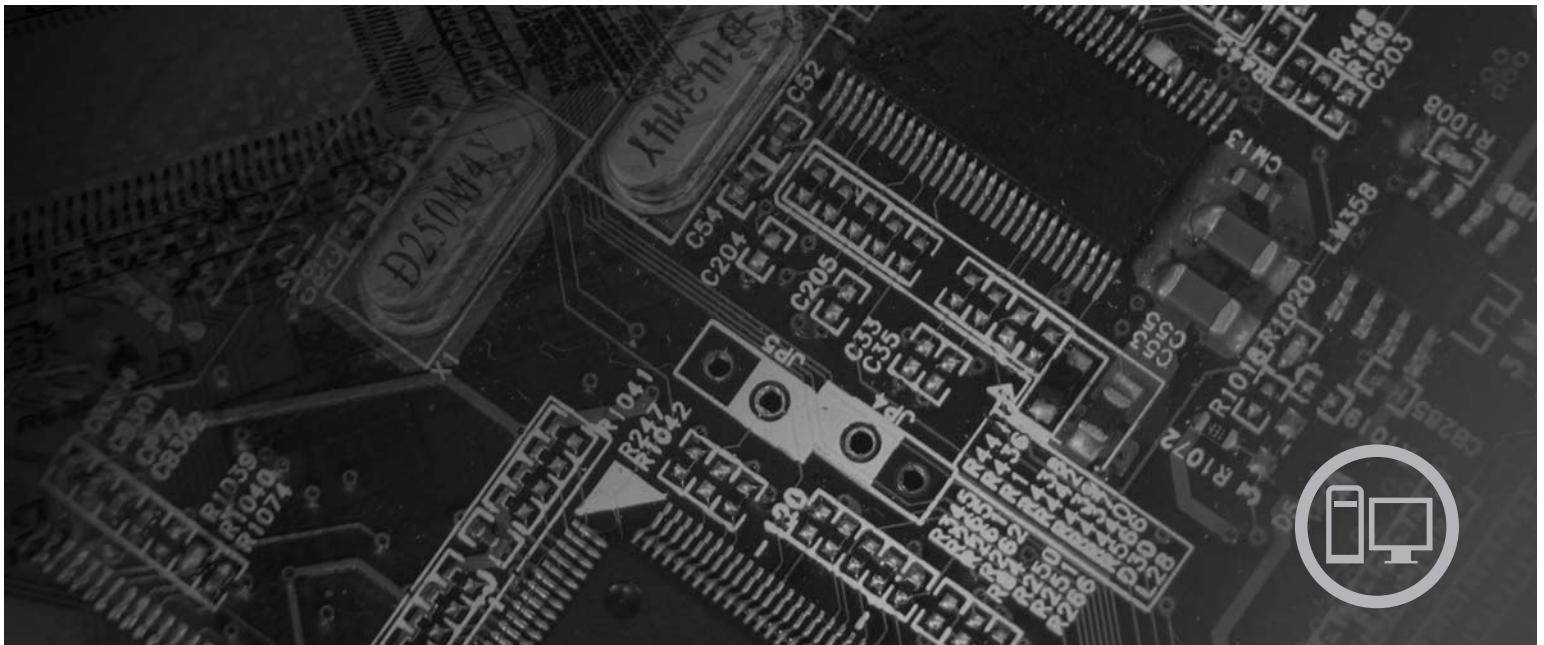




ThinkStation Hardware Installation and Replacement Guide



Machine Types 6423, 6483

lenovo

ThinkStation
Hardware Installation and Replacement
Guide

Note

Before using this information and the product it supports, be sure to read and understand the *Safety and Warranty Guide* for this product and "Notices," on page 51.

First Edition (2007)

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Chapter 1. Important safety information

CAUTION:

Before using this manual, it is important that you read and understand all the related safety information for this product. Refer to the *Safety and Warranty Guide* that you received with this product for the latest safety information. Reading and understanding the safety information reduces the risk of personal injury and damage to your product.

If you no longer have a copy of the *Safety and Warranty Guide*, you can obtain one online from the Lenovo Support Web site at:

<http://www.lenovo.com/support>.

Chapter 2. Overview

This guide contains information about replacing Customer Replaceable Units (CRUs).

This guide does not include procedures for all parts. It is expected that cables, switches, and certain mechanical parts be replaced by trained service personnel without the need for step-by-step procedures.

Note: Use only parts provided by Lenovo™.

This guide contains instructions for installing and or replacing the following parts:

- Battery
- Front Bezel
- Power supply
- Heat sink
- Hard disk drive
- Optical drive
- Diskette drive or card reader
- Memory modules
- Fan assembly
- Internal speaker
- Keyboard
- Mouse

Additional information resources

If you have Internet access, the most up-to-date information for your computer is available from the World Wide Web.

You can find:

- CRU removal and installation information
- CRU removal and installation videos
- Publications
- Troubleshooting information
- Parts information
- Downloads and drivers
- Links to other useful sources of information
- Support phone list

To access this information, point your browser to:
<http://www.lenovo.com/support>

Handling static-sensitive devices

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

When you handle parts 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 parts and other computer components carefully. Handle adapters, memory modules, system boards, and microprocessors by the edges. Never touch any exposed circuitry.
- Prevent others from touching the parts and other computer components.
- Before you replace a new part, 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 in the package and your body.
- When possible, remove the new part from the static-protective packaging, and install it directly in the computer without setting the part down. When this is not possible, place the static-protective package that the part came in on a smooth, level surface and place the part on it.
- Do not place the part on the computer cover or other metal surface.

Locations

This section contains illustrations to help locate the various connectors, controls, and components of the computer.

Locating controls and connectors on the front of your computer

Figure 1 shows the location of the controls and connectors on the front of your computer.

Note: Not all computer models will have the following controls and connections.

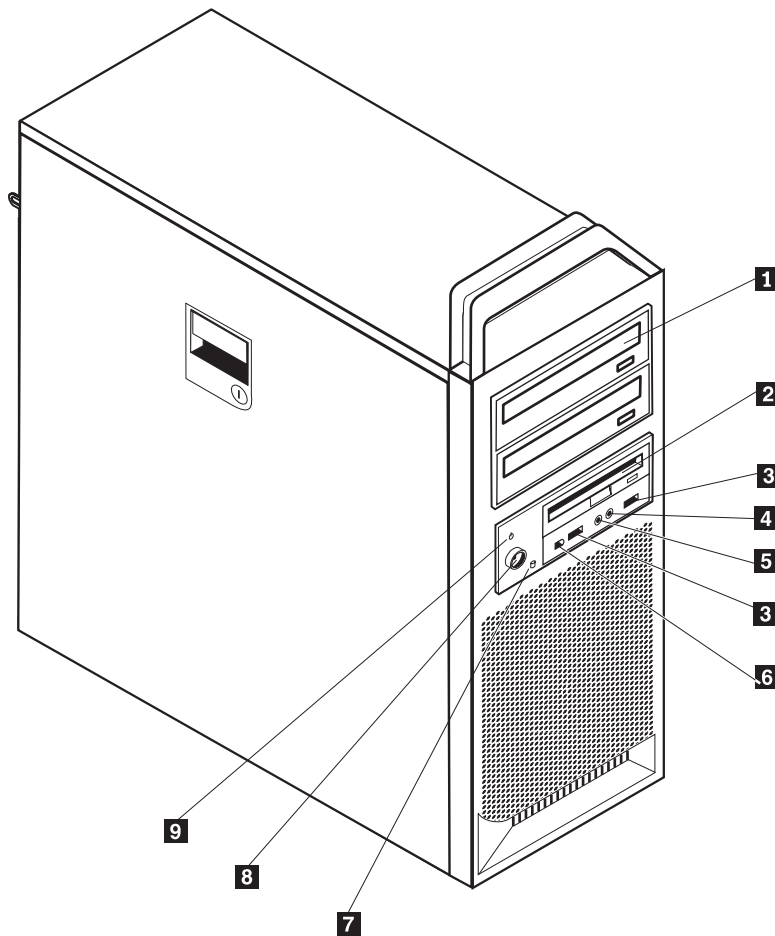


Figure 1. Controls and connectors

- | | | | |
|----------|---|----------|---------------------------|
| 1 | Optical drive (some models) | 6 | IEEE 1394 connector |
| 2 | 3.5 Diskette drive or card reader (some models) | 7 | Hard drive activity light |
| 3 | USB connectors (2) | 8 | Power button |
| 4 | Microphone connector | 9 | Power-on indicator |
| 5 | Headphone connector | | |

Locating connectors on the rear of your computer

Figure 2 shows the location of connectors on the rear of your computer. Some connectors on the rear of your computer are color-coded to help you determine where to connect the cables on your computer.

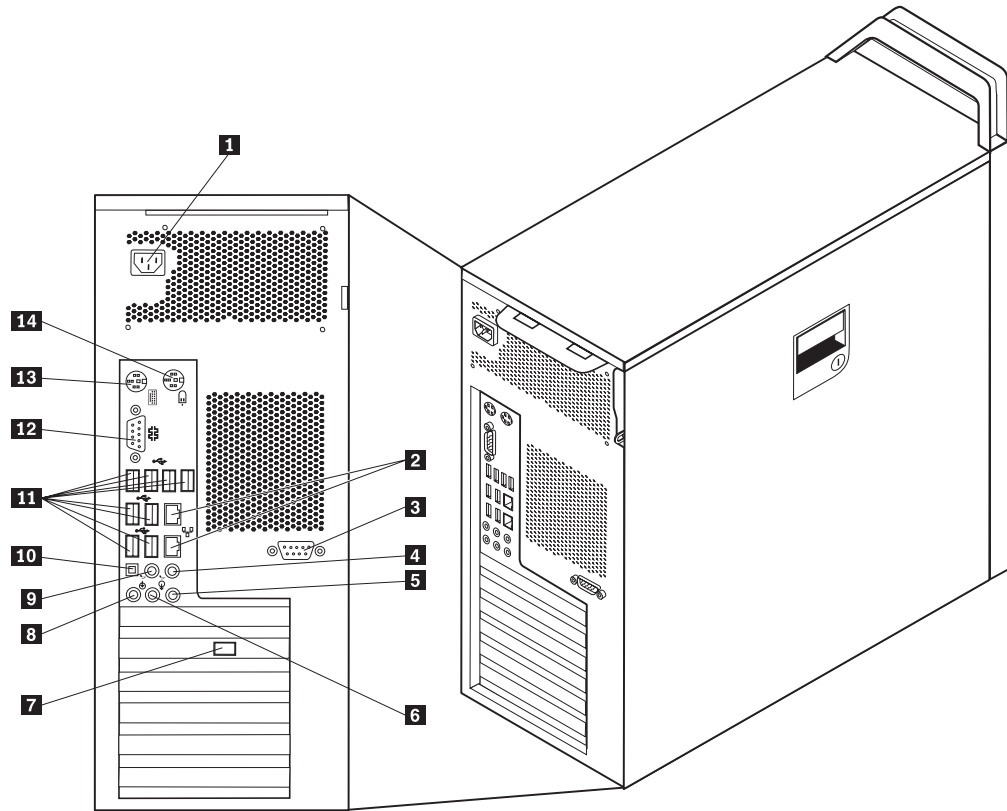


Figure 2. Connector locations

- | | | | |
|----------|---|-----------|---|
| 1 | Power cord connector | 8 | Microphone connector |
| 2 | Ethernet connector | 9 | Audio-line-out connector, rear speakers |
| 3 | Serial connector (some models) | 10 | SPDIF connector |
| 4 | Audio-line-out sub/center connector | 11 | USB connectors (8) |
| 5 | Audio-line-in connector | 12 | Serial connector |
| 6 | Audio-line-out front speakers connector | 13 | Keyboard connector |
| 7 | Video connector (some models) | 14 | Mouse connector |

Connector	Description
USB connectors	Used to attach a device that requires a Universal Serial Bus (USB) connection, such as a USB keyboard, USB mouse, USB scanner or USB printer. If you have more than eight USB devices, you can purchase a USB hub, which you can use to connect additional USB devices.
Ethernet connector	Used to attach an Ethernet cable for a local area network (LAN). Note: To operate the computer within FCC Class B limits, use a Category 5 Ethernet cable.
Serial connector	Used to attach an external modem, serial printer, or other devices that use a 9-pin serial connector.
Parallel connector	Used to attach a parallel printer, parallel scanner, or other devices that use a 25-pin parallel connector.
Audio-line-in connector	Used to receive audio signals from an external audio device, such as a stereo system. When you attach an external audio device, a cable is connected between the audio line out connector of the device and the audio line in connector of the computer.
Audio-line-out connector	Used to send audio signals from the computer to external devices, such as powered stereo speakers (speakers with built-in amplifiers), headphones, multimedia keyboards, or the audio line in connector on a stereo system or other external recording device. Used to send digital audio signals from a computer to an external device (such as an amplifier/receiver), through an optical cable.

