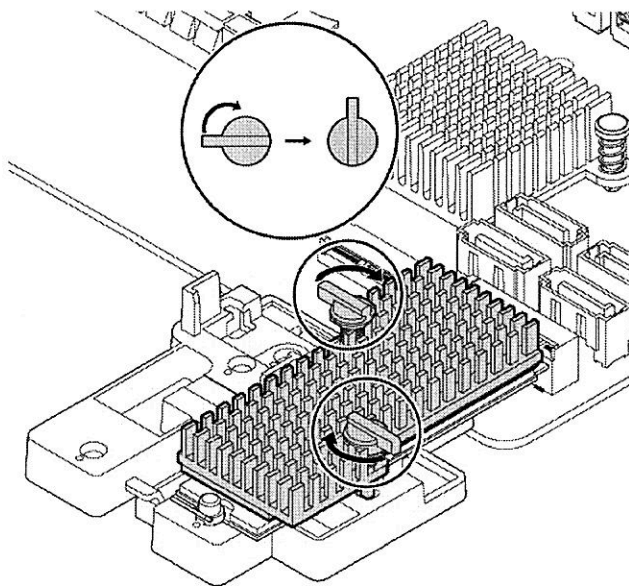


Figure 39. Securing the heat sink to the plastic holder

7. Retie the cables that you have untied with the cable clip.

What to do next:

- To work with another piece of hardware, go to the appropriate section.

- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

M.2 solid-state drive in an M.2 solid-state drive PCIe adapter

To remove or install the M.2 solid-state drive in the M.2 solid-state drive PCIe adapter, do the following:

1. Prepare your computer. See "Preparing your computer" on page 56.
2. To remove the M.2 solid-state drive in the M.2 solid-state drive PCIe adapter, do the following:
 - a. Locate and remove the M.2 solid-state drive adapter from the PCIe card slot. See "PCIe card" on page 62.
 - b. The heat sink is secured by two mounting studs. Pinch the clips of the studs inward **1** and push the studs upward **2** to release the heat sink. Then, lift the heat sink off the M.2 solid-state drive adapter **3**.

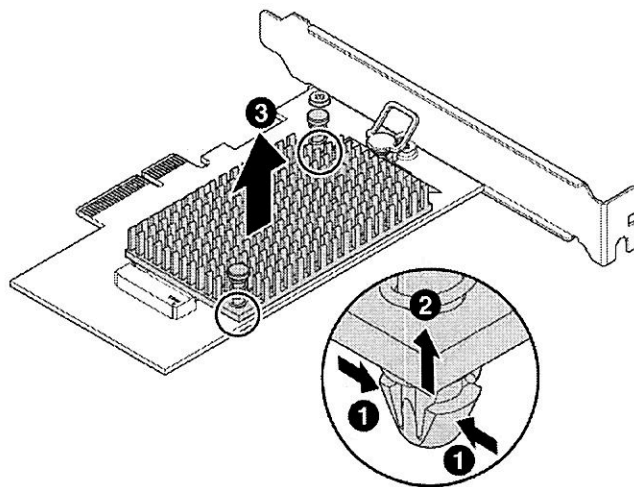


Figure 40. Removing the heat sink from the M.2 solid-state drive adapter

- c. The M.2 solid-state drive is secured by a retention latch. Pull the handle of the retention latch outward to release the M.2 solid-state drive. Then, gently pull the M.2 solid-state drive out of the M.2 slot.

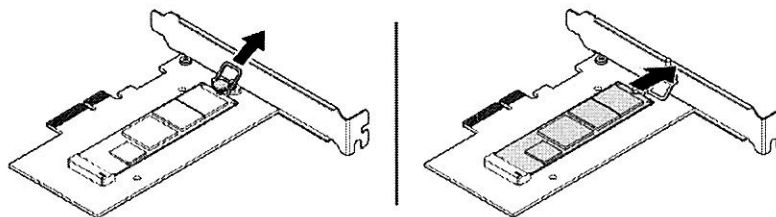


Figure 41. Removing the M.2 solid-state drive

3. To install the M.2 solid-state drive, do the following:

- a. Ensure that a thermal pad is placed in position on the M.2 solid-state drive adapter.

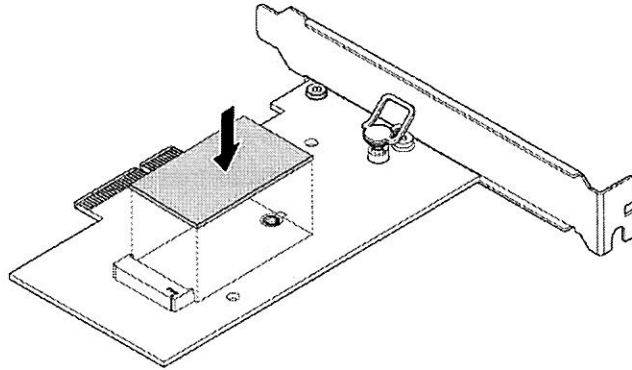


Figure 42. Installing the thermal pad

- b. Pull outward the handle of the retention latch in the M.2 solid-state drive adapter.
- c. Insert the new M.2 solid-state drive into the M.2 slot. Then, insert the plug of the retention latch into the hole to secure the new drive.

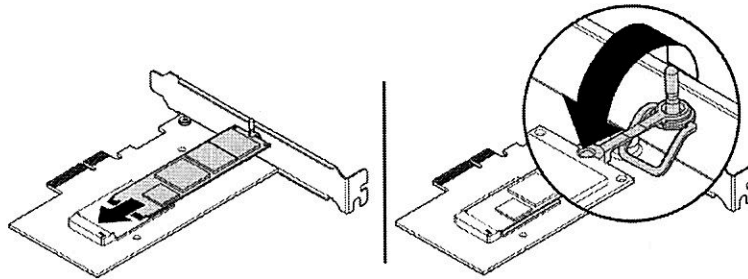


Figure 43. Installing the M.2 solid-state drive

- d. Position the heat sink on the M.2 solid-state drive adapter. Ensure that the two mounting studs in the heat sink are aligned with the holes in the M.2 solid-state drive adapter. Then, push the mounting studs downward to secure the heat sink to the adapter.

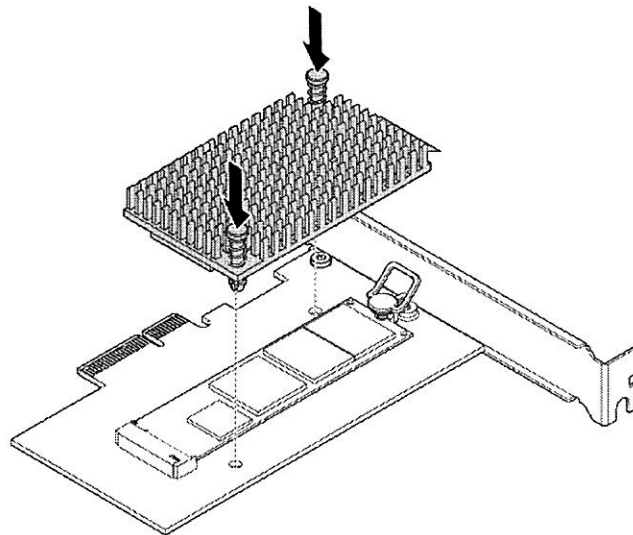


Figure 44. Installing the heat sink

- e. Install the M.2 solid-state drive adapter into the appropriate PCIe card slot on the system board. See "PCIe card" on page 62.

Note: It is recommended that you install the M.2 solid-state drive adapter into the PCIe x16 card slot. See "Parts on the system board" on page 7.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

Memory module

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

Your computer has four memory slots for installing or replacing DDR4 DIMMs. When installing or replacing a memory module, use the following guidelines:

- Use any of DDR4 ECC UDIMMs or DDR4 non-ECC UDIMMs for your computer. Do not install ECC and non-ECC UDIMMs into the same computer.
- Use 4 GB, 8 GB, 16 GB, or 32 GB non-ECC UDIMMs in any combination up to a maximum of 128 GB.
- Use 8 GB or 16 GB ECC UDIMMs in any combination up to a maximum of 64 GB.

Install memory modules in the alphabetic order as shown.

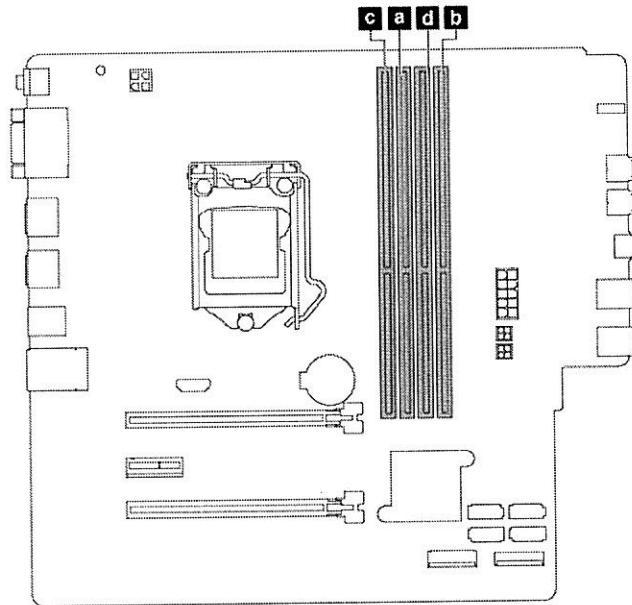


Figure 45. Memory module installation sequence

To install or replace a memory module, do the following:

1. Prepare your computer. See "Preparing your computer" on page 56.
2. Lay the computer on its side for easier access to the system board.
3. Locate the memory slots. See "Parts on the system board" on page 7.
4. Remove any PCIe cards that might prevent your access to the coin-cell battery. See "PCIe card" on page 62.
5. To remove a memory module, open the retaining clips and gently pull the memory module out of the memory slot.

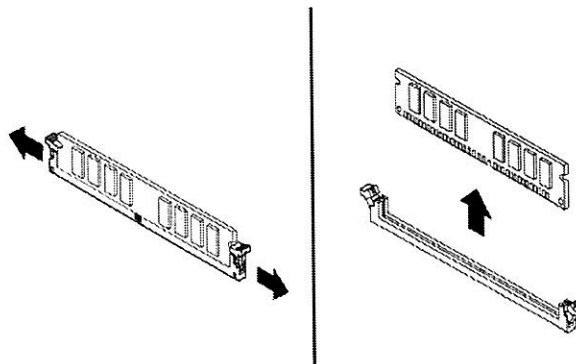


Figure 46. Removing a memory module

6. To install a memory module, do the following:

- a. Open the retaining clips of the memory slot.

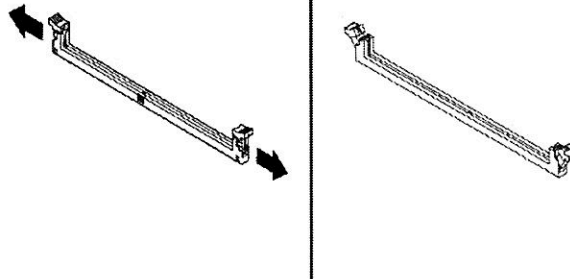


Figure 47. Opening the retaining clips

- b. Position the new memory module over the memory slot. Ensure that the notch **1** on the memory module is aligned with the key **2** in the slot. Push the memory module straight down into the slot until the retaining clips completely close.

Note: Do not touch the circuit board of the memory module.

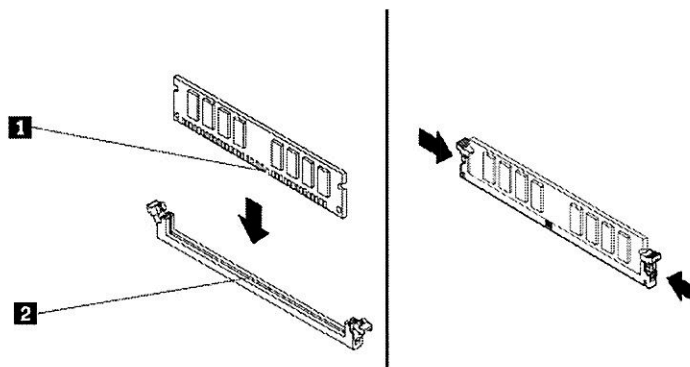


Figure 48. Installing a memory module

7. Reinstall any PCIe cards if you have removed them.

What to do next:

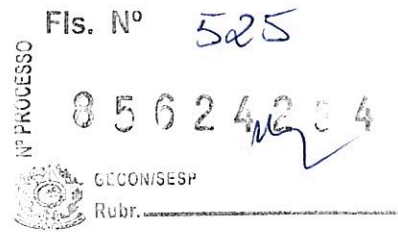
- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

Device in the flex bay

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

Some computer models come with a flex bay. Depending on your computer model, one of the following devices might be installed in the flex bay:

- Flex module
- Flex storage enclosure



- Front-access storage enclosure

Note: The following instructions on how to remove or install a flex storage enclosure also apply to other supported devices in the flex bay.

To remove or install a flex storage enclosure, do the following:

1. Prepare your computer. See “Preparing your computer” on page 56.
2. Locate the flex bay. See “Computer components” on page 5.
3. To remove the flex storage enclosure, do the following:
 - a. Disconnect the signal cable and the power cable from the rear of the flex storage enclosure.

Note: If you are removing other supported devices from the flex bay, disconnect any additional cables first.

- b. Press the tab downward as shown and push the rear of the flex storage enclosure simultaneously to slide it out of the computer.

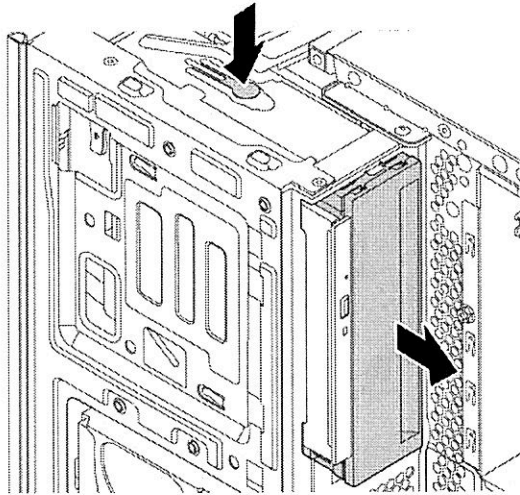


Figure 49. Removing the flex storage enclosure

- c. Remove the retainer from the flex storage enclosure as shown.

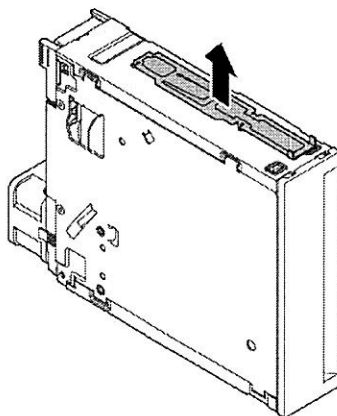


Figure 50. Removing the retainer

4. To install a flex storage enclosure, do the following:
- Install the retainer shipped with the new flex storage enclosure onto the new flex storage enclosure as shown.

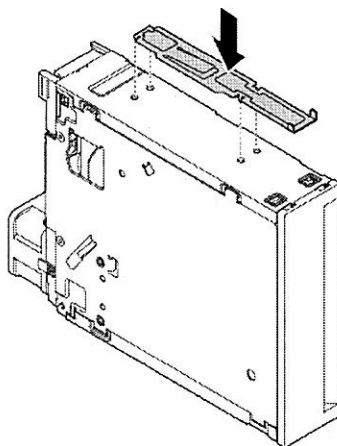


Figure 51. Installing the retainer

- b. Note the orientation of the new flex storage enclosure. Then, slide the flex storage enclosure into the flex bay from the front of the chassis until it snaps into position.