Locating internal components

To open the computer cover, see “Opening the cover” on page 12.

Figure 3 on page 8 shows the location of the components in your computer.

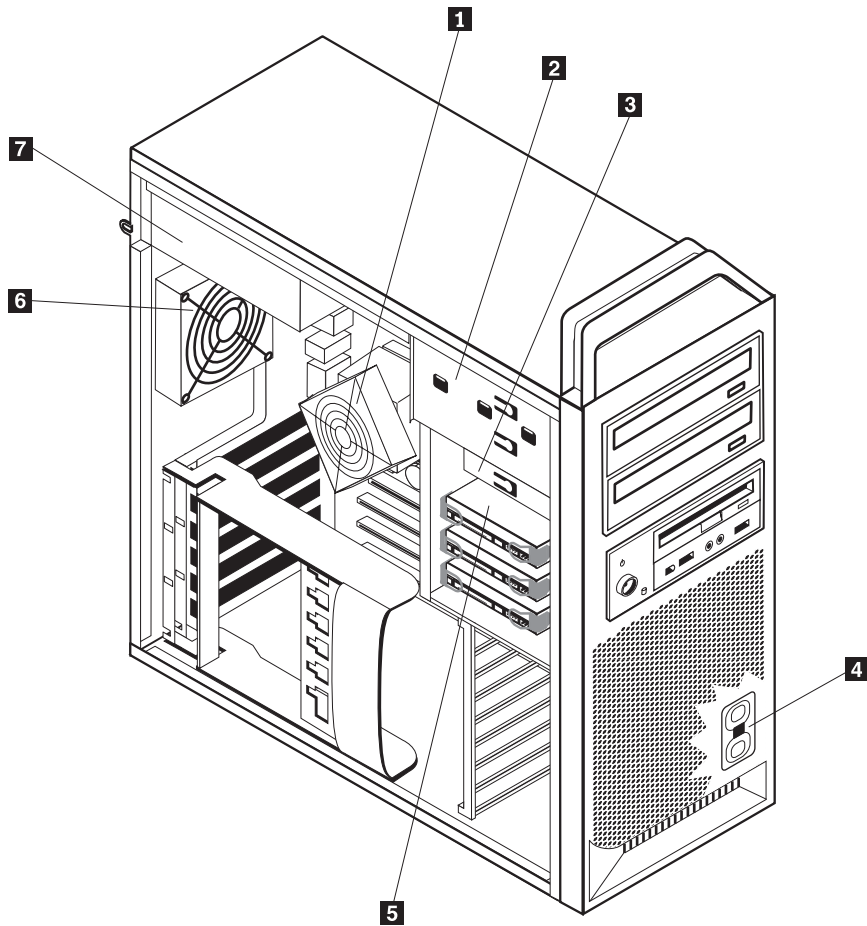


Figure 3. Component locations

- | | | | |
|----------|---|----------|-----------------------|
| 1 | Microprocessor and heat sink | 5 | Hard disk drive |
| 2 | Optical drive (such as a CD or DVD drive) | 6 | Rear fan assembly |
| 3 | 3.5 inch diskette drive or card reader | 7 | Power-supply assembly |
| 4 | Internal speaker | | |

Identifying parts on the system board

Figure 4 shows the location of parts on the system board.

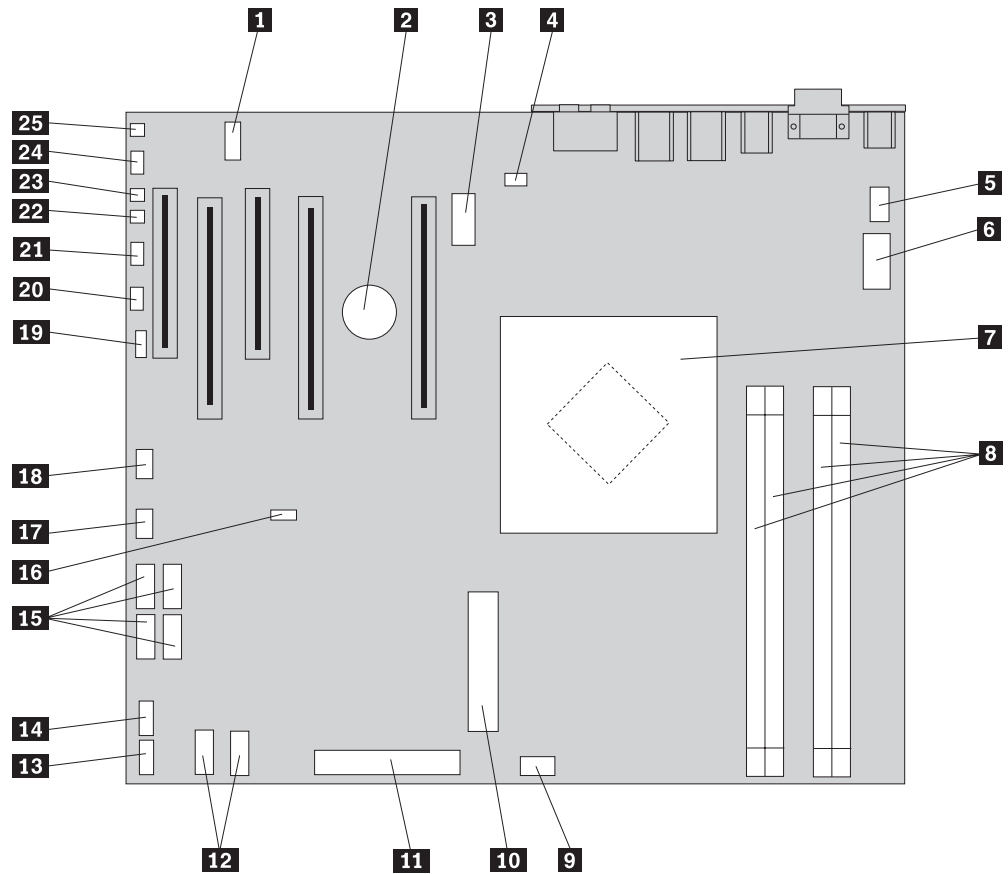


Figure 4. System board parts locations

1	COM2	14	Front USB connector
2	Battery	15	SATA connectors (4)
3	12 volt power connector, graphics	16	Clear CMOS/Recovery jumper
4	Rear fan connector	17	Front adapter fan connector
5	Microprocessor heat sink fan connector	18	IEEE 1394 Connector
6	Microprocessor 12 V power connector	19	SAS LED connector
7	Microprocessor and heat sink	20	Auxiliary LEDs connector
8	Memory connectors (4)	21	Front panel connector
9	Front hard disk drive fan connector	22	Cover tamper switch connector
10	24- pin system power connector	23	Ambient temperature connector
11	Diskette drive connector	24	Front audio connector
12	SATA connectors (2)	25	Internal speaker
13	Auxiliary USB connector		

Chapter 3. Installing options and replacing hardware

This chapter is an introduction to the features and options that are available for your computer. You can expand the capabilities of your computer by adding memory, adapters, or drives. When installing an option, use these instructions along with the instructions that come with the option.

Attention

Do not open your computer or attempt any repair before reading the "Important safety information" in the *Safety and Warranty Guide* that was included with your computer. To obtain a copy of the *Safety and Warranty Guide*, go to the Support Web site at <http://www.lenovo.com/support>.

Note: Use only parts provided by Lenovo.

Installing external options

External speakers, a printer, or a scanner can be connected to your computer. For some external options, you must install additional software in addition to making the physical connection. When adding an external option, see "Locating connectors on the rear of your computer" on page 6 and "Locating controls and connectors on the front of your computer" on page 5 to identify the required connector, and then use the instructions that are included with the option to help you make the connection and install any software or device drivers that are required for the option.

Installing internal options

Important

Read “Handling static-sensitive devices” on page 4 before opening the computer cover.

Opening the cover

To open the computer cover:

1. Remove any media (diskettes, CDs, or tapes) from the drives, shut down your operating system. Turn off all attached devices. Turn off the computer.

Important



Turn off the computer and wait 3 to 5 minutes to let the computer cool before opening the computer cover.

2. Unplug all power cords from electrical outlets.
3. Disconnect the cables attached to the computer. This includes power cords, input/output (I/O) cables, and any other cables that are connected to the computer. See “Locating controls and connectors on the front of your computer” on page 5 and “Locating connectors on the rear of your computer” on page 6.
4. Remove any locking devices, such as a cable lock or padlock that secures the computer cover. See Chapter 5, “Security features,” on page 49.
5. Disengage the cover latch **1**, and open the cover. Remove the cover and place it on a flat surface. See Figure 5 on page 13.

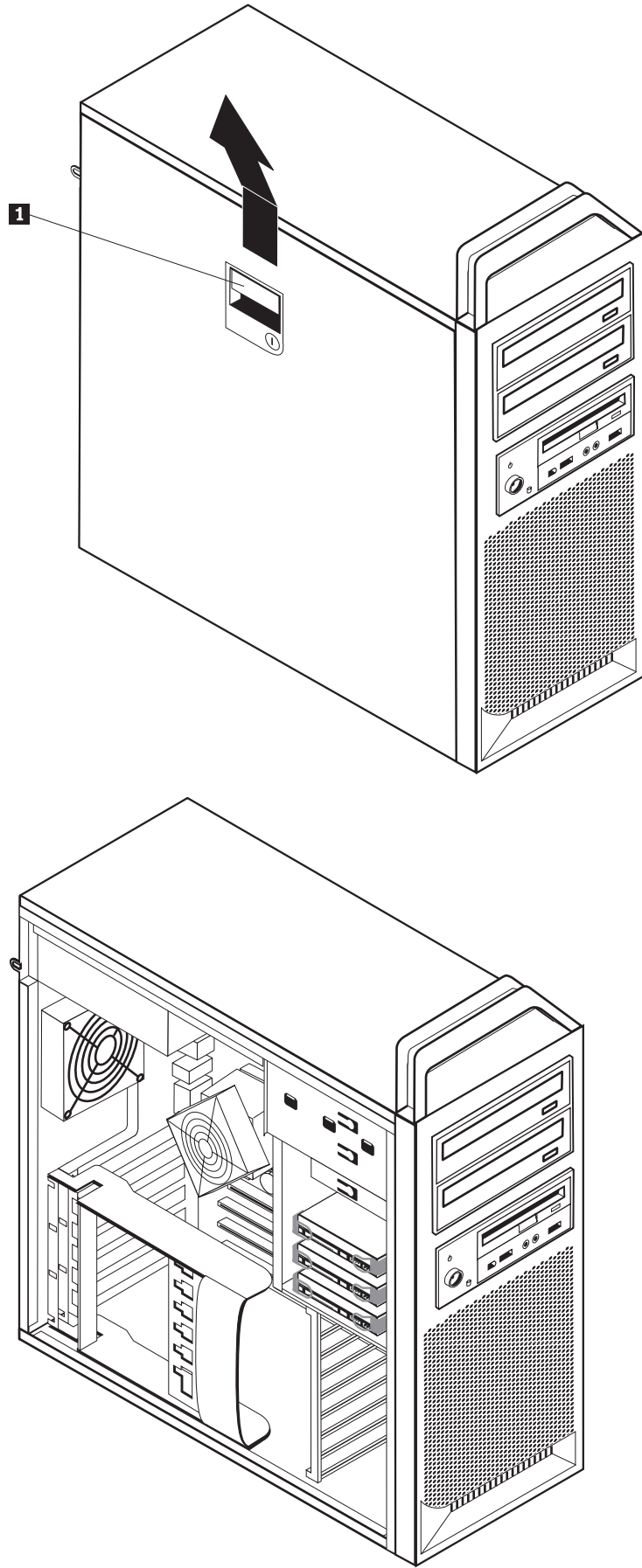


Figure 5. Removing the cover

To replace the cover:

1. Align the cover with the chassis.
2. Close the cover.
3. Engage the cover latch.
4. Check to be sure the cover is latched.
5. Secure the cover using your locking device.

Removing the front bezel

To remove the front bezel:

1. Remove the cover, see "Opening the cover" on page 12.
2. Disengage the bezel latches **1**, one at a time while rotating the bezel away from the computer just enough to keep the latches disengaged. See Figure 6.
3. Lay the front bezel on a flat surface.
4. Reverse these steps to replace the front bezel.

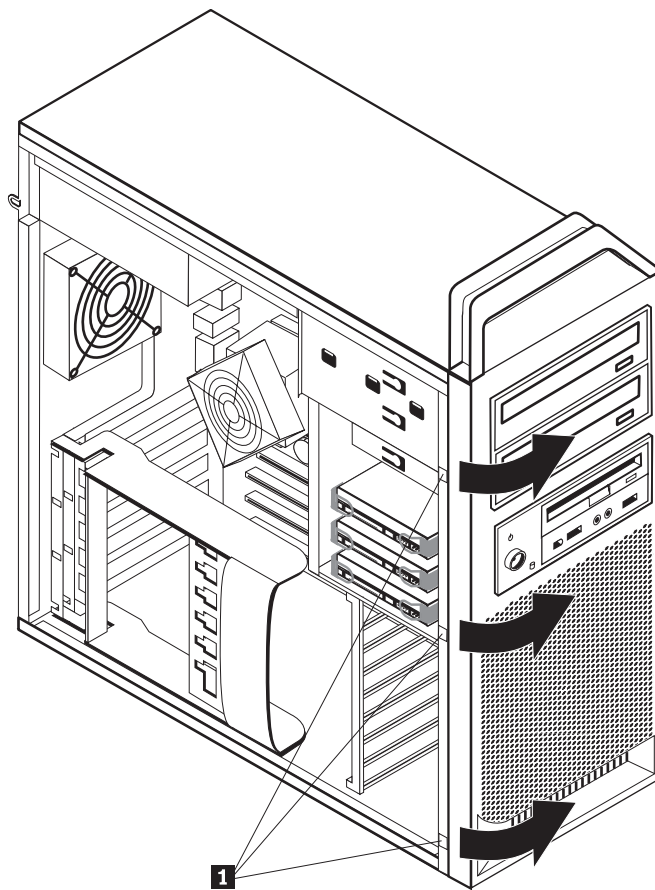


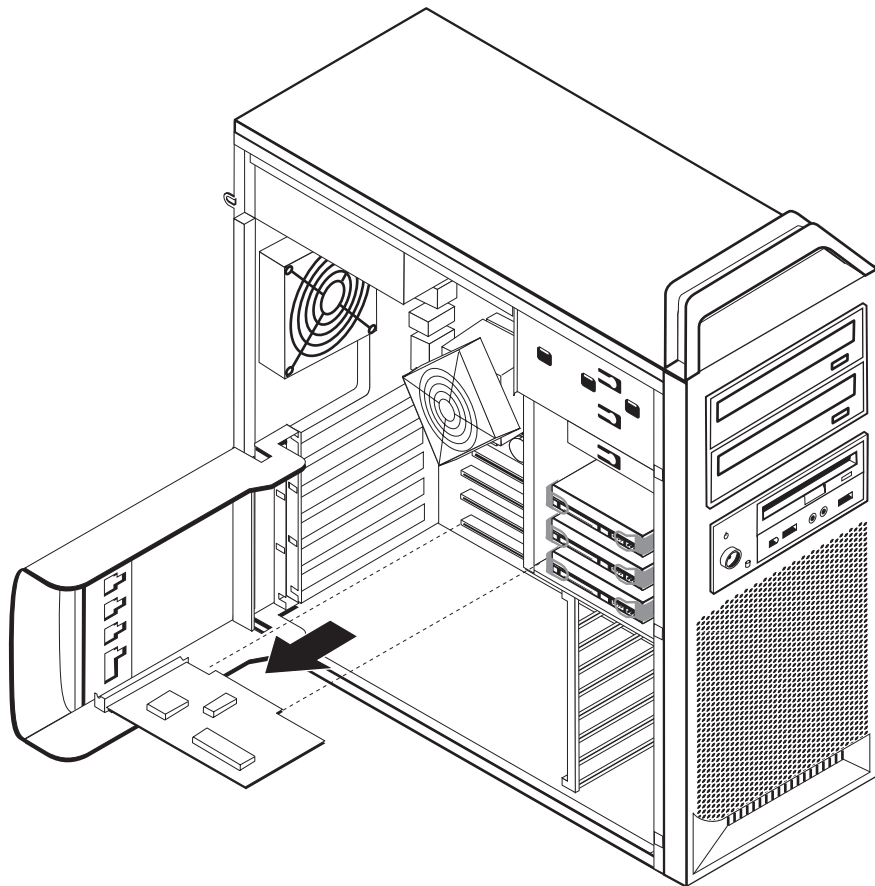
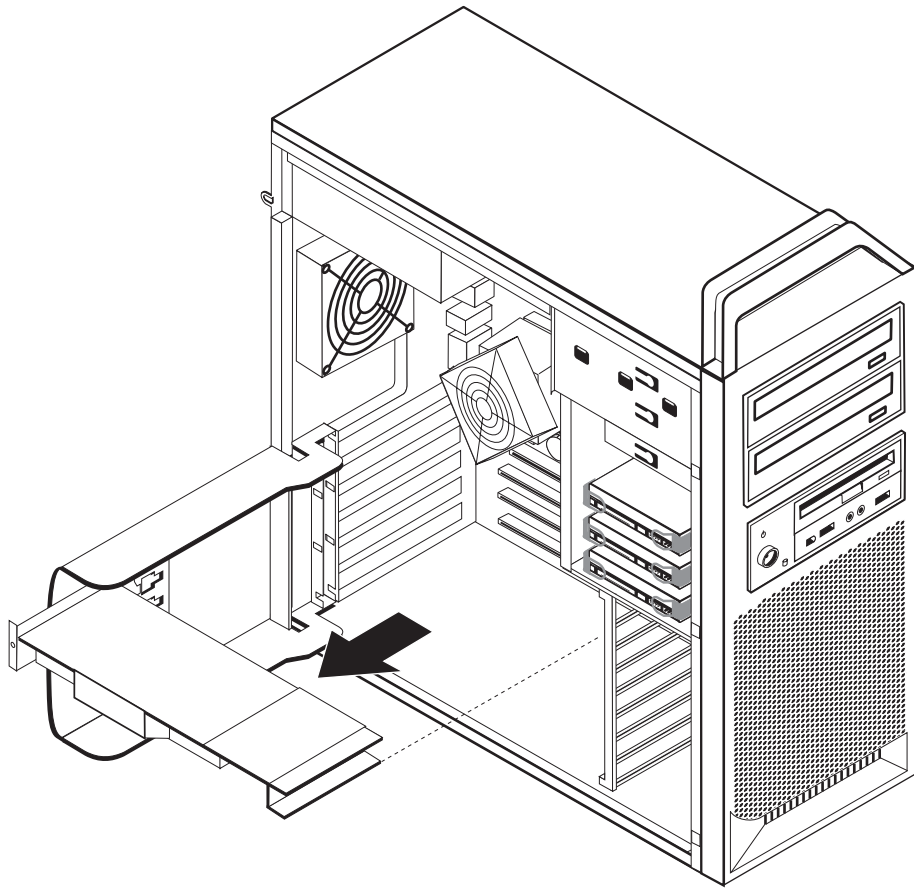
Figure 6. Removing the front bezel

Accessing system board components and drives

To access system board components:

1. Open the computer cover. See “Opening the cover” on page 12.
2. Unlatch and open the adapter card retainer.
3. Remove the hard disk drive fan and bracket (some models).
4. Take note of the location of all cable connections on the adapter cards. It will be necessary to reconnect them properly when replacing the cards.
5. Disconnect all cables connected to the adapter cards. See “Identifying parts on the system board” on page 9.
6. Remove the card retaining screw, if one is used.
7. Release the card support retaining latches. Grasp the adapter card and pull the card out of the slot. See “Replacing an adapter card” on page 28 for more information.

Note: The card is a tight fit, so it might be necessary to remove each side a little at a time until the card is removed from the card slot.



What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to Chapter 4, “Completing the parts replacement,” on page 45.

Installing internal drives

This section provides information and instructions for installing and removing internal drives.

Internal drives are devices that your computer uses to read and store data. You can add drives to your computer to increase storage capacity and to enable your computer to read other types of media. Some of the types of drives that are available for your computer are:

- Serial Advanced Technology Attachment (SATA) hard disk drives
- SATA optical drives, such as CD drives or DVD drives
- Removable media drives

Internal drives are installed in *bays*. In this book, the bays are referred to as bay 1, bay 2, and so on.

When you install an internal drive, it is important to note the type and size of drive that you can install in each bay. Also, it is important to correctly connect the internal drive cables to the installed drive.

Drive specifications

Your computer comes with the following factory-installed drives:

- An optical drive in bay 1
- A blank bay for expansion or optional optical drive
- A 3.5-inch diskette drive or a card reader in bay 3 (some models)

Any bay that does not have a drive installed has a static shield and bay panel installed.

Figure 8 on page 18 shows the location of the drive bays.