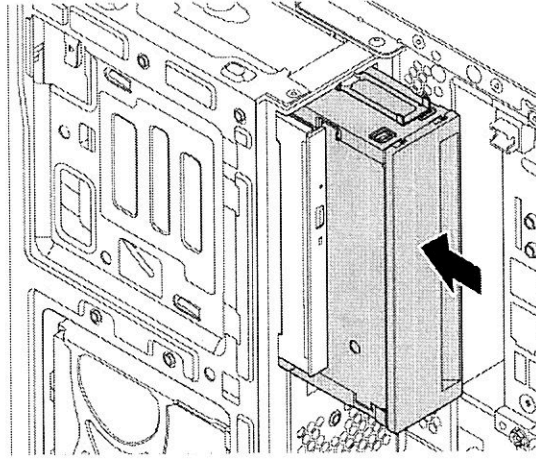


Figure 52. Installing the new flex storage enclosure

- c. Connect the signal cable and the power cable to the new flex storage enclosure.

Note: Reconnect any cables removed from other supported devices.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

Storage drive in the front-access storage enclosure

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

You can install or replace a storage drive in the front-access storage enclosure. The storage drive also can be hot-swappable, which means that you can install or replace the drive without even turning off your computer. Therefore, lock the enclosure cover to prevent the unexpected removal. The keys are attached at the rear of the computer. Store the keys in a secure place.

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

- The eSATA mode of the SATA 4 connector is enabled. See "Parts on the system board" on page 7 for more information.
- The SATA cable of the front-access storage enclosure is connected to the SATA 4 connector on the system board. To verify the cable connection, see "Preparing your computer" on page 56 and "Parts on the system board" on page 7 for more information.
- The operating system of your computer does not reside on the storage drive installed in the front-access storage enclosure.

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

3.5-inch storage drive

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

1. Before removing an old 3.5-inch storage drive, safely eject the old storage drive from the operating system first. For more information, see the Windows help system.
2. Unlock the enclosure cover with the provided key as shown. Press the notch **a** to open the enclosure cover.

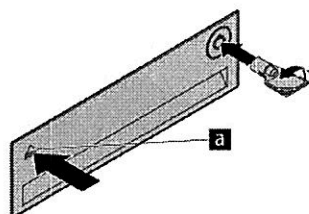


Figure 53. Opening the front-access storage enclosure cover

3. Press the pit on the bracket cover, and then grasp the tilted cover to pull the bracket out of the front-access storage enclosure.

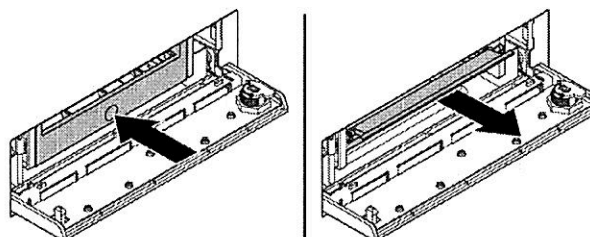


Figure 54. Removing the bracket from the front-access storage enclosure

4. Flex both sides of the bracket to remove the 3.5-inch storage drive from the bracket.

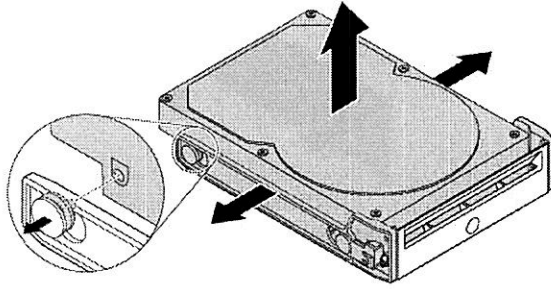


Figure 55. Removing the 3.5-inch storage drive from the bracket

5. To install a new 3.5-inch storage drive into the front-access storage enclosure, do the following:

- a. Flex both sides of the bracket and align pins **1** on the bracket with the corresponding holes in the new 3.5-inch storage drive.

Notes:

- Ensure that the circuit board faces downward and the connectors face toward the rear of the bracket.
- Do not touch the circuit board on the storage drive.

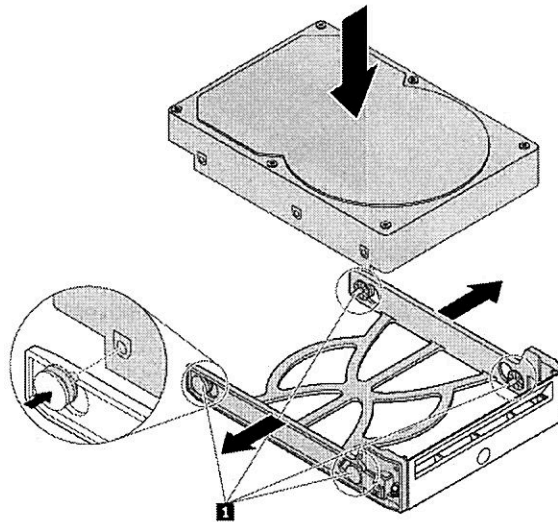


Figure 56. Installing the 3.5-inch storage drive into the bracket

- b. Slide the bracket with the new 3.5-inch storage drive into the front-access storage enclosure until it snaps into position.

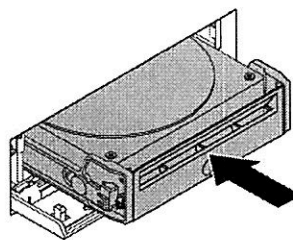


Figure 57. Installing the 3.5-inch storage drive into the front-access storage enclosure

- c. Press the notch to secure the enclosure cover and lock the enclosure cover with the key.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 121.

2.5-inch storage drive

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

1. Before removing an old 2.5-inch storage drive, safely eject the old storage drive from the operating system first. For more information, see the Windows help system.
2. Unlock the enclosure cover with the provided key as shown. Press the notch **a** to open the enclosure cover.

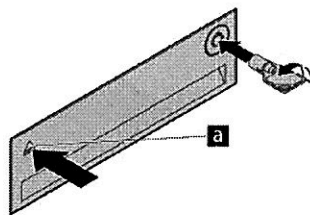


Figure 58. Opening the front-access storage enclosure cover

3. Press the pit on the bracket cover, and then grasp the tilted cover to pull the bracket out of the front-access storage enclosure.

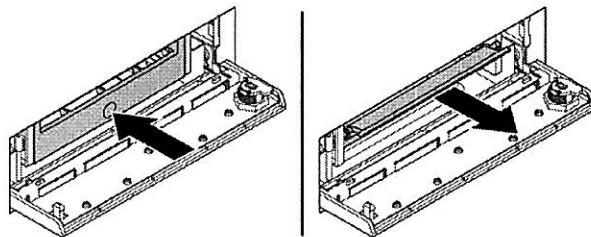


Figure 59. Removing the bracket from the front-access storage enclosure

4. To remove the 2.5-inch storage drive, do the following:
 - a. Flex both sides of the bracket to remove the 2.5-inch storage drive from the bracket.

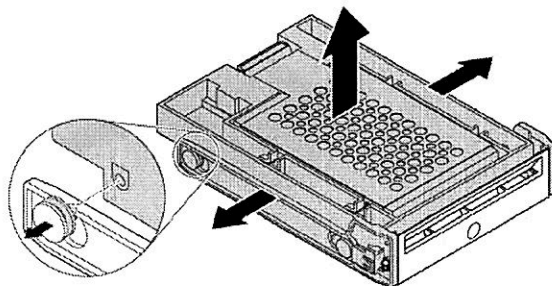


Figure 60. Removing the 2.5-inch storage drive from the bracket

- b. Pivot the tab **1** of the metal adapter upward. Then, push the adapter as shown until the four tabs on the adapter slide into the notches **2**. Pivot the adapter as shown to remove it with the storage drive from the converter.

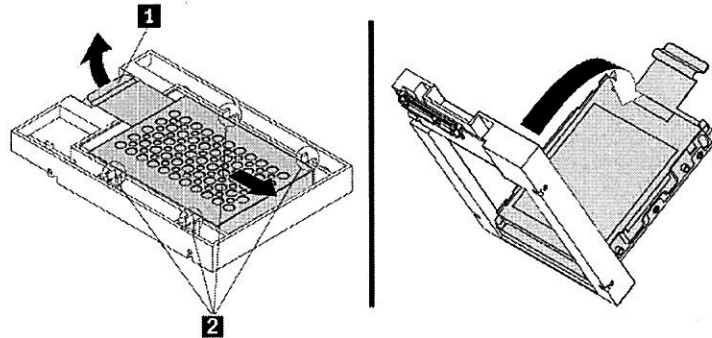


Figure 61. Removing the adapter from the converter

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

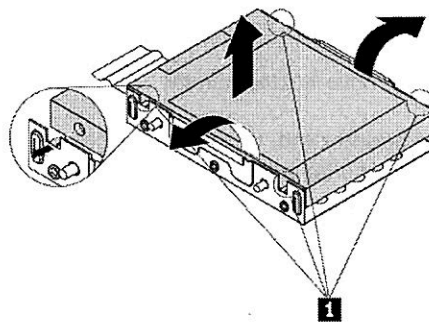


Figure 62. Removing the storage drive from the adapter

5. To install a new 2.5-inch storage drive, do the following:

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

Note: Do not touch the circuit board (if accessible) of the 2.5-inch storage drive.

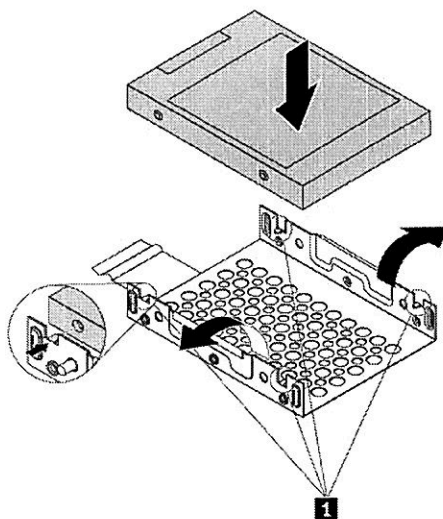


Figure 63. Installing the storage drive into the adapter

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

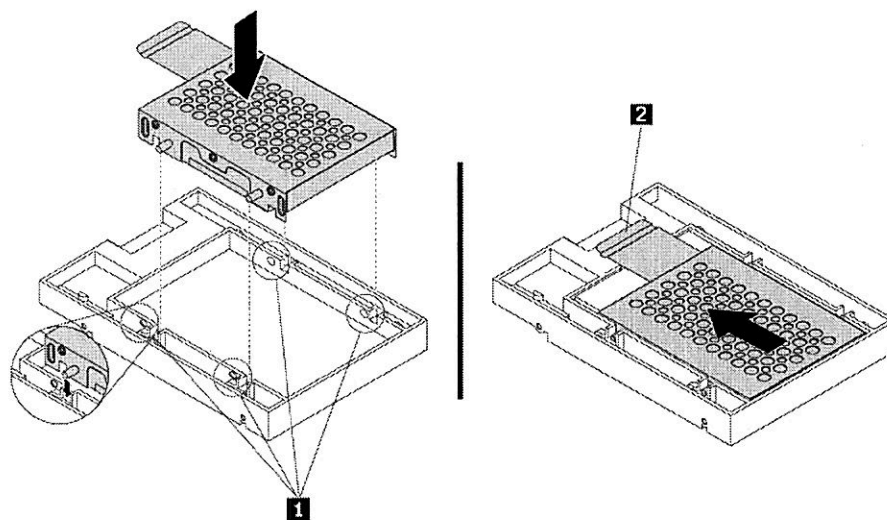


Figure 64. Installing the adapter into the converter

- c. Flex both sides of the plastic bracket and align pins **1** on the plastic bracket with the corresponding holes in the plastic frame of the converter.

Notes:

- Ensure that the circuit board faces downward and the connectors face toward the rear of the bracket.
- Do not touch the circuit board on the storage drive.

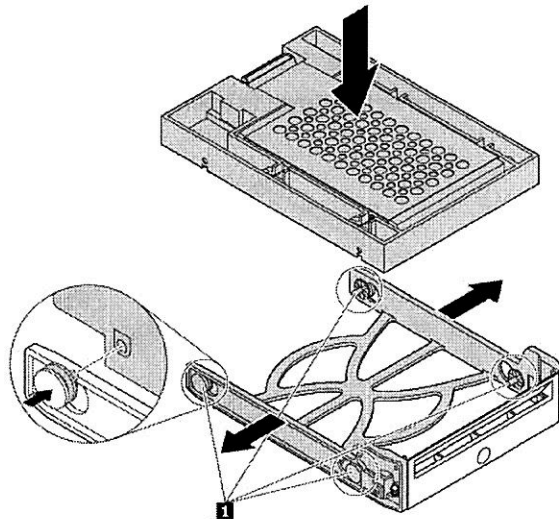


Figure 65. Installing the converter with the 2.5-inch storage drive into the plastic bracket

- d. Slide the plastic bracket with the new 2.5-inch storage drive into the front-access storage enclosure until it snaps into position.

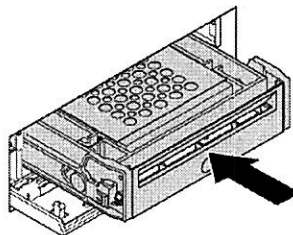


Figure 66. Installing the plastic bracket with the 2.5-inch storage drive into the front-access storage enclosure

- e. Press the notch to secure the enclosure cover and lock the enclosure cover with the key.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

Device in the flex storage enclosure

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

A flex storage enclosure might be equipped with one of the following components:

- 3.5-inch storage drive
- 2.5-inch storage drive

3.5-inch storage drive

To remove or install a 3.5-inch storage drive in the flex storage enclosure, do the following:

1. Prepare your computer. See "Preparing your computer" on page 56.
2. Locate the flex bay. See "Internal storage drives" on page 8.
3. Slide the enclosure out of the chassis. See "Device in the flex bay" on page 77.
4. Pinch the two clips toward each other as shown to open the rear cover of the enclosure.

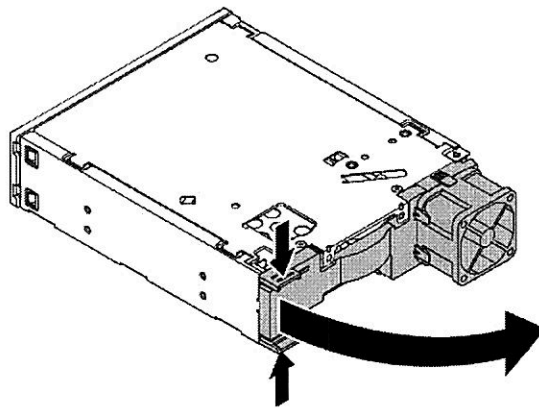


Figure 67. Opening the enclosure from the rear

5. To remove a 3.5-inch storage drive, do the following:
 - a. Slide the 3.5-inch storage drive out of the rear of the enclosure.