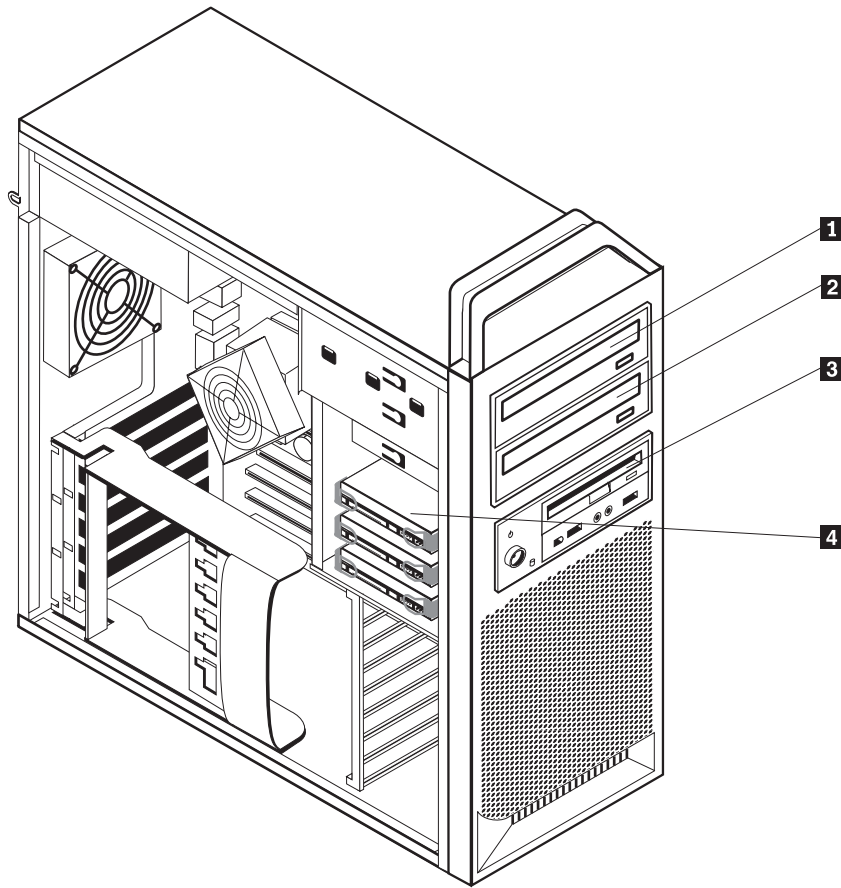


Figure 8. Drive bay locations

The following list describes the types and size of drives that you can install in each bay:

- | | |
|---|---|
| 1 Bay 1 - Maximum height: 43.0 mm (1.7 inch) | Optical drives, such as CD drive or DVD drive (preinstalled in some models) |
| 2 Bay 2 - Maximum height: 43.0 mm (1.7 inch) | Optional drives such as CD drive or DVD drive (preinstalled in some models) |
| 3 Bay 3 - Maximum height: 26.1 mm (1.0 inch) | 3.5-inch diskette drive
card reader (preinstalled in some models) |
| 4 Bay 4 | Hard disk drives (preinstalled) |

Installing a drive for bay 1

To install the optical drive for bay 1:

1. Open the computer cover. See “Opening the cover” on page 12.
2. Remove the front bezel. See “Removing the front bezel” on page 14.

Note: On the inside of the front bezel where the drive is to be located there is a drive adapter plate for installing new drive. Remove the drive adapter plate and use it to install the drive.

3. Remove the plastic drive cover from the bezel.
4. For drive bay one, remove the static shield (for bay one the static shield just pulls out).
5. Install the adapter plate on the left side of the drive to be installed.
6. Slide the drive into the bay until it locks into position.

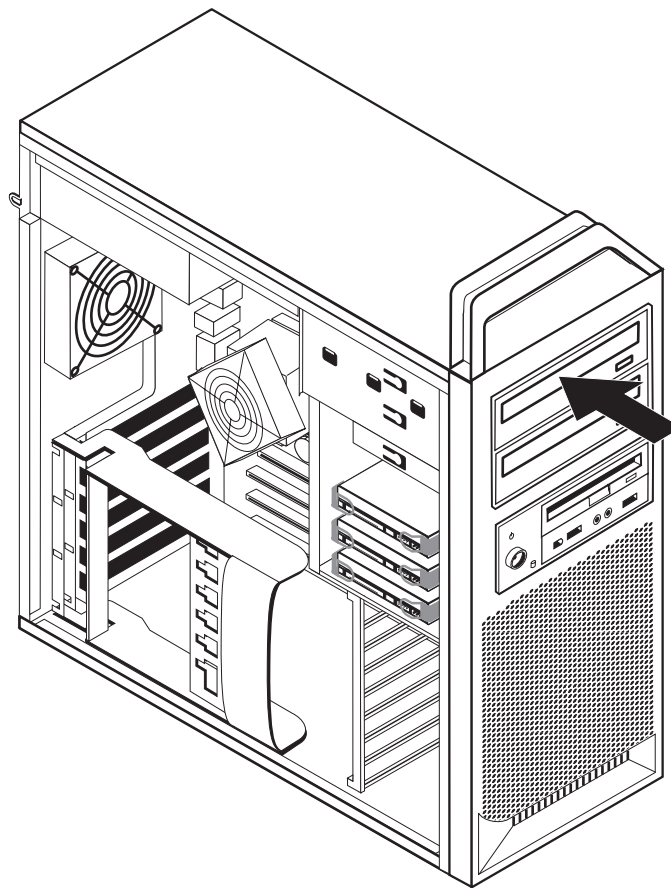


Figure 9. Installing an optical drive

7. Connect the drive cables.
8. Install the front bezel.

What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to Chapter 4, “Completing the parts replacement,” on page 45.

Installing a drive for bay 2

To install the optical drive for bay 2:

1. Open the computer cover. See “Opening the cover” on page 12.
2. Remove the front bezel. See “Removing the front bezel” on page 14.

Note: On the inside of the front bezel where the drive is to be located there is a drive adapter plate. If there is no drive installed there are drive adapter plates for each drive. Remove the drive adapter plate and use it to install the drive.

3. Remove the plastic drive cover from the bezel.
4. For drive bay two, remove the static shield (for bay two the static shield just pulls out).
5. Install the adapter plate on the left side of the drive to be installed.
6. Slide the drive into the bay until it locks into position.

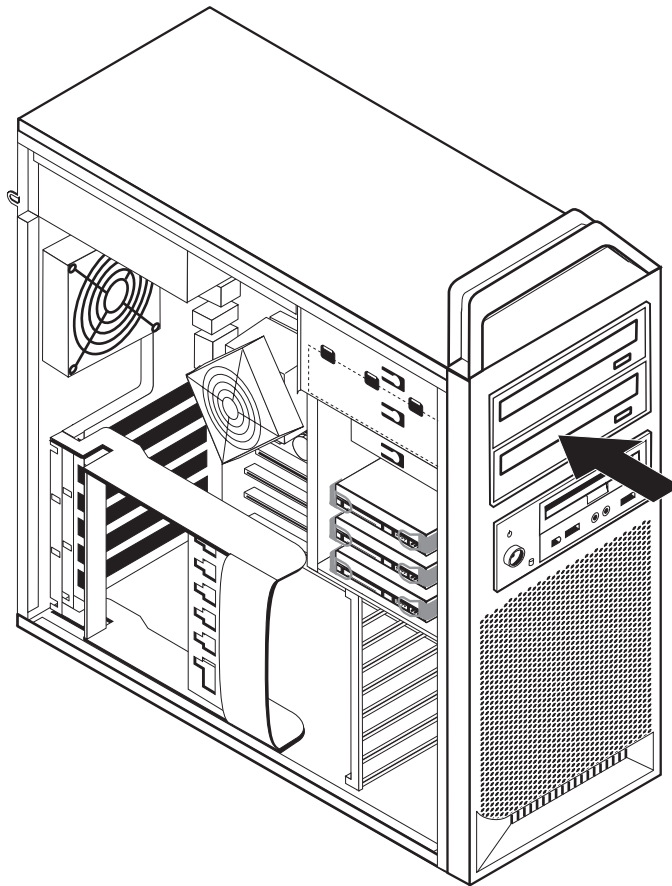


Figure 10. Installing an optical drive

7. Connect the drive cables.
8. Install the front bezel.

What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to Chapter 4, “Completing the parts replacement,” on page 45.

Installing a diskette drive or card reader in bay 3

To install a diskette drive or card reader in bay 3:

1. Open the computer cover. See “Opening the cover” on page 12.
2. Remove the front bezel . See “Removing the front bezel” on page 14.
3. Remove the plastic panel in the bezel by squeezing the plastic tabs that secure the panel on the inside of the bezel.

Note: On the inside of the front bezel where the drive is to be located there is a drive adapter plate for each drive. Remove the drive adapter plate and use it to install the drive.

4. Slide the diskette drive to the locked position. See “Locating internal components” on page 7.

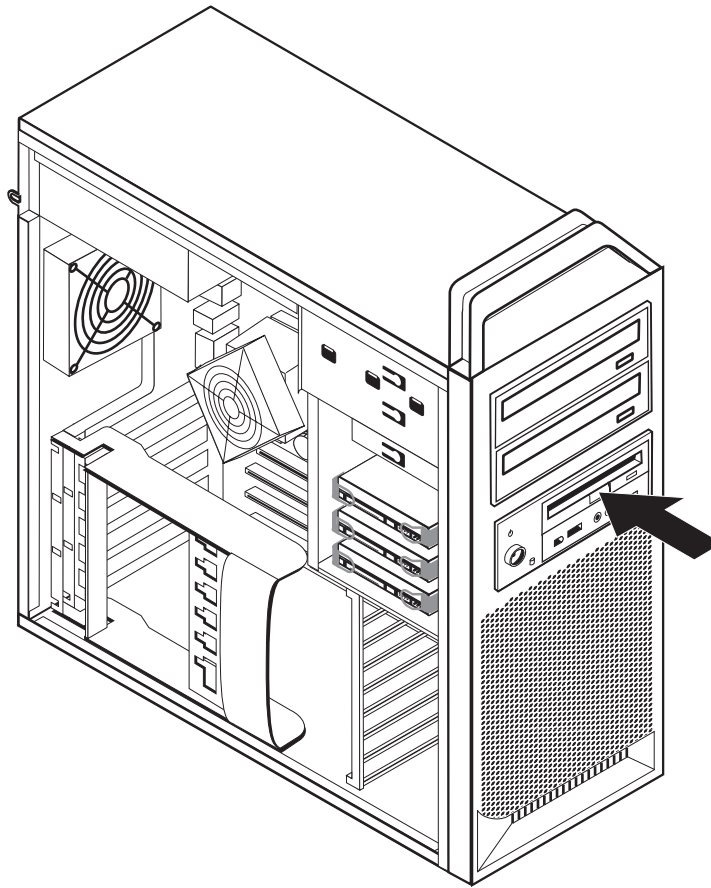


Figure 11. Installing a new drive

5. Connect the flat cable to the new drive.
6. Reinstall the front bezel.

What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to Chapter 4, “Completing the parts replacement,” on page 45.

Erasing a lost or forgotten password (clearing CMOS)

This section applies to lost or forgotten passwords. For more information about lost or forgotten passwords, go to the ThinkVantage Productivity Center program.

To erase a forgotten password:

1. Open the computer cover. See “Opening the cover” on page 12.
2. Access the system board. See “Accessing system board components and drives” on page 15.
3. Locate the Clear CMOS/Recovery jumper on the system board. See “Identifying parts on the system board” on page 9.
4. Move the jumper from the standard position (pins 1 and 2) to the maintenance or configure position (pins 2 and 3).
5. Lower the drive-bay assembly and reconnect any cables that were disconnected.
6. Close the computer cover and connect the power cord. See Chapter 4, “Completing the parts replacement,” on page 45.
7. Restart the computer, leave it on for approximately 10 seconds. Turn off the computer by holding the power switch for approximately 5 seconds. The computer will turn off.
8. Repeat steps 1 through 3 on page 23.
9. Move the Clear CMOS/Recovery jumper back to the standard position (pins 1 and 2).
10. Close the computer cover and connect the power cord. See Chapter 4, “Completing the parts replacement,” on page 45.

Replacing the battery

Your computer has a special type of memory that maintains the date, time, and settings for built-in features, such as serial-port 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, time, and configuration information (including passwords) are lost. An error message is displayed when you turn on the computer.

Refer to the "Lithium battery notice" in the *Safety and Warranty Guide* for information about replacing and disposing of the battery.

To change the battery:

1. Turn off the computer and disconnect the power cord from the electrical outlet and from the computer.
2. Open the computer cover. See "Opening the cover" on page 12.
3. Access the system board. See "Accessing system board components and drives" on page 15.
4. Locate the battery. See "Identifying parts on the system board" on page 9.
5. Remove the old battery. See Figure 12.

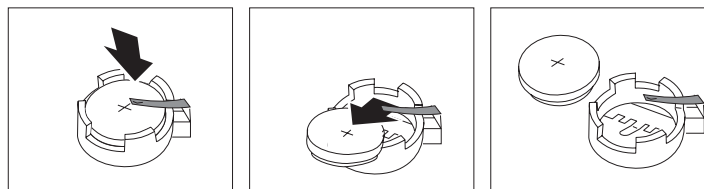


Figure 12. Battery removal

6. Install the new battery. See Figure 13.

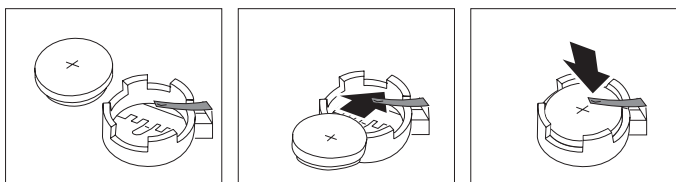


Figure 13. Battery installation

7. Close the computer cover, and connect the cables. See Chapter 4, "Completing the parts replacement," on page 45.

Note: When the computer is turned on for the first time after battery replacement, 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 and any passwords. See *ThinkStation User Guide* "Using the Setup Utility".

Replacing the power supply assembly

Attention

Do not open your computer or attempt any repair before reading the “Important safety information” in the *Safety and Warranty Guide* that was included with your computer. To obtain a copy of the *Safety and Warranty Guide*, go to the Support Web site at <http://www.lenovo.com/support>.

To replace the power-supply assembly:

1. Open the computer cover. See “Opening the cover” on page 12.
2. Locate the power-supply assembly. See “Locating internal components” on page 7.
3. Disconnect the power-supply cables **1**, **2**, and **3** from the system-board connectors, all adapter cards (some models) and from all drives. See Figure 14.

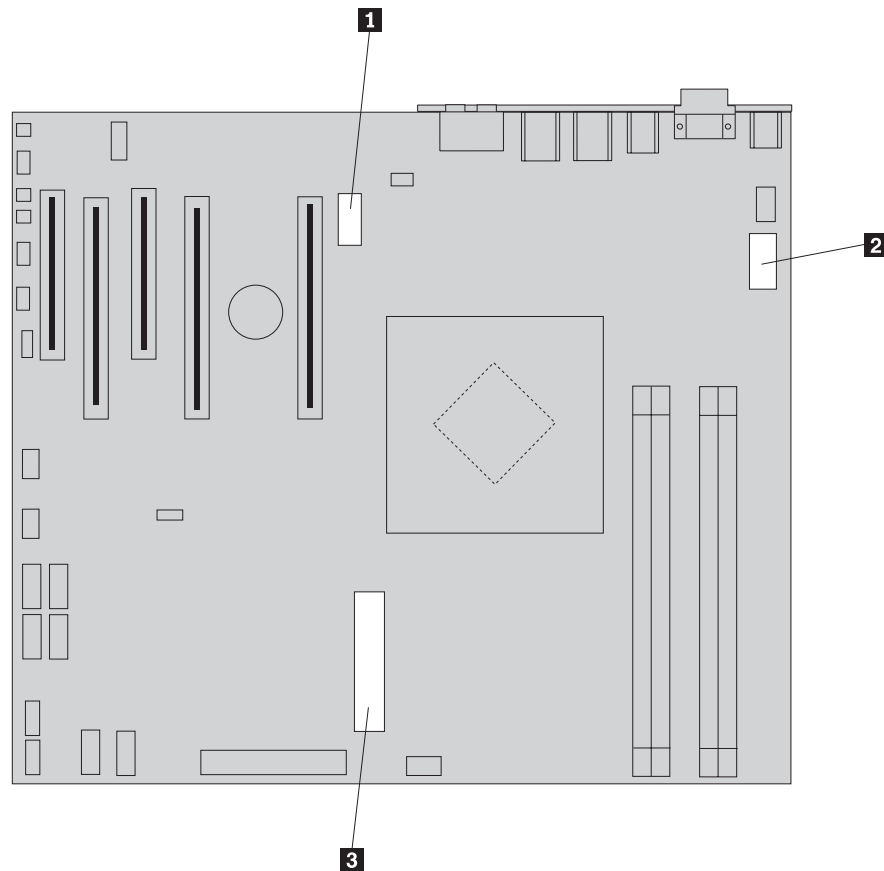


Figure 14. System-board connectors

4. Remove the power-supply cables from the cable clips and ties.
5. Remove the four screws at the rear of the chassis that secure the power supply. See Figure 15 on page 26.

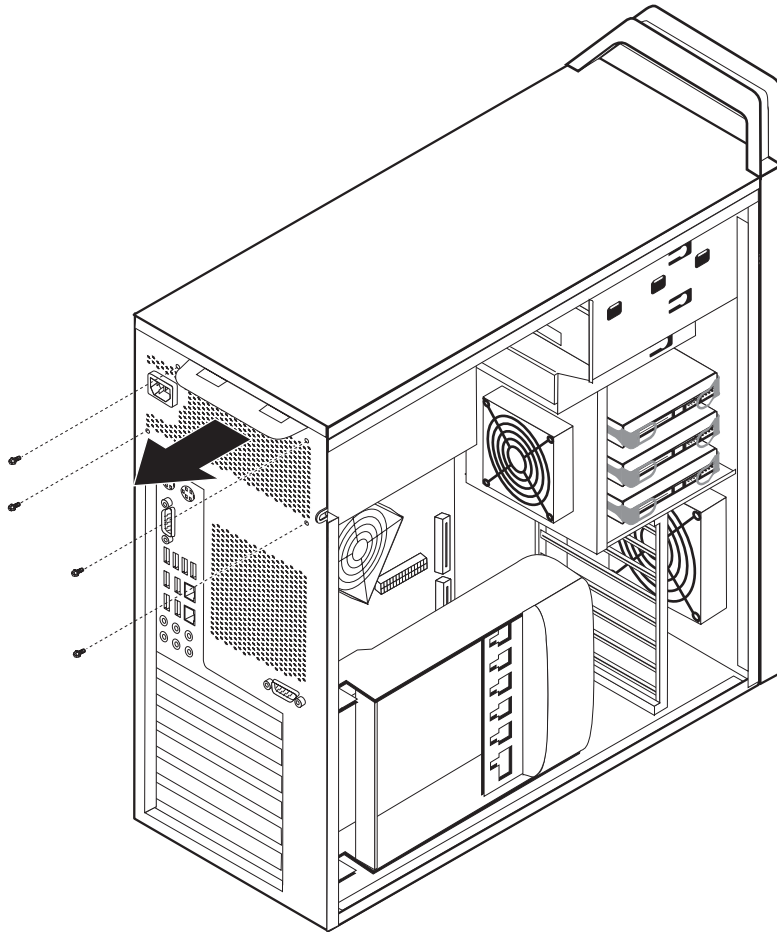


Figure 15. Replacing the power-supply-retaining screws

6. Depress the power supply latch **1**. Slide the power-supply assembly toward the front of the computer, remove it from the chassis. See Figure 16.

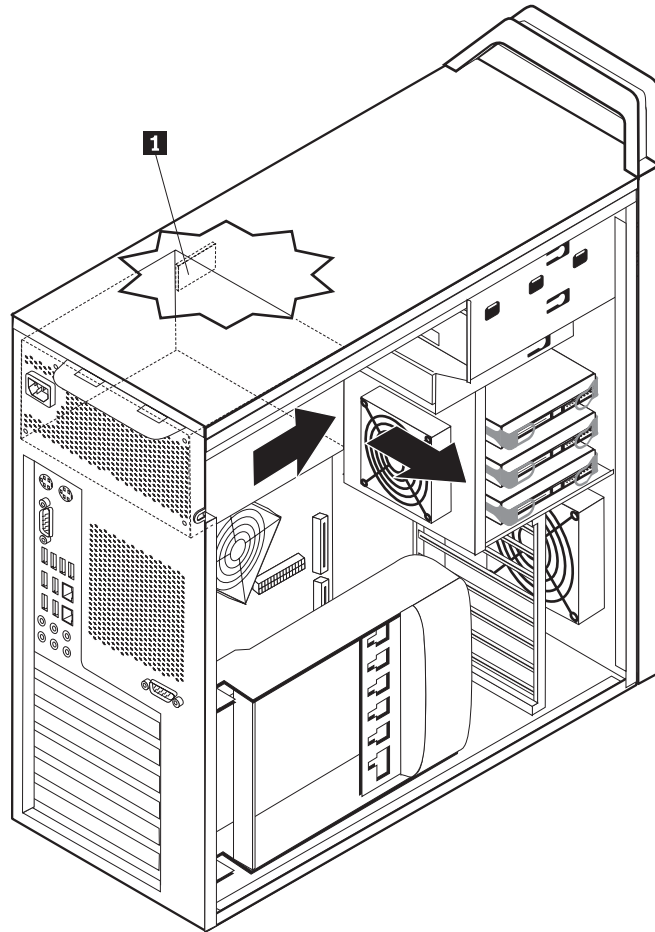


Figure 16. Removing the power supply

7. 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.

Note: Use only the screws provided by Lenovo.

8. Install and tighten the four screws at the rear of the chassis to secure the power-supply assembly.
9. Ensure that the power supply is the correct replacement. Some power supplies auto sense the voltage, some power supplies are voltage specific, and some power supplies have a voltage selection switch. If there is a selection switch use a ballpoint pen to slide the switch, if necessary.

Note: For models that have a switch:

- If the voltage supply range is 100–127 V ac, set the switch to 115 V.
 - If the voltage supply range is 200–240 V ac, set the switch to 230 V.
10. Reconnect all the power supply cables to the drives, adapters, and the system board. Make sure to reconnect power to the graphics cards that require an additional cable.
 11. Go to Chapter 4, “Completing the parts replacement,” on page 45.