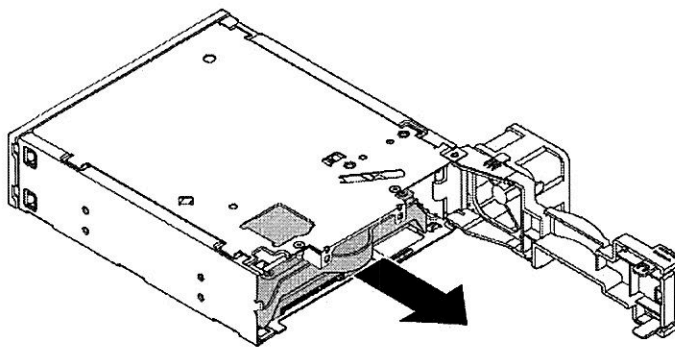


Figure 68. Removing the 3.5-inch storage drive from the rear

- b. Flex two sides of the bracket to remove the 3.5-inch storage drive from the 3.5-inch storage-drive bracket.
6. To install a new 3.5-inch storage drive into the bracket:

- a. Slide the 3.5-inch storage-drive bracket out of the rear of the enclosure.
- b. Flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the 3.5-inch storage drive. Do not touch the circuit board **5** on the 3.5-inch storage drive.

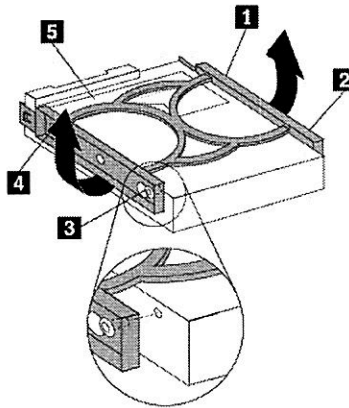


Figure 69. Installing the 3.5-inch storage drive into the bracket

- c. Slide the new 3.5-inch storage drive into the enclosure from the rear until the drive snaps into position.

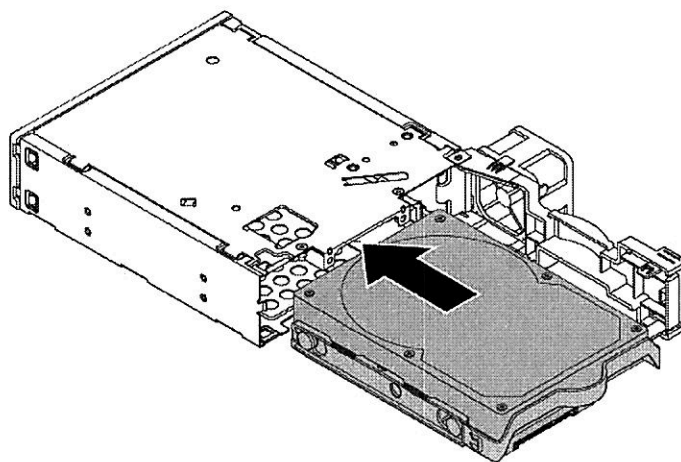


Figure 70. Installing the 3.5-inch storage drive into the enclosure

7. Pivot the rear cover of the enclosure inward until you hear a click. The rear cover is secured in place.

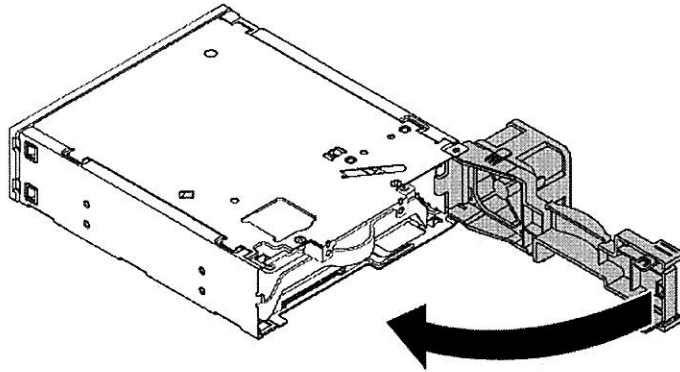


Figure 71. Pivoting the rear cover inward

8. Connect the signal cable and the power cable to the storage drive.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

2.5-inch storage drive

To remove or install a 2.5-inch storage drive with a 2.5-inch to 3.5-inch storage-drive converter (hereafter referred to as storage-drive converter), do the following:

1. Prepare your computer. See "Preparing your computer" on page 56.
2. Locate the flex bay. See "Internal storage drives" on page 8.
3. Slide the enclosure out of the chassis. See "Device in the flex bay" on page 77.
4. Pinch the two clips toward each other as shown to open the rear cover of the enclosure.

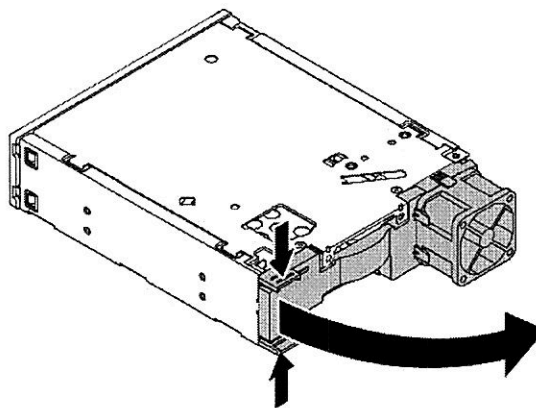


Figure 72. Opening the enclosure from the rear



5. To remove a 2.5-inch storage drive, do the following:
 - a. Slide the 2.5-inch storage drive out of the rear of the enclosure.

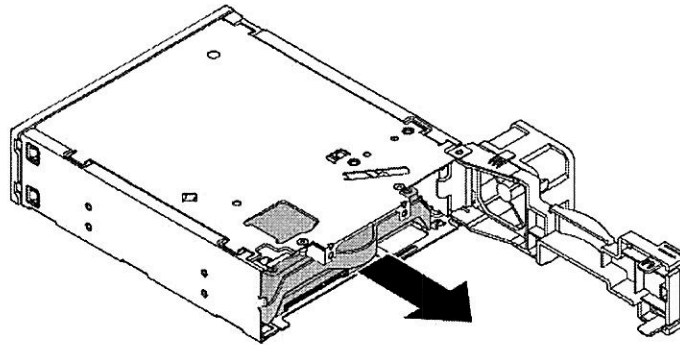


Figure 73. Removing the 2.5-inch storage drive from the rear

- b. Flex the sides of the bracket to remove the storage-drive converter from the 3.5-inch storage-drive bracket.

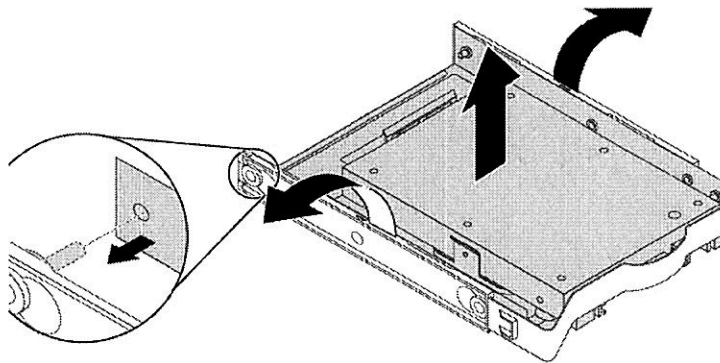


Figure 74. Removing the storage-drive converter from the 3.5-inch storage-drive bracket

- c. Remove the four screws that secure the 2.5-inch storage drive. Then lift the storage drive out of the storage-drive converter.

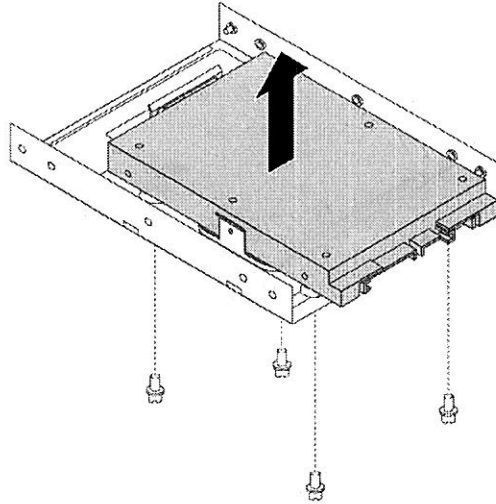


Figure 75. Removing the 2.5-inch storage drive from the storage-drive converter

6. To install a new 2.5-inch storage drive, do the following:
 - a. Slide the 3.5-inch storage-drive bracket out of the rear of the enclosure.
 - b. Flex the sides of the bracket to remove the storage-drive converter from the bracket.

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- c. Install a new 2.5-inch storage drive into the storage-drive converter. Then install the four screws to secure the new storage drive to the storage-drive converter.

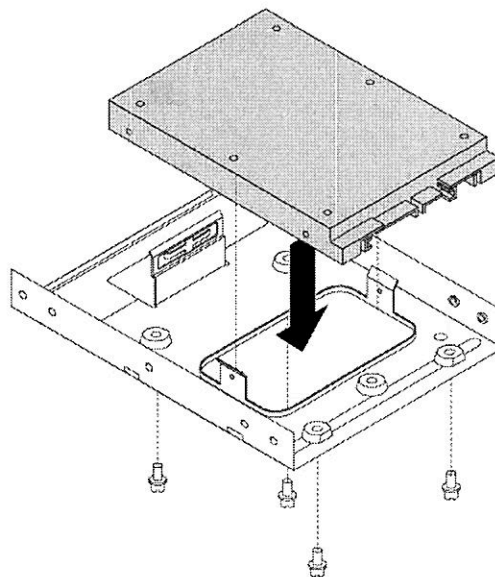


Figure 76. Installing the new solid-state drive into the storage converter

- d. To install the storage-drive converter into the 3.5-inch storage-drive bracket, flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the storage converter.

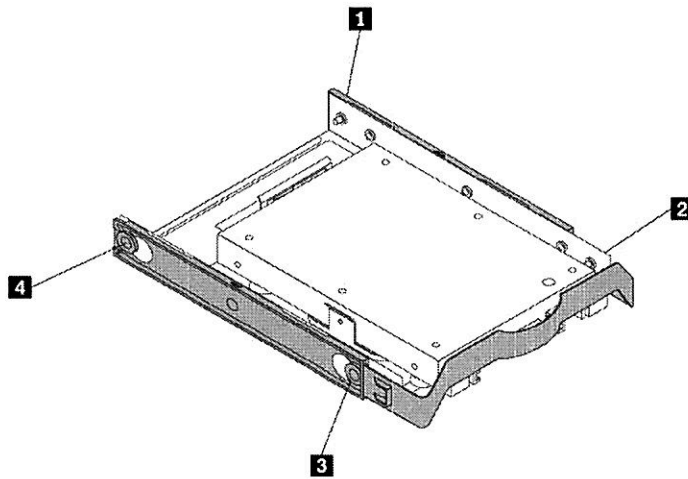


Figure 77. Installing the storage converter together with the solid-state drive into the storage drive bracket

- e. Install the storage converter with the bracket into the enclosure from the rear until the drive snaps into position.

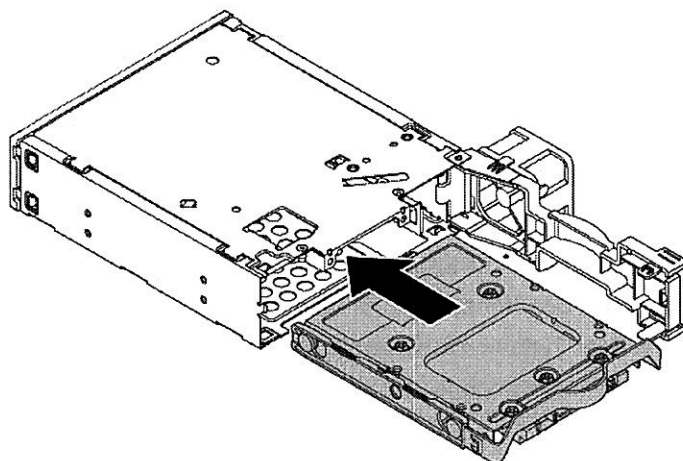


Figure 78. Installing the storage converter with the bracket into the enclosure

7. Pivot the rear cover of the enclosure inward until you hear a click. The rear cover is secured in place.

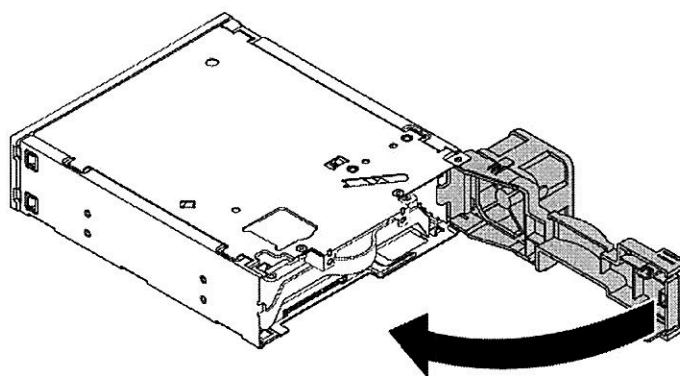


Figure 79. Pivoting the rear cover inward

8. Connect the signal cable and the power cable to the storage drive.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

Coin-cell battery

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

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

The battery normally requires no charging or maintenance throughout its life; however, no battery lasts forever. If the battery fails, the date and time information is lost.

Refer to the “Lithium coin cell battery notice” in the *Safety and Warranty Guide* for information about replacing and disposing of the battery.

To replace the coin-cell battery, do the following:

1. Prepare your computer. See “Preparing your computer” on page 56.
2. Locate the battery. See “Parts on the system board” on page 7.
3. Remove any parts that might impede your access to the battery. Depending on your computer model, you might need to remove the PCI card for easier access to the battery. See “PCIe card” on page 62 or “Full-length PCIe card” on page 65.
4. Remove the old battery.

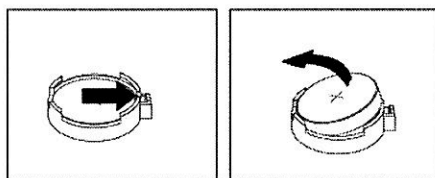


Figure 80. Removing the battery

5. Install a new battery.

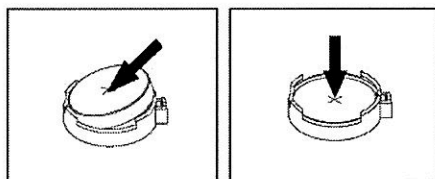


Figure 81. Installing a battery

6. Reinstall the PCI card if you have removed it. See “PCIe card” on page 62 or “Full-length PCIe card” on page 65.
7. Reinstall the computer cover and connect the cables. See “Completing the parts replacement” on page 121.

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

8. Turn on the computer and all attached devices.
9. Use the Setup Utility program to set the date and time. See “Using the Setup Utility program” on page 35.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

Cover presence switch

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

To remove or install the cover presence switch, do the following:

1. Prepare your computer. See "Preparing your computer" on page 56.
2. Locate the cover presence switch. See "Computer components" on page 5.
3. To remove the cover presence switch, do the following:
 - a. Disconnect the cover presence switch cable from the cover presence switch connector on the system board. See "Parts on the system board" on page 7.
 - b. Remove the screw that secures the cover presence switch and remove the cover presence switch from the chassis.

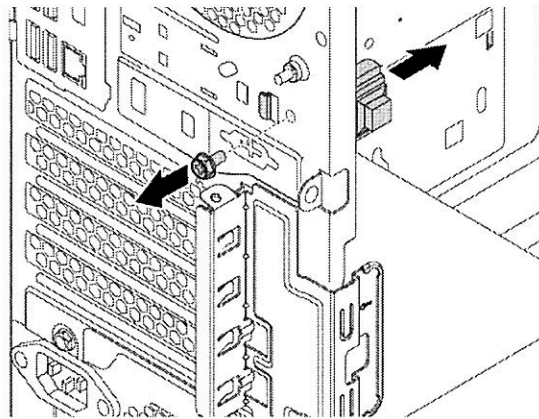


Figure 82. Removing the cover presence switch

4. To install the cover presence switch, do the following:

- a. Align the screw hole in the cover presence switch with the corresponding hole in the chassis. Then install the screw to secure the cover presence switch to the chassis.