Replacing an adapter card

1. Turn off the computer and allow the computer to cool for 3-5 minutes.
2. Open the computer cover. See “Opening the cover” on page 12.
3. Unlatch and open the card retainer.
4. Take note of the location of all cable connections on the adapter card. It will be necessary to reconnect them properly when installing a new card.
5. Disconnect all cables connected to the adapter card. See “Identifying parts on the system board” on page 9.
6. Some models have:
 - A screw installed in the adapter bracket, remove this screw.
 - An additional retention feature located on the card guide end. Push the retention feature toward the front of the chassis before removing the adapter card.
7. Release the card support retaining latches. Grasp the adapter card and pull the card out of the slot.

Note: The card is a tight fit, so it might be necessary to remove each side a little at a time until the card is removed from the card slot.

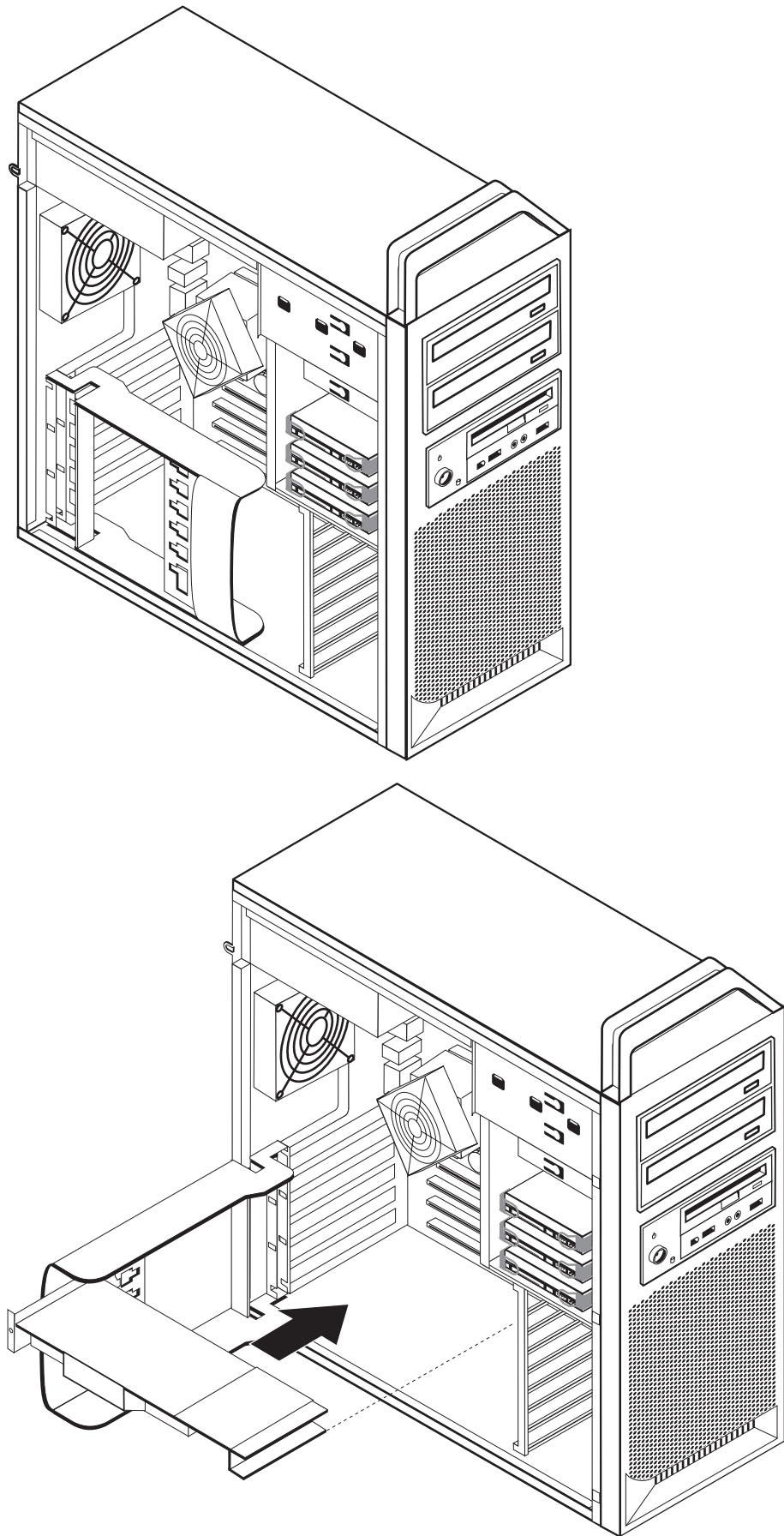


Figure 17. Installing an adapter card

- Reverse this procedure to install the card, and then proceed to step 9.
- Go to Chapter 4, "Completing the parts replacement," on page 45.

Replacing the heat sink

Attention

Do not open your computer or attempt any repair before reading the "Important safety information" in the *Safety and Warranty Guide* that was included with your computer. To obtain a copy of the *Safety and Warranty Guide*, go to the Support Web site at <http://www.lenovo.com/support>.

This section provides instructions on how to replace the heat sink.

To replace the heat sink:

- Open the computer cover. See "Opening the cover" on page 12.
- Remove the heat sink fan cable from the system board. Note the cable location.
- Remove the heat sink from the system board by removing the 4 screws holding the heat sink to the system board **1**. Carefully lift the heat sink off of the system board. See Figure 18.

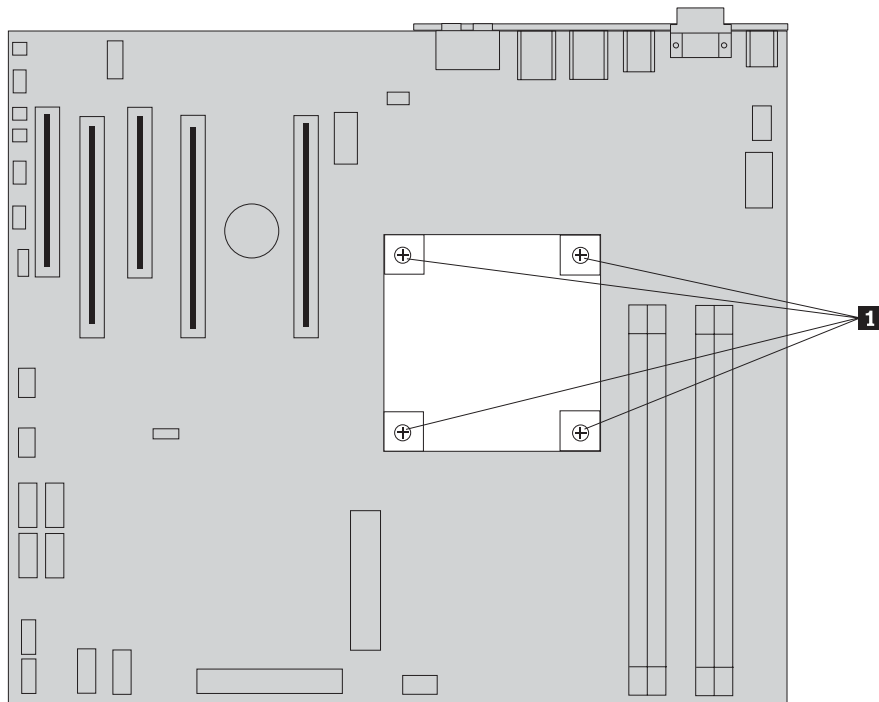


Figure 18. Removing the heat sink

- Remove the plastic covering from the bottom of the new heat sink to expose the heat sink grease (this cover protects the heat sink grease from contamination).

Note: Do not remove the plastic covering the grease until you are ready to install the heat sink on the microprocessor. Do not touch the grease the heat sink. Do not put the heat sink anywhere except on the microprocessor after the plastic covering has been removed and the grease exposed.

5. Place the new heat sink into position and replace the 4 screws to secure the heat sink.
6. Reconnect the heat sink fan cable.
7. Go to Chapter 4, “Completing the parts replacement,” on page 45.

Replacing a hard disk drive

Attention

Do not open your computer or attempt any repair before reading the “Important safety information” in the *Safety and Warranty Guide* that was included with your computer. To obtain a copy of the *Safety and Warranty Guide*, go to the Support Web site at <http://www.lenovo.com/support>.

This section provides instructions on how to replace the hard disk drive.

Important

When you receive a new hard disk drive, you also receive a set of *Product Recovery CDs*. The set of *Product Recovery CDs* will enable you to restore the contents of the hard disk to the same state as when your computer was originally shipped from the factory. For more information on recovering factory-installed software, refer to “Recovering software” in your *ThinkStation User Guide*.

Note: When replacing a hard disk drive in a raid configured array, depending on which type of array is used, rebuilding the raid array might be required. If the array is redundant, make sure to connect the new drive to the same port from which the replaced drive was removed.

To replace the hard disk drive:

1. Open the computer cover. See “Opening the cover” on page 12.
2. Disconnect the signal and power cables from the hard disk drive.
3. Pull the handle to remove the hard disk drive. See Figure 19 on page 32.

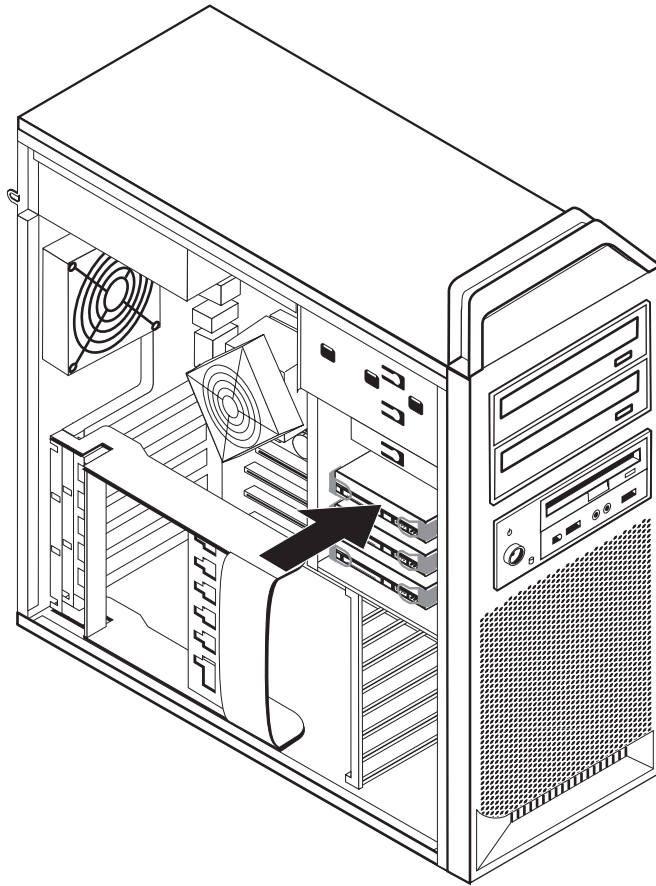


Figure 19. Removing the hard disk drive

4. Remove the failing hard disk drive from the bracket by flexing the bracket.
5. Install the new drive into the bracket, flex the bracket, and align the pins **1** through **4** on the bracket with the holes in the hard disk drive. See Figure 20 on page 33. Do not touch the circuit board **5** on the bottom of the hard disk drive.