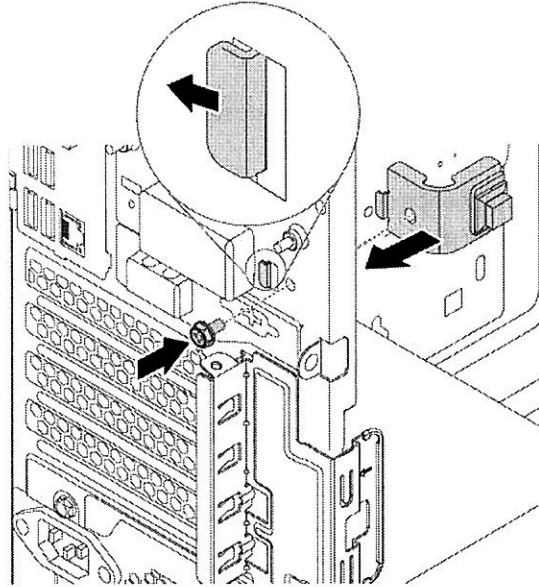


Figure 83. Installing the cover presence switch

- b. Connect the cover presence switch cable to the cover presence switch connector on the system board. See "Parts on the system board" on page 7.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

Power supply assembly

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

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

CAUTION:



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



DANGER



Disconnect all power cords from electrical outlets before removing the computer cover or any part that has the above label attached.

DO NOT disassemble components that have the above label attached. There are no serviceable parts inside these components.

Your product is designed for safe use. However, hazardous voltage, current, and energy levels are present inside any component that has this label attached. Disassembling of these components might cause fire or might even result in death. If you suspect a problem with one of these parts, contact a service technician.

To remove and install the power supply assembly, do the following:

1. Prepare your computer. See "Preparing your computer" on page 56.
2. To remove the power supply assembly, do the following:
 - a. Disconnect the power supply assembly cables from the system board and all drives. See "Parts on the system board" on page 7.
 - b. Release the power supply assembly cables from the cable clips and ties.
 - c. Remove the four screws at the rear of the chassis that secure the power supply assembly. Then slide the power supply assembly to the front of the computer and then lift it out of the chassis.

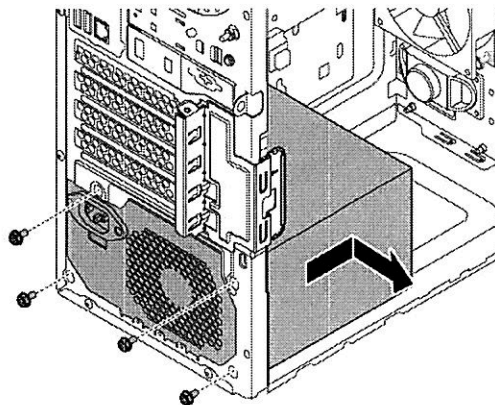


Figure 84. Removing the power supply assembly

3. To install the power supply assembly, do the following:
 - a. Ensure that the new power supply assembly is the correct replacement.
 - b. Install the new power supply assembly into the chassis so that the screw holes in the power supply assembly align with those in the chassis.
 - c. Install and tighten the four screws to secure the power supply assembly.

Note: Use only screws provided by Lenovo.

- d. Connect the power supply assembly cables to the system board and each of the drives.
- e. Secure the power supply assembly cables with the cable clips and ties in the chassis.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

Storage drive in the storage-drive bay

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

Your computer comes with a storage-drive bay for installing or replacing a 3.5-inch storage drive or a 2.5-inch storage drive.

3.5-inch storage drive

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

1. Prepare your computer. See "Preparing your computer" on page 56.
2. Locate the storage-drive bay. See "Computer components" on page 5.
3. To remove the 3.5-inch storage drive, do the following:
 - a. Disconnect the signal cable and the power cable from the storage drive.
 - b. Push the tab of the plastic 3.5-inch storage-drive bracket as shown and pull the tab outward to remove the storage drive from the storage-drive bay.

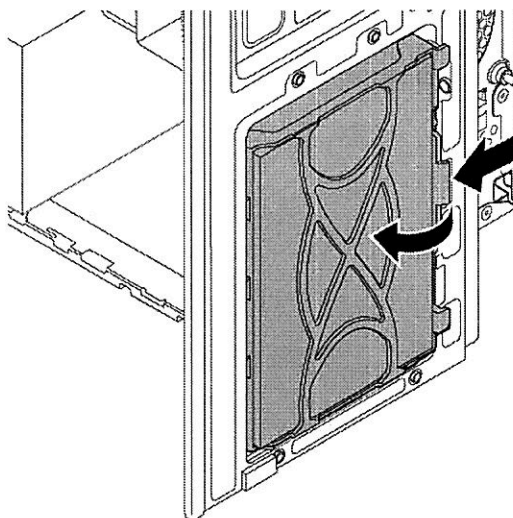


Figure 85. Removing the storage drive

- c. Flex the sides of the bracket to remove the storage drive from the bracket.
4. To install the 3.5-inch storage drive, do the following:
 - a. Pull the handle of the plastic 3.5-inch storage-drive bracket to remove it from the storage-drive bay.

- b. To install a new storage drive into the bracket, flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the storage drive. Do not touch the circuit board **5** on the storage drive.

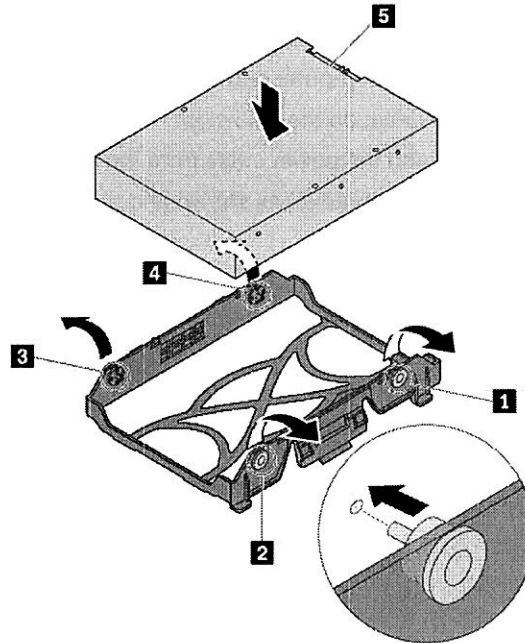


Figure 86. Installing the storage drive into the bracket

- c. Align the three plastic tabs on the left side of the storage drive with the corresponding holes in the drive bay assembly. Then pivot the storage drive inward until it snaps into position.

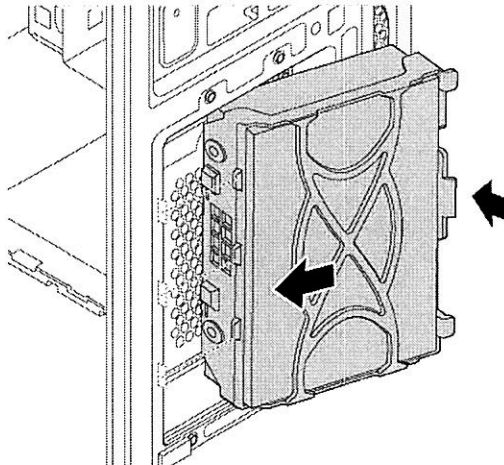


Figure 87. Installing the storage-drive

- d. Connect the signal cable and the power cable to the new storage drive.

What to do next:

- To work with another piece of hardware, go to the appropriate section.

- To complete the installation or replacement, go to “Completing the parts replacement” on page 121.

2.5-inch storage drive

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

1. Prepare your computer. See “Preparing your computer” on page 56.
2. Locate the storage-drive bay. See “Computer components” on page 5.
3. To remove the 2.5-inch storage drive, do the following:
 - a. Disconnect the signal cable and the power cable from the storage drive.
 - b. Push the tab of the storage-drive bracket as shown and pull the tab outward to remove the storage drive from the storage-drive bay.

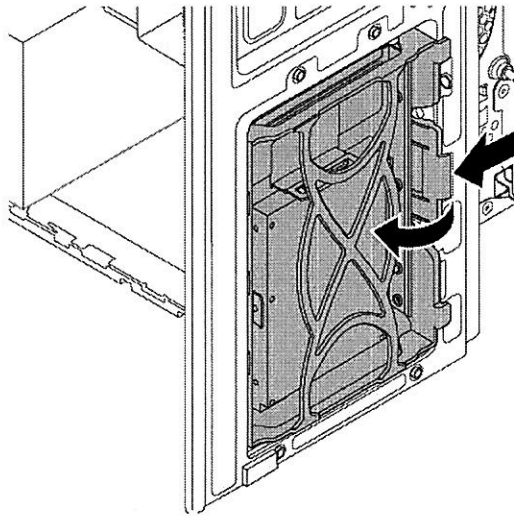


Figure 88. Removing the 2.5-inch storage drive with 3.5-inch storage-drive bracket

- c. Flex the sides of the bracket to remove the storage-drive converter from the 3.5-inch storage-drive bracket.

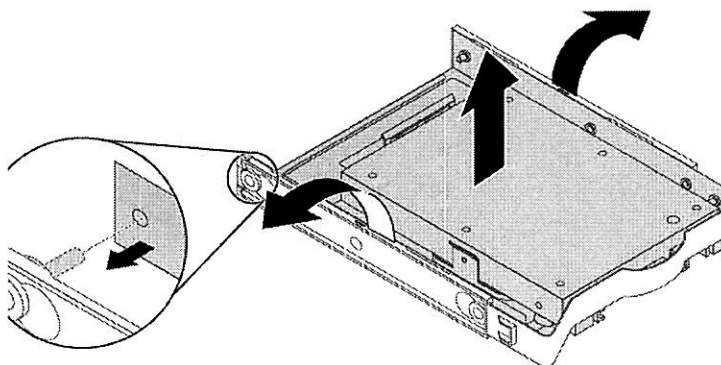


Figure 89. Removing the storage-drive converter from the 3.5-inch storage-drive bracket

- d. Remove the four screws that secure the 2.5-inch storage drive. Then lift the storage drive out of the storage-drive converter.

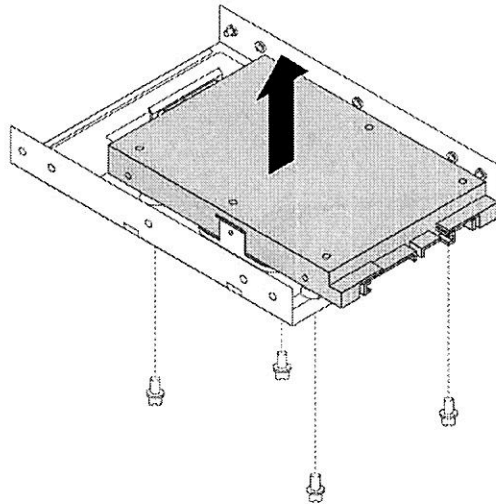


Figure 90. Removing the 2.5-inch storage drive from the storage-drive converter

4. To install the 2.5-inch storage drive, do the following:
 - a. Pull the handle of the plastic 3.5-inch storage-drive bracket to remove it from the storage-drive bay.



- b. Install a new 2.5-inch storage drive into the storage-drive converter. Then install the four screws to secure the new storage drive to the storage-drive converter.

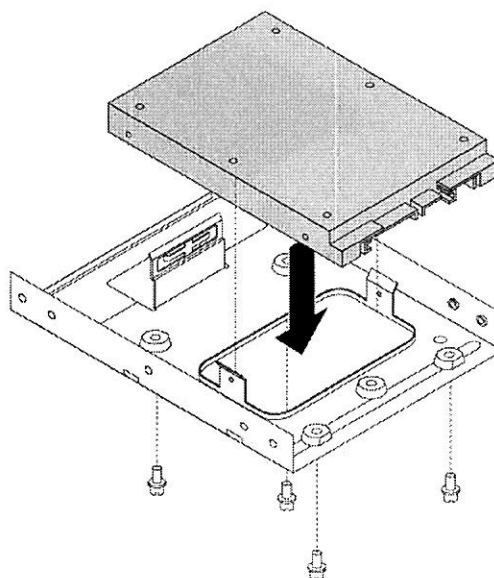


Figure 91. Installing the new 2.5-inch storage drive into the storage-drive converter

- c. To install a new 2.5-inch storage drive into the bracket, flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the storage drive. Do not touch the circuit board **5** on the storage drive.

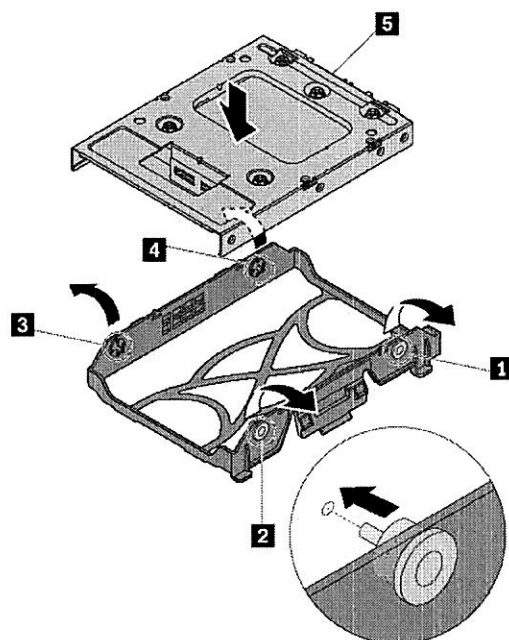


Figure 92. Installing the 2.5-inch storage drive with the storage-drive converter into the bracket

- d. Align the three plastic tabs on the left side of the storage drive with the corresponding holes in the drive bay assembly. Then pivot the storage drive inward until it snaps into position.

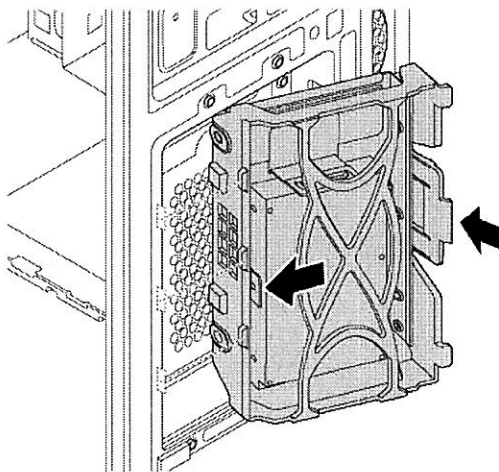


Figure 93. Installing the 2.5-inch storage drive

- e. Connect the signal cable and the power cable to the new storage drive.

What to do next:

- To work with another piece of hardware, go to the appropriate section.

- To complete the installation or replacement, go to “Completing the parts replacement” on page 121.

Type-1 storage-drive cage

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

Some computer models come with a type-1 storage-drive cage for installing or replacing a 3.5-inch storage drive or a 2.5-inch storage drive.

3.5-inch storage drive

To remove or install a 3.5-inch storage drive in the type-1 storage-drive cage, do the following:

1. Prepare your computer. See “Preparing your computer” on page 56.
2. Locate the type-1 storage-drive cage. See “Computer components” on page 5.
3. To remove a 3.5-inch storage drive in the type-1 storage-drive cage, do the following:
 - a. Disconnect the signal cable and the power cable from the storage drive.
 - b. Remove the screw and slide the type-1 storage-drive cage downward to release it from the drive bay assembly.

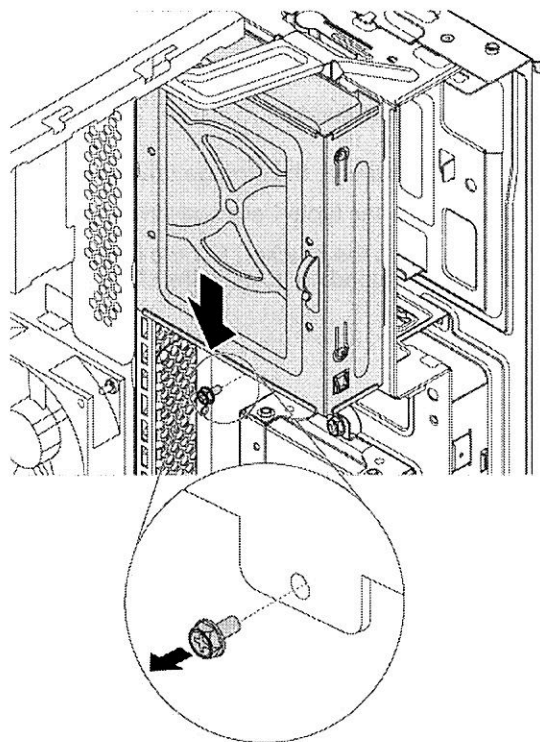


Figure 94. Removing the type-1 storage-drive cage

- c. Pull the handle of the plastic 3.5-inch storage-drive bracket to remove the storage drive from the type-1 storage-drive cage.

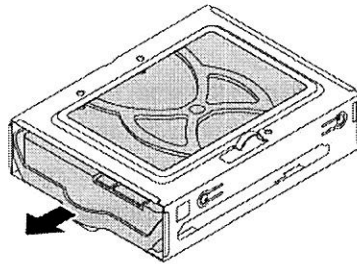


Figure 95. Removing the 3.5-inch storage drive

- d. Flex the sides of the bracket to remove the storage drive from the bracket.
4. To install a 3.5-inch storage drive in the type-1 storage-drive cage, do the following:
 - a. To install a new storage drive into the bracket, flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the storage drive. Do not touch the circuit board **5** on the storage drive.

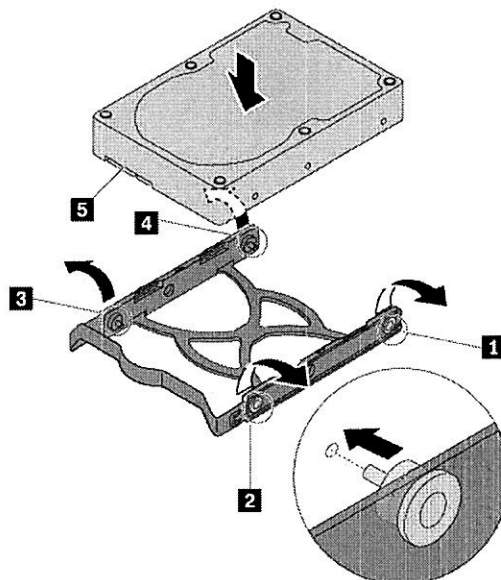


Figure 96. Installing the storage drive into the bracket

- b. Slide the new storage drive into the type-1 storage-drive cage until it snaps into position.

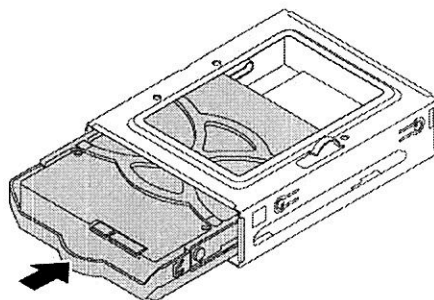


Figure 97. Installing the storage drive

- c. Align the four holes in the rear of the type-1 storage-drive cage with the corresponding hooks in the drive bay assembly. Then slide the type-1 storage-drive cage upward until it snaps into position. Reinstall the screw to secure the type-1 storage-drive cage.

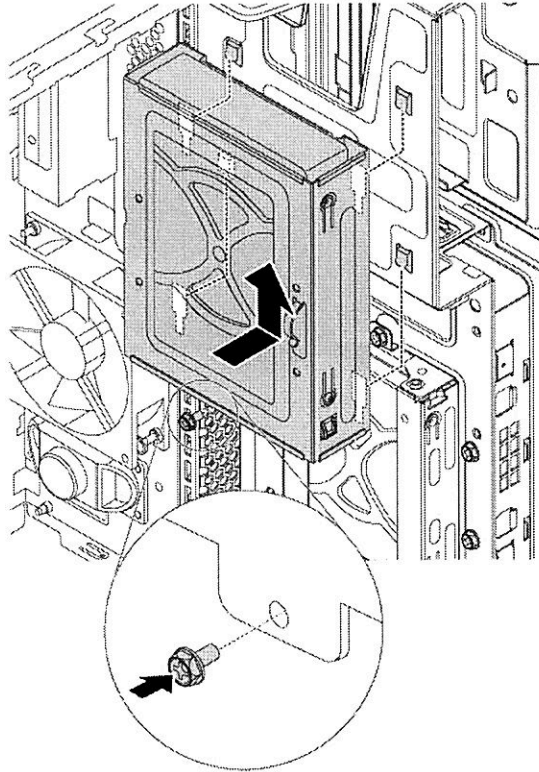


Figure 98. Installing the type-1 storage-drive cage

- d. Connect the signal cable and the power cable to the new storage drive.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 121.

2.5-inch storage drive

To remove or install a 2.5-inch storage drive with a 2.5-inch to 3.5-inch storage-drive converter (hereafter referred to as storage-drive converter), do the following:

1. Prepare your computer. See “Preparing your computer” on page 56.
2. Locate the type-1 storage-drive cage. See “Computer components” on page 5.
3. To remove a 2.5-inch storage drive with a storage-drive converter in the type-1 storage-drive cage, do the following:
 - a. Disconnect the signal cable and the power cable from the storage drive.

- b. Remove the screw and slide the type-1 storage-drive cage downward to release it from the drive bay assembly.

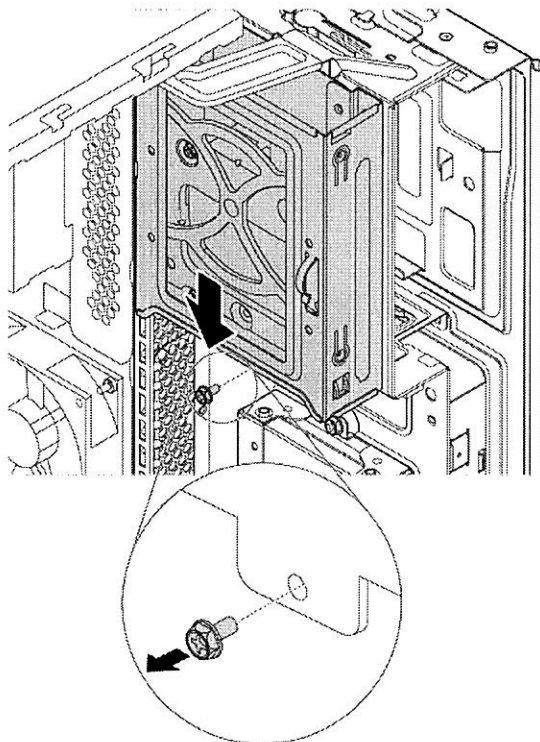


Figure 99. Removing the type-1 storage-drive cage

- c. Pull the handle of the storage-drive bracket to remove the storage drive from the type-1 storage-drive cage.

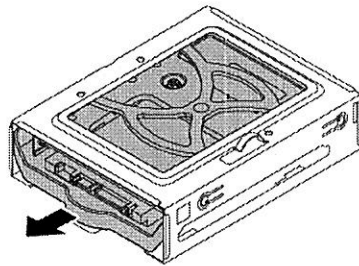


Figure 100. Removing the 2.5-inch storage drive

- d. Flex the sides of the bracket to remove the storage-drive converter from the bracket.

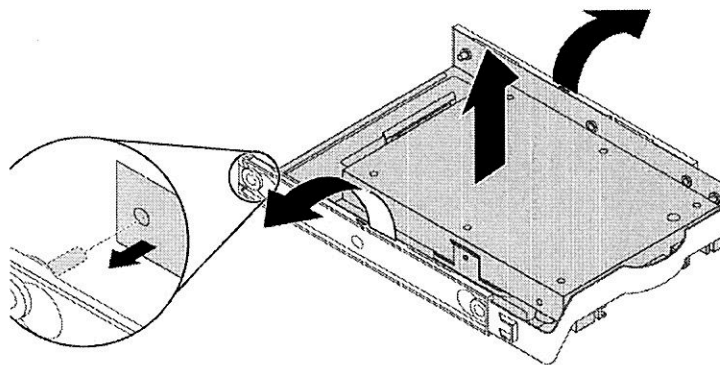


Figure 101. Removing the storage-drive converter from the storage-drive bracket

- e. Remove the four screws that secure the 2.5-inch storage drive. Then lift the storage drive out of the storage-drive converter.

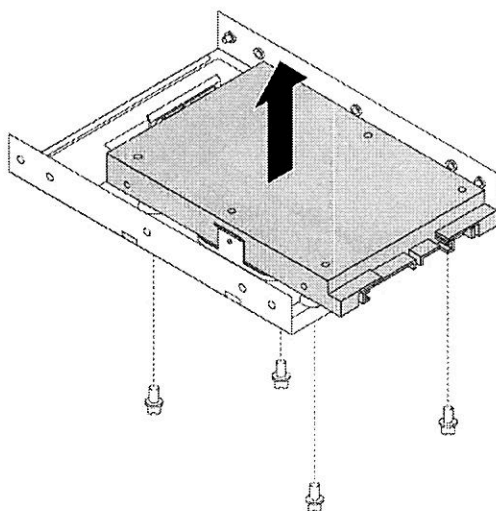


Figure 102. Removing the 2.5-inch storage drive from the storage-drive converter

4. To install a new 2.5-inch storage drive in the type-1 storage-drive cage, do the following:

- a. Install the 2.5-inch storage drive with a storage-drive converter into the storage-drive converter. Then install the four screws to secure the new storage drive to the storage-drive converter.

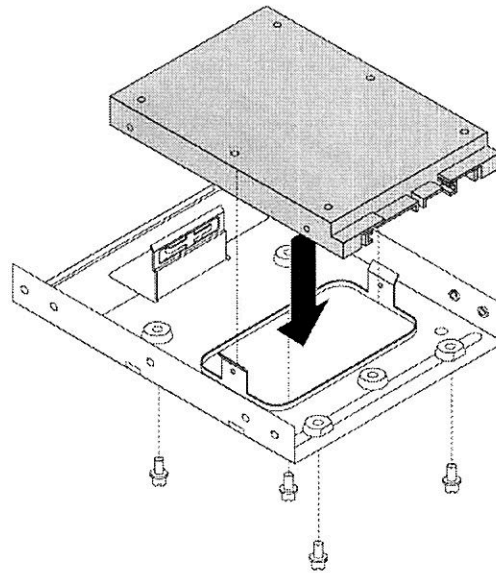


Figure 103. Installing the 2.5-inch storage drive into the storage-drive converter

- b. To install a new storage drive into the bracket, flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the storage drive. Do not touch the circuit board **5** on the storage drive.

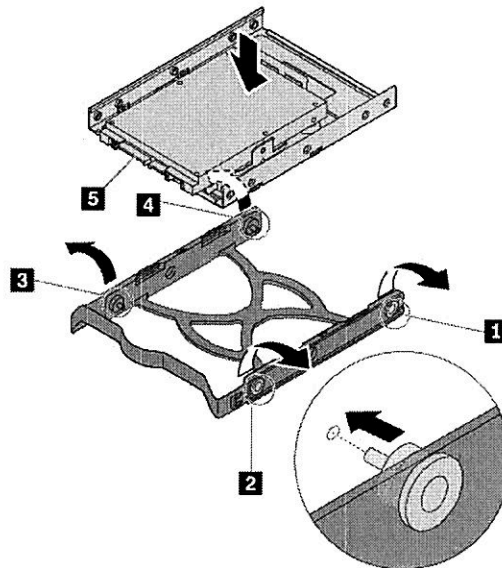


Figure 104. Installing the 2.5-inch storage drive into the bracket

- c. Slide the new storage drive with the storage-drive converter into the type-1 storage-drive cage until it snaps into position.

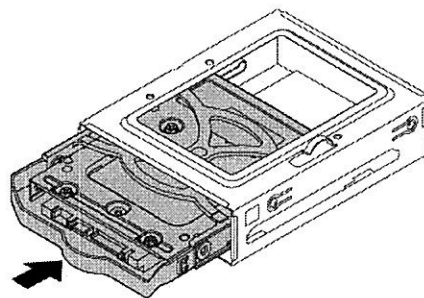


Figure 105. Installing the 2.5-inch storage drive into the type-1 storage-drive cage

- d. Align the four holes in the rear of the type-1 storage-drive cage with the corresponding hooks in the drive bay assembly. Then slide the type-1 storage-drive cage upward until it snaps into position. Reinstall the screw to secure the type-1 storage-drive cage.

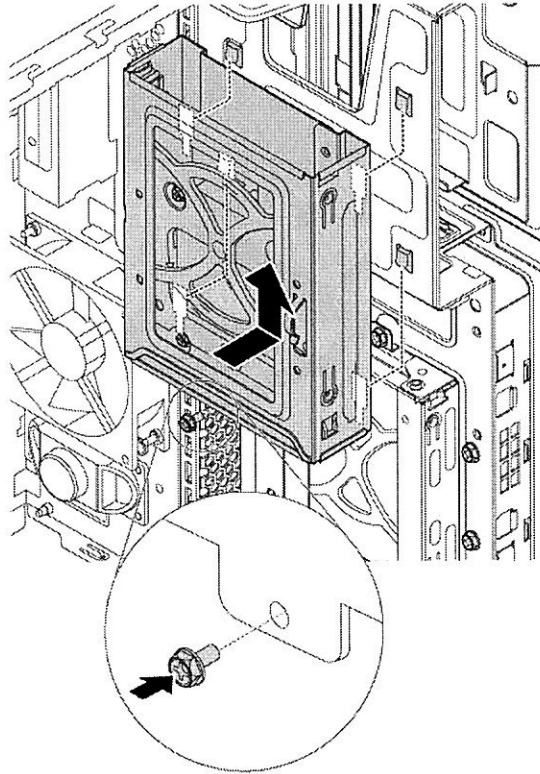


Figure 106. Installing the type-1 storage-drive cage

- e. Connect the signal cable and the power cable to the new storage drive.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 121.

Type-2 storage-drive cage

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

Some computer models come with a type-2 storage-drive cage for installing or replacing a 2.5-inch storage drive.

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

1. Prepare your computer. See “Preparing your computer” on page 56.
2. Locate the type-2 storage-drive cage. See “Computer components” on page 5.
3. To remove a 2.5-inch storage drive from the type-2 storage-drive cage, do the following:
 - a. Disconnect the signal cable and the power cable from the 2.5-inch storage drive.

- b. Remove the screw and slide the type-2 storage-drive cage downward to release it from the drive bay assembly.

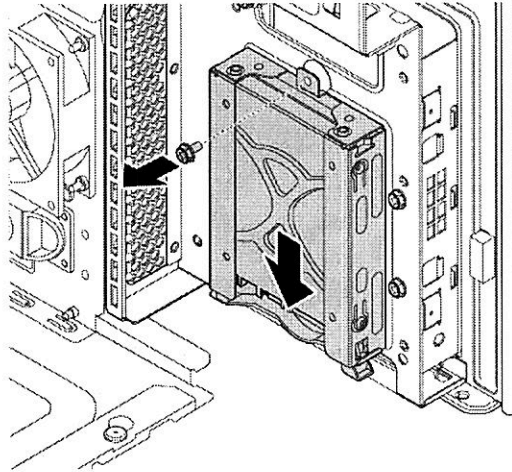


Figure 107. Removing the type-2 storage-drive cage

- c. Pull the handle of the plastic 2.5-inch storage-drive bracket to remove it from the type-2 storage-drive cage.