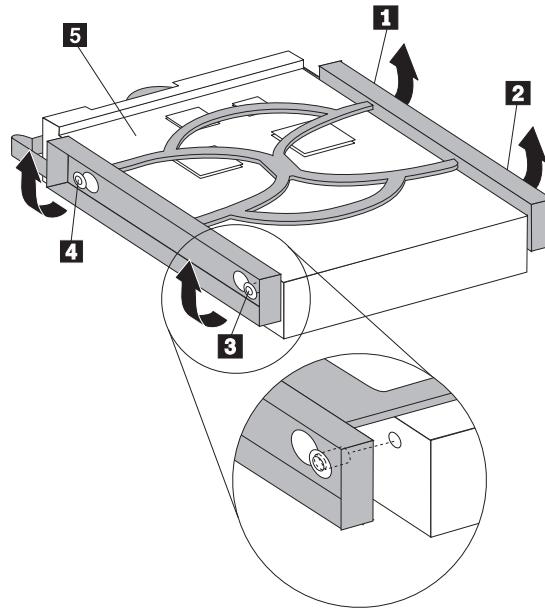


Figure 20. Replacing the hard disk drive

6. Install the hard disk drive and bracket into the drive bay.
7. Connect the signal and power cables to the rear of the new hard disk drive.
8. Go to Chapter 4, “Completing the parts replacement,” on page 45.

Replacing the optical drive

Attention

Do not open your computer or attempt any repair before reading the “Important safety information” in the *Safety and Warranty Guide* that was included with your computer. To obtain a copy of the *Safety and Warranty Guide*, go to the Support Web site at <http://www.lenovo.com/support>.

This section provides instructions on how to replace the optical drive.

1. Open the computer cover. See “Opening the cover” on page 12.
2. Remove the front bezel. See “Removing the front bezel” on page 14.
3. Locate the optical-drive connectors. See “Identifying parts on the system board” on page 9.
4. Note the location of the optical-drive cables. Disconnect the signal and power cables from the rear of the optical drive.
5. Press the drive latch **1** (for the drive you want to remove) and slide the optical-drive from the chassis. See Figure 21 on page 34.

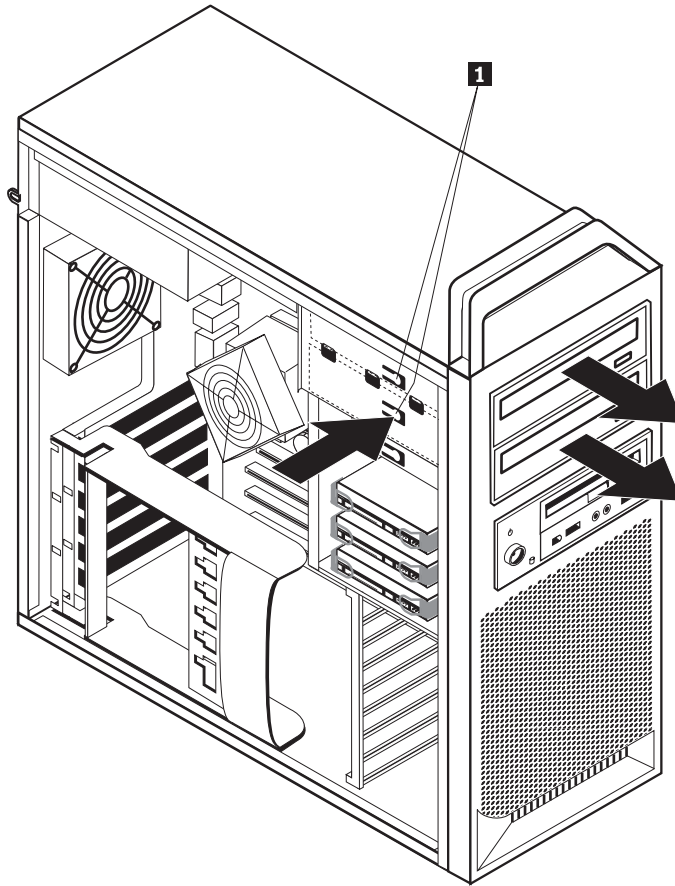


Figure 21. Removing the diskette drive or optional card reader drive

6. Install the new optical-drive from the front of the drive-bay assembly. Slide the optical-drive toward the rear of the chassis to lock the drive into position.
7. Connect the flat cable to the new optical-drive.
8. Go to Chapter 4, "Completing the parts replacement," on page 45.

Replacing the diskette drive or optional card reader

Attention

Do not open your computer or attempt any repair before reading the "Important safety information" in the *Safety and Warranty Guide* that was included with your computer. To obtain a copy of the *Safety and Warranty Guide*, go to the Support Web site at <http://www.lenovo.com/support>.

This section provides instructions on how to replace the diskette drive.

1. Open the computer cover. See "Opening the cover" on page 12.
2. Remove the front bezel. See "Removing the front bezel" on page 14.
3. Locate the drive cable connectors. See "Identifying parts on the system board" on page 9.
4. Note the location of the drive cables. Disconnect the drive cables from the system board.

5. Press the drive latch **1** and slide the drive from the chassis. See Figure 22.

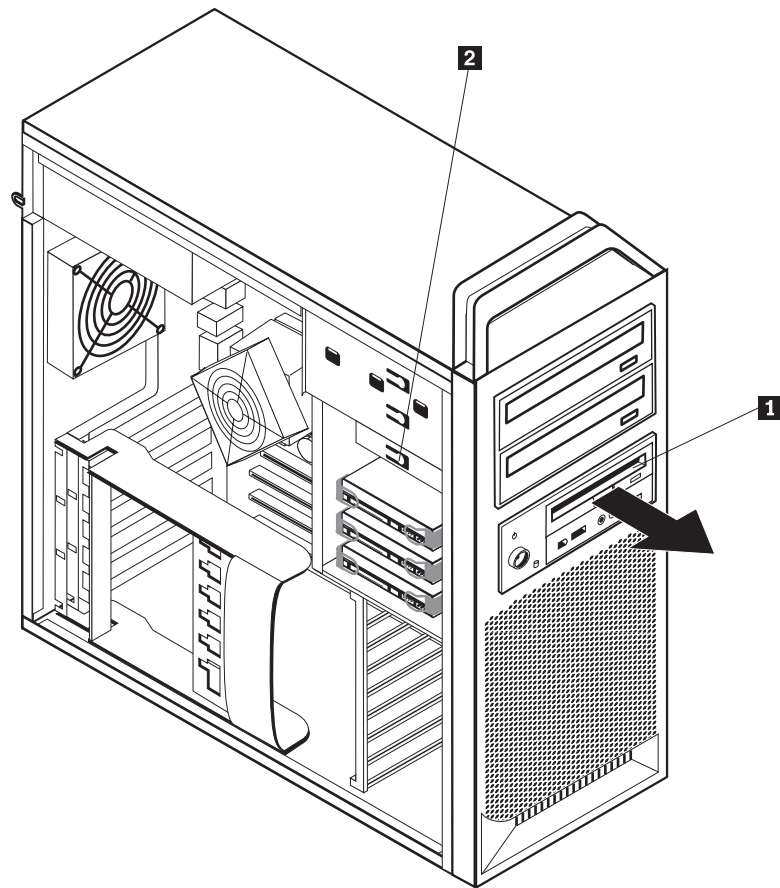


Figure 22. Removing the diskette drive or optional card reader drive

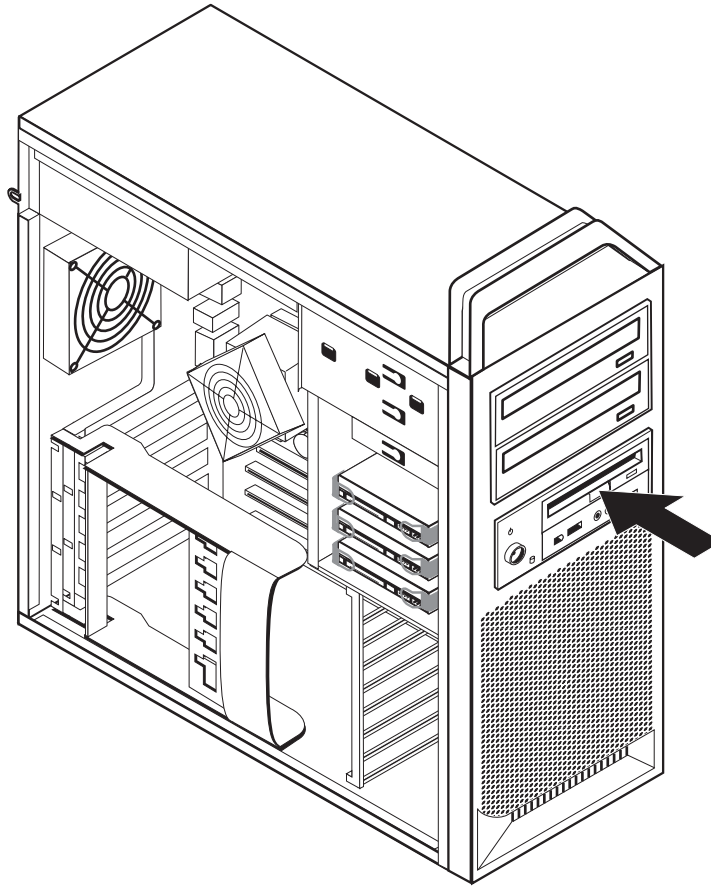


Figure 23. Replacing the diskette drive or optional card reader drive

6. Disconnect the flat cable from the rear of the failing diskette drive.
7. Connect the flat cable to the new diskette drive.
8. Install the new drive into the drive-bay assembly and lock the drive into position.
9. Go to Chapter 4, "Completing the parts replacement," on page 45.

Installing or replacing a memory module

Attention

Do not open your computer or attempt any repair before reading the "Important safety information" in the *Safety and Warranty Guide* that was included with your computer. To obtain a copy of the *Safety and Warranty Guide*, go to the Support Web site at <http://www.lenovo.com/support>.

This section provides instructions on how to replace a memory module.

Note: Your computer has support for four memory modules.

1. Open the computer cover. See "Opening the cover" on page 12.
2. Locate the memory-module connectors. See "Identifying parts on the system board" on page 9. If you are installing additional memory be sure the retaining clips are open.