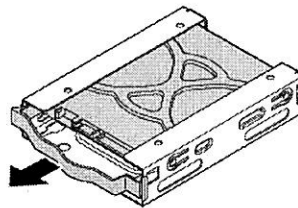


Figure 108. Removing the 2.5-inch storage drive

- d. Flex the sides of the bracket to remove the storage drive from the bracket.
4. To install a new 2.5-inch storage drive into the type-2 storage-drive cage, do the following:

- a. To install a new 2.5-inch storage drive into the bracket, flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the storage drive. Do not touch the circuit board **5** on the storage drive.

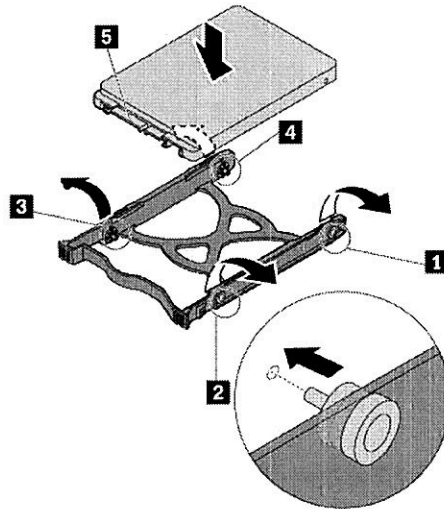


Figure 109. Installing the 2.5-inch storage drive into the bracket

- b. Slide the new storage drive into the type-2 storage-drive cage until it snaps into position.

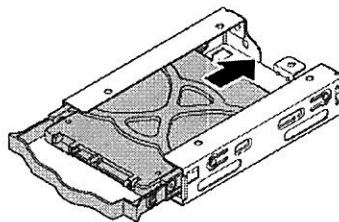


Figure 110. Installing the 2.5-inch storage drive into the type-2 storage-drive cage

- c. Align the four holes in the rear of the type-2 storage-drive cage with the corresponding hooks in the drive bay assembly. Then slide the type-2 storage-drive cage upward until it snaps into position. Reinstall the screw to secure the type-2 storage-drive cage.

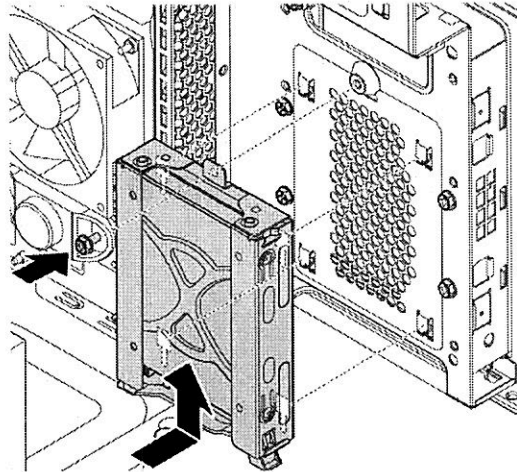


Figure 111. Installing the type-2 storage-drive cage

- d. Connect the signal cable and the power cable to the new storage drive.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

Heat-sink-and-fan assembly

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

CAUTION:



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

To remove or install the heat-sink-and-fan assembly, do the following:

1. Prepare your computer. See "Preparing your computer" on page 56.
2. Lay the computer on its side for easier access to the system board.
3. To remove the heat-sink-and-fan assembly, do the following:
 - a. Disconnect the heat-sink-and-fan assembly cable from the microprocessor fan connector on the system board. See "Parts on the system board" on page 7.

- b. Follow the following sequence to loosen the four screws that secure the heat-sink-and-fan assembly to the system board:

- Partially loosen screw **1**, fully loosen screw **2**, and then fully loosen screw **1**.
- Partially loosen screw **3**, fully loosen screw **4**, and then fully loosen screw **3**.

Note: Carefully loosen the four screws to avoid any possible damage to the system board. The four screws cannot be removed from the heat-sink-and-fan assembly.

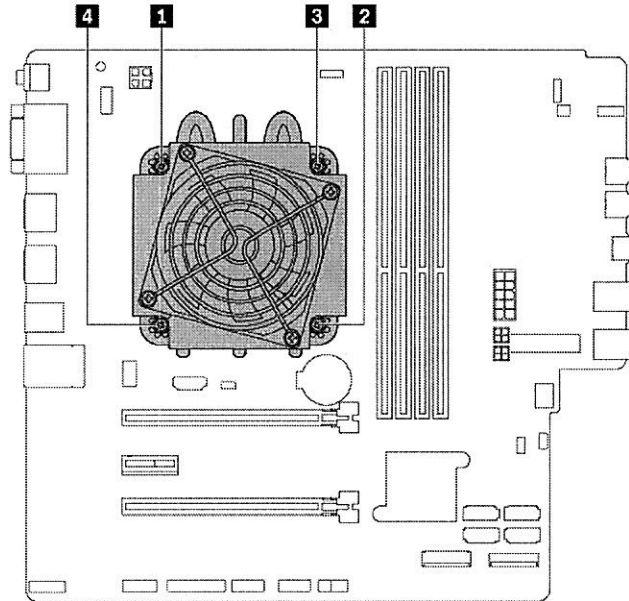


Figure 112. Removing the heat-sink-and-fan assembly

- c. Lift the failing heat-sink-and-fan assembly off the system board.

Notes:

- You might have to gently twist the heat-sink-and-fan assembly to free it from the microprocessor.
- Do not touch the thermal grease while handling the heat-sink-and-fan assembly.

4. To install the heat-sink-and-fan assembly, do the following:

- a. Apply appropriate amount of thermal grease to the new heat-sink-and-fan assembly.
- b. Position the heat-sink-and-fan assembly on the system board. Ensure that the four screws are aligned with the holes in the system board.

Note: Ensure that the heat-sink-and-fan assembly cable is toward the microprocessor fan connector on the system board.

- c. Follow the following sequence to tighten the four screws to secure the new heat-sink-and-fan assembly. Do not over-tighten the screws.

- Partially tighten screw **1**, fully tighten screw **2**, and then fully tighten screw **1**.
- Partially tighten screw **3**, fully tighten screw **4**, and then fully tighten screw **3**.



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- d. Connect the heat-sink-and-fan assembly cable to the microprocessor fan connector on the system board. See "Parts on the system board" on page 7.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to "Completing the parts replacement" on page 121.

Completing the parts replacement

CAUTION:



After replacing a CRU, reinstall all protective covers, including the computer cover, before connecting power and operating the computer. This action is important to help prevent unexpected electrical shock and help ensure the containment of an unexpected fire that could happen under extremely rare conditions.

After completing the installation or replacement for all parts, pivot the drive bay assembly inward, reinstall the front bezel, reinstall the computer cover, and reconnect cables. Depending on the parts you installed or replaced, you might need to confirm the updated information in the Setup Utility program. Refer to "Using the Setup Utility program" on page 35.

To complete the parts replacement, do the following:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer. See "Computer components" on page 5 for the locations of various components in your computer.
2. Ensure that the cables are routed correctly before reinstalling the computer cover. Keep cables clear of the hinges and sides of the computer chassis to avoid interference with reinstalling the computer cover.
3. Press the release tab as shown and pivot the drive bay assembly inward until it snaps into position.

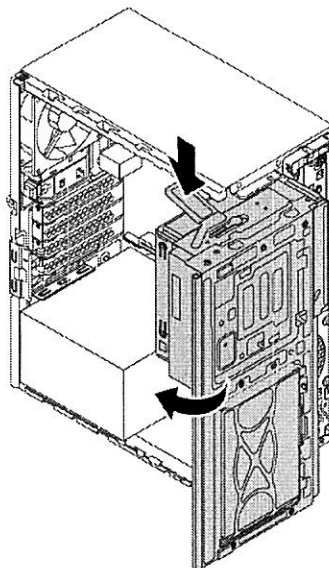


Figure 113. Pivoting the drive bay assembly downward

4. To reinstall the front bezel, first align the three plastic tabs on the front bezel with the corresponding holes in the chassis. Then pivot the front bezel inward until it snaps into position.

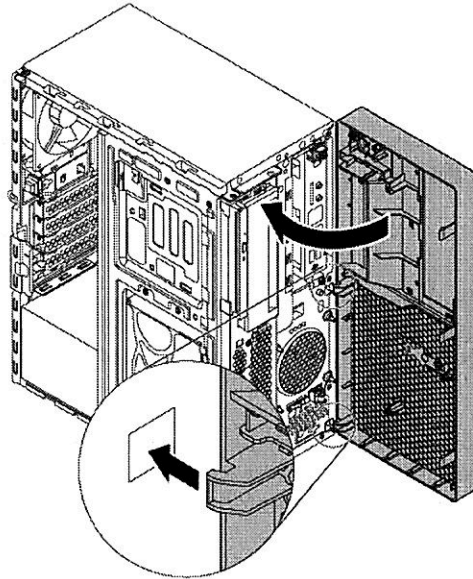


Figure 114. Reinstalling the front bezel

5. Position the computer cover on the chassis so that the rail guides on the bottom of the computer cover engage the rails on the chassis. Then, push the cover to the front of the computer until it snaps into position. Install the screws to secure the computer cover.

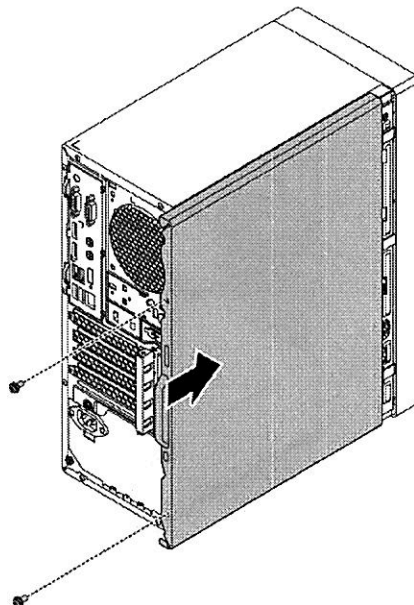


Figure 115. Reinstalling the computer cover



6. Reinstall the dust shield if you have removed it.

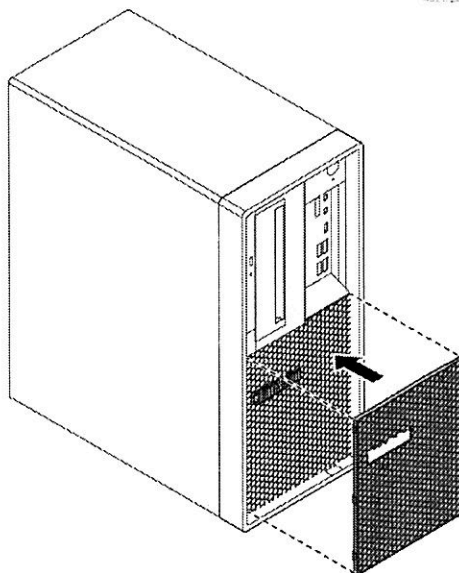


Figure 116. Reinstalling the dust shield

7. If there is any locking device available, lock the computer cover. See "Locking the computer cover" on page 29.
8. Reconnect the external cables and power cords to the corresponding connectors on the computer. See "Hardware locations" on page 1.
9. Update the configuration of your computer if necessary. See "Using the Setup Utility program" on page 35.
10. If a newly installed hardware component does not work correctly, update the device driver. See "Keeping your computer current" on page 24.

Chapter 8. Getting information, help, and service

This chapter provides information about getting help and support from Lenovo.

Information resources

You can use the information in this section to access useful resources relating to your computing needs.

Accessing the user guide in various languages

To access the user guide in various languages, go to:

<https://support.lenovo.com>

Windows help system

The Windows help system provides you with detailed information about using the Windows operating system.

Note: Using the help for Windows 10 requires an active Internet connection.

To access the Windows help system, do the following:

1. Click the Start button to open the Start menu.
2. Click **Get Help**.

Safety and warranty

The *Safety and Warranty Guide* provided with your computer contains important safety information, product warranty terms, and legal notices. Ensure that you read and understand all safety information in the *Safety and Warranty Guide* before using your computer.

In addition, read and understand "Read this first: Important safety information" on page iii before using your computer. This preface provides additional safety information that applies to topics and tasks described in this *User Guide*.

Lenovo Web site

The Lenovo Web site (<https://www.lenovo.com>) provides up-to-date information and services to help you buy, upgrade, and maintain your computer. You also can do the following:

- Shop for desktop and notebook computers, monitors, projectors, upgrades, and accessories for your computer, and special offers.
- Purchase additional services, such as support for hardware, operating systems, programs, network setup and configuration, and custom installations.
- Purchase upgrades and extended hardware repair services.
- Access troubleshooting and support information for your computer model and other supported products.
- Find a Service Provider located near you.

Lenovo Support Web site

Technical support information is available on the Lenovo Support Web site at:

<https://support.lenovo.com>

This Web site is updated with the latest support information such as the following:

- Drivers and software
- Diagnostic solutions
- Product and service warranty
- Product and parts details
- User guides and manuals
- Knowledge base and frequently asked questions
- Lenovo Support phone numbers

Help and service

This section provides information about obtaining help and service.

Calling for service

During the warranty period, you can get help and information by telephone through the Customer Support Center. For the warranty period of your computer, go to <https://www.lenovo.com/warranty-status>. For a list of Lenovo Support phone numbers, 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.

The following services are available during the warranty period:

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

These items are not covered by the warranty:

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

If possible, be at your computer when you call. Have the following information available:

- Machine type and model
- Serial numbers of your hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

Using other services

You might travel with your computer or relocate it to a country or region where the machine type for your desktop or notebook computer is sold. In such a situation, your computer might be eligible for International



Warranty Service, which automatically entitles you to obtain warranty service throughout the warranty period. Service will be performed by service providers authorized to perform warranty service.

Service methods and procedures vary by country, and some services might not be available in all countries. International Warranty Service is delivered through the method of service (such as depot, carry-in, or on-site service) that is provided in the servicing country. Service centers in certain countries might not be able to service all models of a particular machine type. In some countries, fees and restrictions might apply at the time of service.

To determine whether your computer is eligible for International Warranty Service and to view a list of the countries or regions where service is available, go to <https://support.lenovo.com>.

For technical assistance with the installation of or questions related to Service Packs for your preinstalled Microsoft Windows product, go to <https://support.microsoft.com>. You also can contact the Lenovo Customer Support Center for help. Some fees might apply.

Purchasing additional services

During and after the warranty period, you can purchase additional services. Examples of these additional services include:

- Support for hardware, operating systems, and programs
- Network setup and configuration services
- Upgraded or extended hardware repair services
- Custom installation services

Service availability and service name might vary by country or region. For more information about these services, go to the Lenovo Web site at:
<https://www.lenovo.com>



Appendix A. System memory speed

The Intel Xeon® microprocessor families compatible with this ThinkStation computer feature an integrated memory controller. The memory controller provides the microprocessor 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 microprocessor model.

Notes:

- The actual system memory speed of the memory modules varies depending on the microprocessor model. For example, your computer comes with 2666 MT/s memory modules, but the microprocessor only supports up to 2400 MT/s memory modules. Then the system memory speed will be no faster than 2400 MT/s.
- The microprocessor models supported in your computer might vary. For a list of supported microprocessor models, contact the Lenovo Customer Support Center.
- The ECC memory modules are not supported on the computer models with Intel Core i5 or i7 microprocessors.

Refer to the following information about the system memory speed:

- **Memory module types:**
 - DDR4 ECC UDIMMs
 - DDR4 non-ECC UDIMMs
- **Memory module operating voltage:** 1.2 V
- **Memory module frequency:** 2666 MT/s
- **Microprocessor models:**
 - Intel Xeon: E-2186G, E-2176G, E-2174G, E-2146G, E-2144G, E-2136, E-2134, E-2126G, E-2124G, E-2124, and E-2104G
 - Intel Core: i7-8700K, i7-8700, i5-8600, i5-8500, i5-8400, i3-8300, and i3-8100
 - Intel Pentium: G5400

Appendix B. Supplemental information about the Ubuntu operating system

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

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

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:

`/usr/share/doc/lenovo-doc`

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

Access the Ubuntu help system

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

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

<https://www.ubuntu.com>

Get support information

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

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

<https://support.lenovo.com>

Appendix C. Regulatory information of countries and regions

The latest compliance information is available at:
<https://www.lenovo.com/compliance>

Export classification notice

This product is subject to the United States Export Administration Regulations (EAR) and has an Export Classification Control Number (ECCN) of 5A992.c. It can be re-exported except to any of the embargoed countries in the EAR E1 country list.

TCO Certified

Selected models are TCO Certified and bear the TCO Certified logo.

Note: TCO Certified is an international third-party sustainability certification for IT products. For details, go to <https://www.lenovo.com/us/en/compliance/tco>.

Taiwan precautionary vision statement

警語：使用過度恐傷害視力

注意事項：

- 使用30分鐘請休息10分鐘。
- 未滿2歲幼兒不看螢幕，2歲以上每天看螢幕不要超過1小時。

Electronic emissions notices

Federal Communications Commission Declaration of Conformity

The following information refers to Lenovo personal computer machine types 30CY, 30D0, and 30D3.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an authorized dealer or service representative for help.

Lenovo is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party:
Lenovo (United States) Incorporated
7001 Development Drive
Morrisville, NC 27560
Email: FCC@lenovo.com



Industry Canada compliance statement

CAN ICES-3(B)/NMB-3(B)

European Union conformity

EU Contact: Lenovo (Slovakia), Landererova 12, 811 09 Bratislava, Slovakia



EMC Directive Statement: This product is in conformity with the protection requirements of EU Council Directive 2014/30/EU on the approximation of the laws of the Member States relating to electromagnetic compatibility.

This product has been tested and found to comply with the limits for Class B equipment according to European Standards harmonized in the Directives in compliance. The Class B requirements for equipment are intended to offer adequate protection to broadcast services within residential environments.

Radio Equipment Directive Statement: This product is in conformity with all the requirements and essential norms that apply to EU Council Radio Equipment Directive 2014/53/EU on the approximation of the laws of the Member States relating to radio equipment. The full text of the system EU declaration of conformity and the EU wireless module declarations are available at the following Internet addresses: <https://www.lenovo.com/eu-doc-workstations>

Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the installation of option cards from other manufacturers.

German Class B compliance statement

Hinweis zur Einhaltung der Klasse B zur elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie zur elektromagnetischen Verträglichkeit Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der Klasse B der Norm gemäß Richtlinie.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der Lenovo empfohlene Kabel angeschlossen werden. Lenovo übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der Lenovo verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der Lenovo gesteckt/eingebaut werden.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EU Richtlinie 2014/30/EU, der EU Richtlinie 2014/53/EU Artikel 3.1b), für Geräte der Klasse B.

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraf 5 des EMVG ist die Lenovo (Deutschland) GmbH, Meitnerstr. 9, D-70563 Stuttgart.

Korean wireless-radio compliance information

무선설비 전파 혼신 (사용주파수 2400~2483.5, 5725~5825 무선제품해당)

해당 무선설비가 전파혼신 가능성이 있으므로 인명안전과 관련된 서비스는 할 수 없음

SAR 정보

본 장치는 전파 노출에 대한 가이드라인을 충족합니다.

본 장치는 무선 송수신기입니다. 본 장치는 국제 가이드라인으로 권장되는 전파 노출에 대한 제한을 초과하지 않도록 설계되었습니다. 장치 액세서리 및 최신 부품을 사용할 경우 SAR 값이 달라질 수 있습니다. SAR 값은 국가 보고 및 테스트 요구 사항과 네트워크 대역에 따라 다를 수 있습니다. 본 장치는 사람의 신체에서 20mm 이상의 거리에서 사용할 수 있습니다.

Japan VCCI Class B compliance statement

この装置は、クラスB機器です。この装置は、住宅環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

VCCI-B

Japan compliance statement for products which connect to the power mains with rated current less than or equal to 20 A per phase

日本の定格電流が 20A/相 以下の機器に対する高調波電流規制
高調波電流規格 JIS C 61000-3-2 適合品

Japan notice for ac power cord

The ac power cord shipped with your product can be used only for this specific product. Do not use the ac power cord for other devices.

本製品およびオプションに電源コード・セットが付属する場合は、それぞれ専用のものになっていますので他の電気機器には使用しないでください。

Lenovo product service information for Taiwan

委製商/進口商名稱: 荷蘭商聯想股份有限公司台灣分公司
進口商地址: 台北市中山區北安路780號7樓
進口商電話: 0800-000-702 (代表號)

Keyboard and mouse compliance statement for Taiwan

本產品隨貨附已取得經濟部標準檢驗局認可之PS/2或USB的鍵盤與滑鼠一組

Eurasian compliance mark



Brazil audio notice

Ouvir sons com mais de 85 decibéis por longos períodos pode provocar danos ao sistema auditivo.

Mexico wireless-radio compliance information

Advertencia: En Mexico la operación de este equipo está sujeta a las siguientes dos condiciones: (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Additional regulatory information

For additional regulatory information, refer to the *Regulatory Notice* shipped with your computer. Depending on the configuration of your computer and the country or region where the computer was purchased, you might have received additional printed regulatory notices. All regulatory notices are available on the Lenovo Support Web site in electronic format. To access electronic copies of the documentation, go to <https://support.lenovo.com>.

Appendix D. WEEE and recycling information of countries and regions

Lenovo encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. Lenovo offers various programs and services to assist equipment owners in recycling their IT products. The latest environmental information is available at: <https://www.lenovo.com/ecodeclaration>

Important WEEE information



The WEEE marking on Lenovo products applies to countries with WEEE and e-waste regulations (for example, the European WEEE Directive, India E-Waste Management Rules). Appliances are labeled in accordance with local regulations concerning waste electrical and electronic equipment (WEEE). These regulations determine the framework for the return and recycling of used appliances as applicable within each geography. This label is applied to various products to indicate that the product is not to be thrown away, but rather put in the established collection systems for reclaiming these end of life products.

Users of electrical and electronic equipment (EEE) with the WEEE marking must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, and recovery of WEEE and to minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. Lenovo electrical and electronic equipment (EEE) may contain parts and components, which at end-of-life might qualify as hazardous waste.

EEE and waste electrical and electronic equipment (WEEE) can be delivered free of charge to the place of sale or any distributor that sells electrical and electronic equipment of the same nature and function as the used EEE or WEEE.

For additional WEEE information, go to:
<https://www.lenovo.com/recycling>

WEEE information for Hungary

Lenovo, as a producer, bears the cost incurred in connection with the fulfillment of Lenovo's obligations under Hungary Law No. 197/2014 (VIII.1.) subsections (1)-(5) of section 12.

Recycling information for Japan

Collecting and recycling a disused Lenovo computer or monitor

If you are a company employee and need to dispose of a Lenovo computer or monitor that is the property of the company, you must do so in accordance with the Law for Promotion of Effective Utilization of Resources. Computers and monitors are categorized as industrial waste and should be properly disposed of by an

industrial waste disposal contractor certified by a local government. In accordance with the Law for Promotion of Effective Utilization of Resources, Lenovo Japan provides, through its PC Collecting and Recycling Services, for the collecting, reuse, and recycling of disused computers and monitors. For details, visit the Lenovo Web site at <https://www.lenovo.com/recycling/japan>. Pursuant to the Law for Promotion of Effective Utilization of Resources, the collecting and recycling of home-used computers and monitors by the manufacturer was begun on October 1, 2003. This service is provided free of charge for home-used computers sold after October 1, 2003. For details, visit the Lenovo Web site at <https://www.lenovo.com/recycling/japan>.

Disposing of Lenovo computer components

Some Lenovo computer products sold in Japan may have components that contain heavy metals or other environmental sensitive substances. To properly dispose of disused components, such as a printed circuit board or drive, use the methods described above for collecting and recycling a disused computer or monitor.

Disposing of disused lithium batteries from Lenovo computers

A button-shaped lithium battery is installed inside your Lenovo computer to provide power to the computer clock while the computer is off or disconnected from the main power source. If you need to replace it with a new one, contact your place of purchase or contact Lenovo for service. If you need to dispose of a disused lithium battery, insulate it with vinyl tape, contact your place of purchase or an industrial-waste-disposal operator, and follow their instructions. Disposal of a lithium battery must comply with local ordinances and regulations.

Recycling information for Brazil

Declarações de Reciclagem no Brasil

Descarte de um Produto Lenovo Fora de Uso

Equipamentos elétricos e eletrônicos não devem ser descartados em lixo comum, mas enviados à pontos de coleta, autorizados pelo fabricante do produto para que sejam encaminhados e processados por empresas especializadas no manuseio de resíduos industriais, devidamente certificadas pelos órgãos ambientais, de acordo com a legislação local.

A Lenovo possui um canal específico para auxiliá-lo no descarte desses produtos. Caso você possua um produto Lenovo em situação de descarte, ligue para o nosso SAC ou encaminhe um e-mail para: reciclar@lenovo.com, informando o modelo, número de série e cidade, a fim de enviarmos as instruções para o correto descarte do seu produto Lenovo.

Recycling information for mainland China

《废弃电器电子产品回收处理管理条例》提示性说明

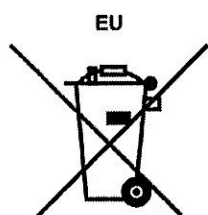
联想鼓励拥有联想品牌产品的用户当不再需要此类产品时，遵守国家废弃电器电子产品回收处理相关法律法规，将其交给当地具有国家认可的回收处理资质的厂商进行回收处理。更多回收服务信息，请点击进入<http://support.lenovo.com.cn/activity/551.htm>

Battery recycling information for Taiwan



廢電池請回收

Battery recycling information for the European Union



Notice: This mark applies only to countries within the European Union (EU).

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury, and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances.

Before placing electrical and electronic equipment (EEE) in the waste collection stream or in waste collection facilities, the end user of equipment containing batteries and/or accumulators must remove those batteries and accumulators for separate collection.

Disposing of lithium batteries and battery packs from Lenovo products

A coin-cell type lithium battery might be installed inside your Lenovo product. You can find details about the battery in the product documentation. If the battery needs to be replaced, contact your place of purchase or contact Lenovo for service. If you need to dispose of a lithium battery, insulate it with vinyl tape, contact your place of purchase or a waste-disposal operator, and follow their instructions.

Disposing of battery packs from Lenovo products

Your Lenovo device might contain a lithium-ion battery pack or a nickel metal hydride battery pack. You can find details on the battery pack in the product documentation. If you need to dispose of a battery pack, insulate it with vinyl tape, contact Lenovo sales, service, or your place of purchase, or a waste-disposal operator, and follow their instructions. You also can refer to the instructions provided in the user guide for your product.

For proper collection and treatment, go to:
<https://www.lenovo.com/lenovo/environment>

Appendix E. Restriction of Hazardous Substances (RoHS) Directive of countries and regions

The latest environmental information is available at:

<https://www.lenovo.com/ecodeclaration>

European Union RoHS

This Lenovo product, with included parts (cables, cords, and so on) meets the requirements of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment ("RoHS recast" or "RoHS 2").

For more information about Lenovo worldwide compliance on RoHS, go to:

<https://www.lenovo.com/rohs-communication>

Mainland China RoHS

产品中有害物质的名称及含量

部件名称	有害物质					
	铅(Pb)	汞(Hg)	镉(Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板组件*	X	O	O	O	O	O
硬盘	X	O	O	O	O	O
光驱	X	O	O	O	O	O
内存	X	O	O	O	O	O
电脑I/O 附件	X	O	O	O	O	O
电源	X	O	O	O	O	O
键盘	X	O	O	O	O	O
鼠标	X	O	O	O	O	O
机箱/附件	X	O	O	O	O	O
电池	X	O	O	O	O	O

本表格依据 SJ/T 11364 的规定编制。

O: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

注: 表中标记 "X" 的部件, 皆因全球技术发展水平限制而无法实现有害物质的替代。

印刷电路板组件*: 包括印刷电路板及其零部件、电容和连接器

根据型号的不同, 可能不会含有以上的所有部件, 请以实际购买机型为准



在中华人民共和国境内销售的电子信息产品必须标识此标志, 标志内的数字代表在正常使用状态下的产品的环保使用期限

Turkish RoHS

The Lenovo product meets the requirements of the Republic of Turkey Directive on the Restriction of the Use of Certain Hazardous Substances in Waste Electrical and Electronic Equipment (WEEE).

Türkiye AEEE Yönetmeliğine Uygunluk Beyanı

Bu Lenovo ürünü, T.C. Çevre ve Orman Bakanlığı'nın "Atık Elektrik ve Elektronik Eşyalarda Bazı Zararlı Maddelerin Kullanımının Sınırlandırılmasına Dair Yönetmelik (AEEE)" direktiflerine uygundur.

AEEE Yönetmeliğine Uygundur.

Ukraine RoHS

Цим підтверджуємо, що продукція Леново відповідає вимогам нормативних актів України, які обмежують вміст небезпечних речовин

India RoHS

RoHS compliant as per E-Waste (Management) Rules.

Taiwan RoHS

單元	限用物質及其化學符號					
	鉛 (Pb)	汞 (Hg)	鎘 (Cd)	六價鉻 (Cr ⁶⁺)	多溴聯苯 (PBB)	多溴二苯醚 (PBDE)
印刷電路板組件	—	○	○	○	○	○
硬碟	—	○	○	○	○	○
光碟機	—	○	○	○	○	○
記憶體	—	○	○	○	○	○
電腦I/O配件	—	○	○	○	○	○
電源供應器	—	○	○	○	○	○
鍵盤	—	○	○	○	○	○
滑鼠	—	○	○	○	○	○
機殼/配件	—	○	○	○	○	○
備考1. “超出0.1 wt %”及“超出0.01 wt %”係指限用物質之百分比含量超出百分比含量基準值。 備考2. “○”係指該項限用物質之百分比含量未超出百分比含量基準值。 備考3. “—”係指該項限用物質為排除項目。						

Appendix F. ENERGY STAR model information



ENERGY STAR® is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy aimed at saving money and protecting the environment through energy efficient products and practices.

Lenovo is proud to offer our customers products with an ENERGY STAR compliant designation. Some models of the following machine types have been designed and tested to conform to the ENERGY STAR program requirement for computers at the time of manufacture: 30CY, 30D0, and 30D3. For more information about ENERGY STAR ratings for Lenovo computers, go to:
<https://www.lenovo.com>

By using ENERGY STAR compliant products and taking advantage of the power-management features of your computer, you reduce the consumption of electricity. Reduced electrical consumption contributes to potential financial savings, a cleaner environment, and the reduction of greenhouse gas emissions.

For more information about ENERGY STAR, go to:
<https://www.energystar.gov/>

Lenovo encourages you to make efficient use of energy an integral part of your day-to-day operations. To help in this endeavor, set the following power-management features to take effect when your computer has been inactive for a specified duration:

Table 1. ENERGY STAR power-management features

Windows 10 operating system
Power plan: Default • Turn off the display: After 10 minutes • Put the computer to sleep: After 25 minutes • Advanced power settings: – Turn off hard disk drives: After 20 minutes – Hibernate: Never

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

To change power settings, do the following:

1. Click the Start button to open the Start menu.
2. Click **Windows System → Control Panel**.
3. View Control Panel by Large icons or Small icons, and then click **Power Options**.
4. Follow the instructions on the screen.

Appendix G. Notices

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*Lenovo (United States), Inc.
8001 Development Drive
Morrisville, NC 27560
U.S.A.
Attention: Lenovo Director of Licensing*

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Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk.

Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Appendix H. Trademarks

The following terms are trademarks of Lenovo in the United States, other countries, or both:

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- The Lenovo logo
- ThinkStation
- The ThinkStation logo

Microsoft, Windows, and Windows Media are trademarks of the Microsoft group of companies.

The terms HDMI and HDMI High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC in the United States and other countries.

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Linux is a registered trademark of Linus Torvalds.

DisplayPort and Mini DisplayPort are trademarks of the Video Electronics Standards Association.

Ubuntu is a registered trademark of Canonical Ltd.

USB-C is a trademark of USB Implementers Forum.

Wi-Fi is a registered trademarks of Wi-Fi Alliance.

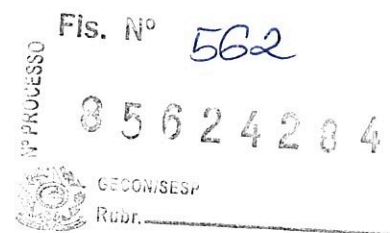
Other company, product, or service names may be trademarks or service marks of others.



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85624284
GEOCON/SESP
Rubr. _____

EPEAT Registry

Your Resource for Sustainable Electronics



ThinkStation P330 Tower Gen 2

PRODUCT SUMMARY:

Product Type:	Workstation
Country:	United States
Manufacturer:	Lenovo
EPEAT Rating:	Silver
Registration Date:	2019-10-22
Product Status:	Active
Exceptions:	
Manufacturer Part Number(s):	

EPEAT RATING SCORE DETAIL

For a product to be listed on the EPEAT Registry, it must, at a minimum, meet the applicable "required" criteria. [Click here](#) to see a list of the required criteria for this product category.

This product has met the necessary required criteria.

Along with required criteria, products can also meet optional criteria and score optional points. It is not required for a product to achieve any optional points.

- Products that meet all required criteria and achieve less than 50% of the optional points are rated at **EPEAT Bronze**.
- Products that meet all required criteria and achieve 50 - 74% of the optional points are rated at **EPEAT Silver**.
- Products that meet all required criteria and achieve 75 - 100% of the optional points are rated at **EPEAT Gold**.

The optional criteria for this product category and optional points achieved by this product are listed below.

Optional Criteria	Scores
▼ 4.1 Substance Management	10 / 16
(4.1.2.1) Restrictions of the use of cadmium	1
(4.1.4.1) Restriction of the use of beryllium	1
(4.1.5.2) Further reduction of bromine and chlorine content of plastic materials	0
(4.1.6.1) Avoidance or elimination of substances on EU REACH Annex XIV (authorization list)	1
(4.1.6.2) Reduction of substances on the EU REACH Candidate List of SVHCs	0
(4.1.8.1) Chemical assessment and selection	0
(4.1.9.1) IEC 62474 declarable substances	0
(4.1.9.2) Requesting substance inventory	1
(4.1.9.3) Acquiring substance inventory	2
(4.1.10.1) Reduce fluorinated gas emissions from flat panel display manufacturing	2
(4.1.10.2) Reduce fluorinated greenhouse emissions from semiconductor production	2
► 4.2 Materials Selection	2 / 3
► 4.4 Product longevity/life-cycle extension	2 / 3
► 4.5 Energy Conservation	0 / 2
► 4.7 Packaging	1 / 2

► 4.8 Life cycle assessment and carbon footprint	6 / 6
► 4.9 Corporate Environmental Performance	7 / 9
► 4.10 Corporate social responsibility	2 / 6
Total Optional Criteria Score	30 / 47

Please note that it is not required for a product to achieve any optional points.

Some optional criteria may not be applicable to a product. Optional criteria that are not applicable (N/A) to the product are not included in the Total Optional Criteria Score, and are not reflected above.



For any questions, comments, or feedback regarding the EPEAT Registry, please contact us [<mailto:lfernandez@greenelectronicscouncil.org>].

EPEAT Registry

Your Resource for Sustainable Electronics



ThinkVision T23i-10

PRODUCT SUMMARY:

Product Type:	Monitors
Country:	United States
Manufacturer:	Lenovo
EPEAT Rating:	Silver
Registration Date:	2019-05-09
Product Status:	Active
Exceptions:	
Manufacturer Part Number(s):	

EPEAT RATING SCORE DETAIL

For a product to be listed on the EPEAT Registry, it must, at a minimum, meet the applicable "required" criteria. [Click here](#) to see a list of the required criteria for this product category.

This product has met the necessary required criteria.

Along with required criteria, products can also meet optional criteria and score optional points. It is not required for a product to achieve any optional points.

- Products that meet all required criteria and achieve less than 50% of the optional points are rated at **EPEAT Bronze**.
- Products that meet all required criteria and achieve 50 - 74% of the optional points are rated at **EPEAT Silver**.
- Products that meet all required criteria and achieve 75 - 100% of the optional points are rated at **EPEAT Gold**.

The optional criteria for this product category and optional points achieved by this product are listed below.

Optional Criteria	Scores
▼ 4.1 Substance Management	11 / 16
(4.1.2.1) Restrictions of the use of cadmium	1
(4.1.4.1) Restriction of the use of beryllium	1
(4.1.5.2) Further reduction of bromine and chlorine content of plastic materials	0
(4.1.6.1) Avoidance or elimination of substances on EU REACH Annex XIV (authorization list)	1
(4.1.6.2) Reduction of substances on the EU REACH Candidate List of SVHCs	0
(4.1.8.1) Chemical assessment and selection	0
(4.1.9.1) IEC 62474 declarable substances	1
(4.1.9.2) Requesting substance inventory	1
(4.1.9.3) Acquiring substance inventory	2
(4.1.10.1) Reduce fluorinated gas emissions from flat panel display manufacturing	2
(4.1.10.2) Reduce fluorinated greenhouse emissions from semiconductor production	2
▼ 4.2 Materials Selection	3 / 3
(4.2.1.2) Higher post-consumer recycled, ITE-derived post-consumer recycled plastic, or bio-based content	2
(4.2.1.3) Post-consumer recycled, ITE-derived post-consumer recycled plastic	1
▼ 4.4 Product longevity/life-cycle extension	1 / 3

Criteria	Score
(4.4.1.2) Long life rechargeable battery	1
(4.4.2.2) Publicly available service information	1
(4.4.2.5) Product upgradeability and repairability	0
▼ 4.5 Energy Conservation	1 / 2
(4.5.1.5) Product energy consumption less than the ENERGY STAR Maximum Energy Limit	1
▼ 4.7 Packaging	0 / 2
(4.7.3.2) Packaging composed of recycled, and/or biobased, and/or sustainably forested content	0
(4.7.4.1) Offering of a bulk packaging option	0
▼ 4.8 Life cycle assessment and carbon footprint	6 / 6
(4.8.1.1) Product life cycle assessment and public disclosure of analyses	2
(4.8.1.2) Product specific greenhouse gas emissions—product carbon footprint	2
(4.8.2.1) Corporate carbon footprint	1
(4.8.2.2) Greenhouse gas emissions from product transport	1
▼ 4.9 Corporate Environmental Performance	6 / 9
(4.9.1.2) Third party certified environmental management system (EMS) for supplier manufacturing facilities	1
(4.9.2.2) Corporate environmental performance reporting by suppliers	1
(4.9.3.1) Energy management system/energy performance improvement – manufacturers	0
(4.9.3.2) Energy management system/energy performance improvement for suppliers	2
(4.9.4.1) Renewable energy use by manufacturer	2
(4.9.4.2) Renewable energy use by manufacturer suppliers	0
▼ 4.10 Corporate social responsibility	2 / 6
(4.10.1.1) Socially responsible supplier manufacturing: Labor	0
(4.10.1.2) Socially responsible manufacturing: OHS	0
(4.10.2.2) Participation in an in-region program that advances responsible sourcing of conflict minerals	1
(4.10.2.3) Smelter and refiner participation in OECD-aligned third party mechanisms	1
Total Optional Criteria Score	30 / 47

Please note that it is not required for a product to achieve any optional points.

Some optional criteria may not be applicable to a product. Optional criteria that are not applicable (N/A) to the product are not included in the Total Optional Criteria Score, and are not reflected above.

For any questions, comments, or feedback regarding the EPEAT Registry, please contact us [<mailto:lfernandez@greenelectronicscouncil.org>].

CPU Benchmarks

CPU Benchmarks

Over 1,000,000 CPUs Benchmarked



Intel Xeon E-2244G @ 3.80GHz

Price and performance details for the Intel Xeon E-2244G @ 3.80GHz can be found below. This is made using thousands of [PerformanceTest](#) benchmark results and is updated daily.

- The first graph shows the relative performance of the CPU compared to the 10 other common (single) CPUs in terms of PassMark CPU Mark.
- The 2nd graph shows the value for money, in terms of the CPUMark per dollar.
- The pricing history data shows the price for a single Processor. For multiple Processors, multiply the price shown by the number of CPUs.

CPU



High End

High Mid Range

Low Mid Range

Low End



Best Value
(On Market)

Best Value XY
Scatter

Best Value
(All time)



New Desktop

New Laptop



Single Thread

Systems with
Multiple CPUs

Overclocked

Power
Performance

CPU Mark by Socket
Type



CPU Mega List

Search Model



Compare ⁰



Common

Intel Xeon E-2244G @ 3.80GHz

Description:

Intel UHD Graphics P630

Class:

Server

Socket:

FCLGA1151-2

Clockspeed:

3.8 GHz

Turbo Speed:

4.8 GHz

No of Cores:

4 (2 logical cores per physical)

Typical TDP:

71 W

Other names: Intel(R) Xeon(R) E-2244G CPU @ 3.80GHz

CPU First Seen on Charts: Q4 2019

CPUMark/\$Price: 37.90

Overall Rank: 286

Last Price Change: \$272.00 USD (2019-04-01)

Note: PassMark Software may earn compensation for sales from links on this site through affiliate programs.

Browser adblocker software has been detected and enabled for our website.
Please consider disabling it to support our site and to view current prices
for the selected CPU.

Average CPU Mark



10309

Single Thread Rating: 2818

Samples: 1*

*Margin for error: High

+ COMPARE

Pricing History

\$300 -

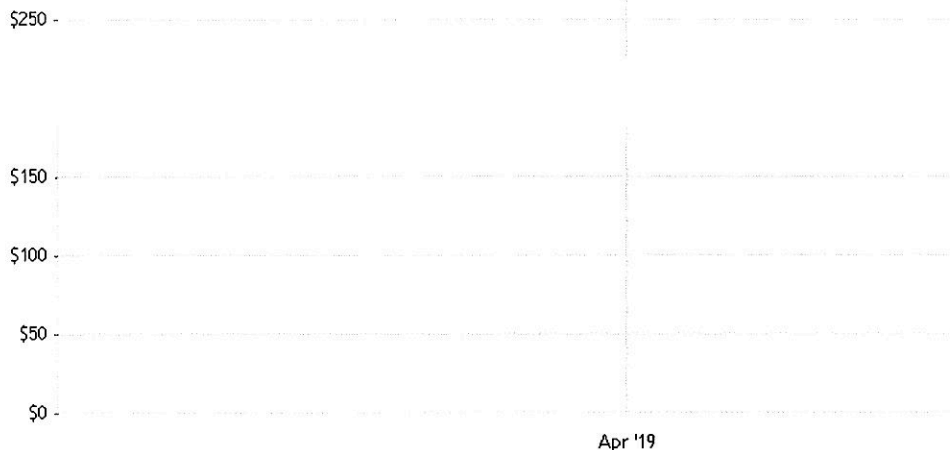
Price Summary

Most
Benchmarked

CPU Benchmarks

Market Share

Year on Year
Performance



CPU Mark Relative to Top 10 Common Server CPUs

As of 2nd of April 2020 - Higher results represent better performance

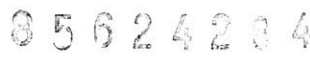
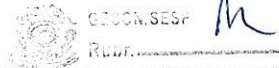
Processor	Average CPU Mark
AMD EPYC 7302P	30,994
AMD EPYC 7402P	28,291
AMD EPYC 7451	15,761
AMD Opteron 6386 SE	10,836
Intel Xeon E-2244G @ 3.80GHz	10,309
Intel Xeon E5-2689 @ 2.60GHz	10,291
Intel Xeon E5-2650 v2 @ 2.60GHz	10,241
Intel Xeon E5-1650 @ 3.20GHz	8,622
Intel Xeon E5-1620 @ 3.60GHz	6,236
AMD Opteron 6128	4,505
Intel Xeon E5450 @ 3.00GHz	2,591

CPU Value (CPU Mark / \$Price)

As of 2nd of April 2020 - Higher results represent better value

Processor	CPU Mark / \$Price
AMD Opteron 6128	166.86
Intel Xeon E5-1620 @ 3.60GHz	119.93
Intel Xeon E5-2650 v2 @ 2.60GHz	85.66

 CPU Benchmarks ▼

AMD Opteron 6386 SE		80.27
AMD EPYC 7302P		32.92
AMD EPYC 7402P		20.21
Intel Xeon E5-1650 @ 3.20GHz		17.42
Intel Xeon E5450 @ 3.00GHz		8.67
AMD EPYC 7451		6.57
Intel Xeon E5-2689 @ 2.60GHz		0.00

Last 1 Baselines for Intel Xeon E-2244G @ 3.80GHz

Most recent listed first

Baseline	CPU Mark
BL1284630 - Oct 18 2019	12782

Popular comparisons for Intel Xeon E-2244G @ 3.80GHz

As of 2nd of April 2020 - Higher results represent better performance

Processor	Average CPU Mark
Intel Xeon E-2244G @ 3.80GHz	10.309
Intel Xeon E-2274G @ 4.00GHz	10.075
Intel Xeon E-2226G @ 3.40GHz	10.683
Intel Xeon W-2123 @ 3.60GHz	9.201
Intel Xeon E-2134 @ 3.50GHz	8.777
Intel Xeon E-2144G @ 3.60GHz	9.662
Intel Xeon E-2236 @ 3.40GHz	12.674
Intel Xeon E-2224G @ 3.50GHz	7.996
AMD EPYC 3251	12.401
Intel Xeon E-2126G @ 3.30GHz	11.249
Intel Xeon E-2124G @ 3.40GHz	7.978
Intel Xeon D-2123IT @ 2.20GHz	8.372

CPU Benchmarks ▼

Intel Xeon E3-1240 v6 @ 3.70GHz	8.048
Intel Xeon Bronze 3204 @ 1.90GHz	6.498
Intel Xeon E5-2643 v3 @ 3.40GHz	10.531
Intel Xeon E3-1270 @ 3.40GHz	5.403

Software

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[PerformanceTest](#)
[OSForensics](#)
[MemTest86](#)
[WirelessMon](#)
[Zoom Search Engine](#)
[Free Software](#)

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