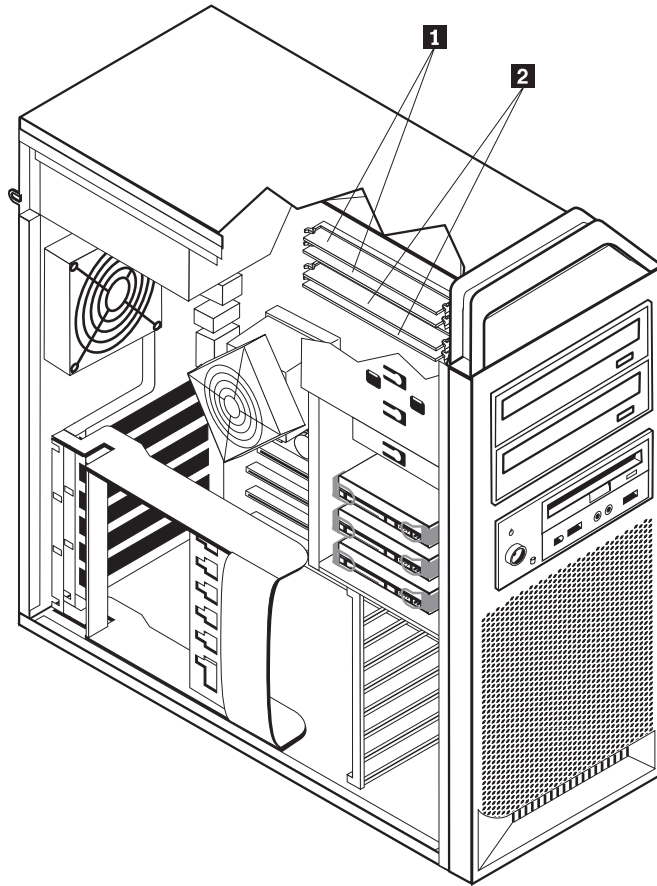


Figure 24. Memory modules

3. Remove the memory module being replaced by opening the retaining clips. See Figure 25.

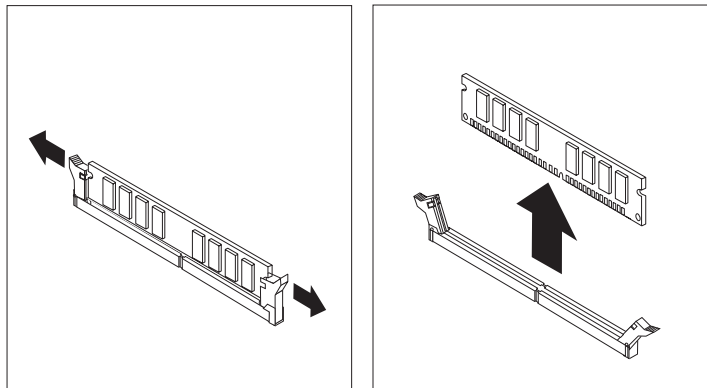


Figure 25. Removing a memory module

4. Position the replacement memory module over the memory connector. Make sure the notch **1** on the memory module aligns correctly with the connector key **2** on the system board. Push the memory module straight down into the connector until the retaining clips close. See Figure 26 on page 38.

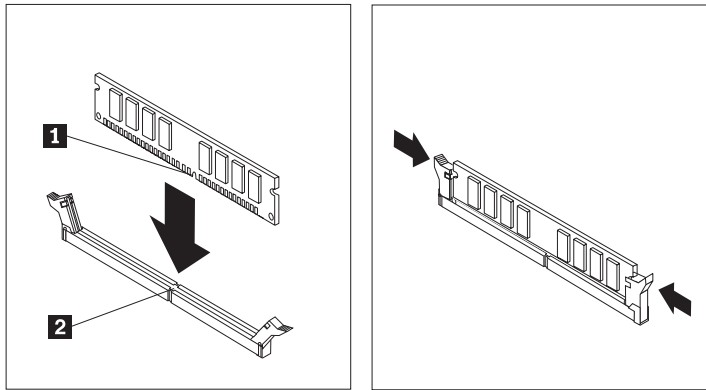


Figure 26. Installing a memory module

5. Go to Chapter 4, “Completing the parts replacement,” on page 45.

Replacing the fan assembly

Attention

Do not open your computer or attempt any repair before reading the “Important safety information” in the *Safety and Warranty Guide* that was included with your computer. To obtain a copy of the *Safety and Warranty Guide*, go to the Support Web site at <http://www.lenovo.com/support>.

This section provides instructions on how to replace the fan assembly.

1. Open the computer cover. See “Opening the cover” on page 12.
2. Skip to step 4 if you are not replacing the front fan. If you are replacing the front fan (some models) go to step 3.
3. Remove the front bezel. See “Removing the front bezel” on page 14.
4. Note the routing of the fan-assembly wiring. See “Identifying parts on the system board” on page 9. Disconnect the fan-assembly-wiring connector from the system board.

5. Remove the fan assembly by releasing the fan grommets as shown. See Figure 27. Then remove the fan and wiring.

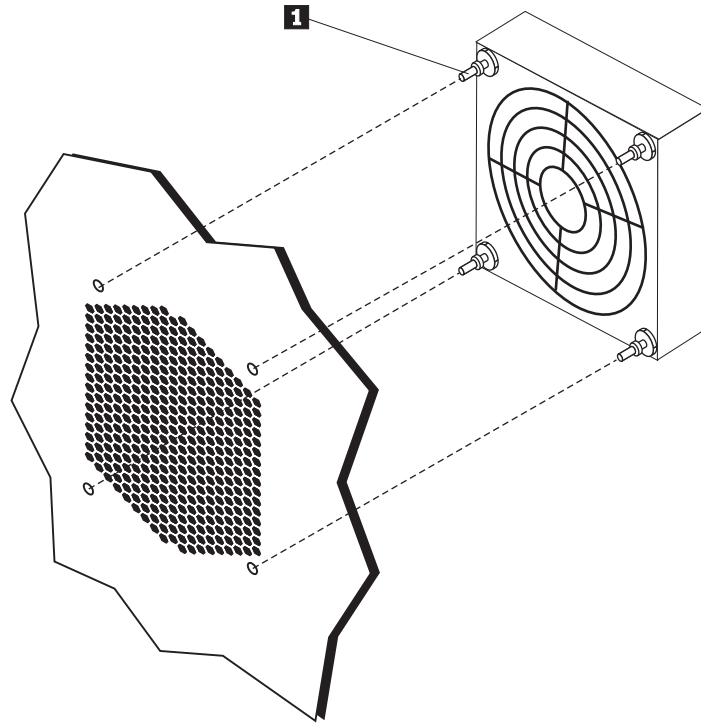


Figure 27. Removing the fan assembly

6. Install the new fan assembly, route the wiring, and then connect the fan-wiring connector to the system board.
7. If you are installing the front fan go to step 8. If you are replacing the rear fan, go to step 9.
8. Reinstall the front bezel.
9. Go to Chapter 4, "Completing the parts replacement," on page 45.

Replacing the internal speaker

Attention

Do not open your computer or attempt any repair before reading the “Important safety information” in the *Safety and Warranty Guide* that was included with your computer. To obtain a copy of the *Safety and Warranty Guide*, go to the Support Web site at <http://www.lenovo.com/support>.

This section provides instructions on how to replace the internal speaker.

1. Open the computer cover. See “Opening the cover” on page 12.
2. Remove the front bezel. See “Removing the front bezel” on page 14.
3. Locate the internal-speaker connector on the system board. See “Locating internal components” on page 7.
4. Note the location of the internal-speaker cable connection. Note the routing of the internal-speaker cable. Disconnect the internal-speaker cable from the system board. See “Identifying parts on the system board” on page 9.
5. Use a blunt instrument (such as, the top of a ball point pen) to disengage one of the internal-speaker-locking tabs **2** and slide that side of the speaker **1** upward enough to keep the locking tab disengaged. Then disengage the other internal-speaker-locking tab and slide the internal speaker upward until the speaker is released. See Figure 28.

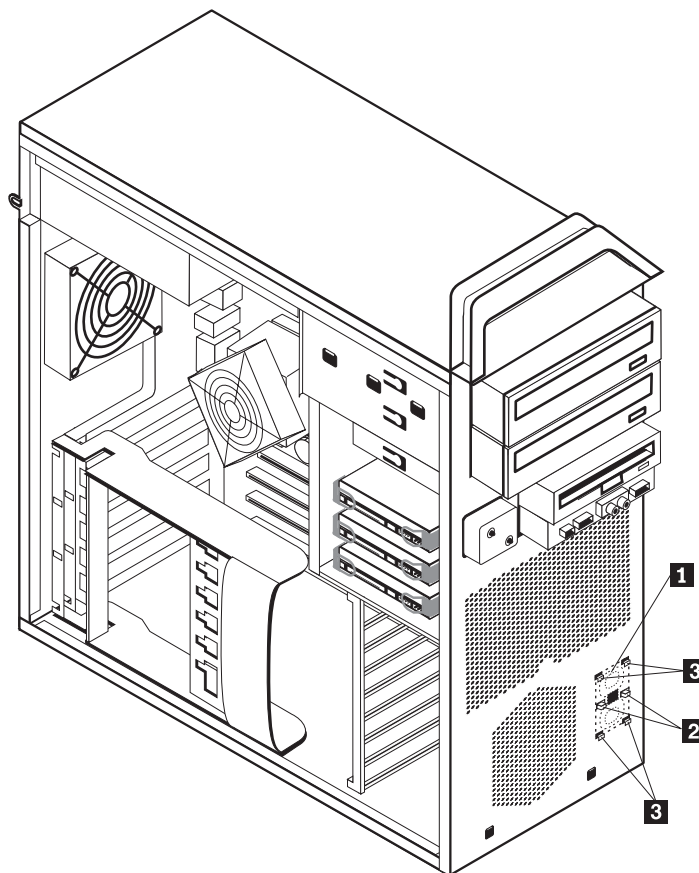


Figure 28. Removing the internal speaker

6. Remove the speaker and speaker cable from the computer.

7. Route the speaker cable and then position the new internal-speaker tabs **3** into the metal speaker slots and then push the internal speaker downward until the speaker-locking tabs snap into position.
8. Connect the speaker cable to the system board. See “Identifying parts on the system board” on page 9.
9. Go to Chapter 4, “Completing the parts replacement,” on page 45.

Replacing the keyboard

Attention

Do not open your computer or attempt any repair before reading the “Important safety information” in the *Safety and Warranty Guide* that was included with your computer. To obtain a copy of the *Safety and Warranty Guide*, go to the Support Web site at <http://www.lenovo.com/support>.

This section provides instructions on how to replace a keyboard.

1. Remove any media (diskettes, CDs, or tapes) from the drives, shut down your operating system, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Locate the keyboard connector. See Figure 29.

Note: Your keyboard might be connected to a standard keyboard connector **1** or a USB connector **2**. Depending on where your keyboard is connected, see “Locating connectors on the rear of your computer” on page 6 or “Locating controls and connectors on the front of your computer” on page 5.

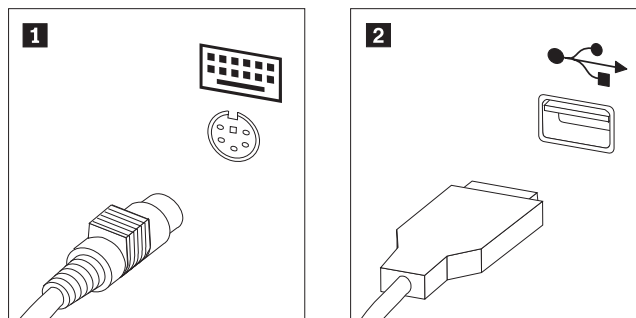


Figure 29. Keyboard connectors, standard and USB

4. Disconnect the failing keyboard cable from the computer.
5. Connect the new keyboard cable to a standard keyboard connector **1** or a USB connector **2** as required.
6. Go to Chapter 4, “Completing the parts replacement,” on page 45.

Replacing the mouse

Attention

Do not open your computer or attempt any repair before reading the "Important safety information" in the *Safety and Warranty Guide* that was included with your computer. To obtain a copy of the *Safety and Warranty Guide*, go to the Support Web site at <http://www.lenovo.com/support>.

This section provides instructions on how to replace a mouse.

1. Remove all media (diskettes, DVDs, or CDs,) from the drives, shut down your operating system, and turn off all attached devices and the computer.
2. Unplug all power cords from electrical outlets.
3. Locate the connector for the mouse. See Figure 30 and "Locating controls and connectors on the front of your computer" on page 5 or "Locating connectors on the rear of your computer" on page 6.

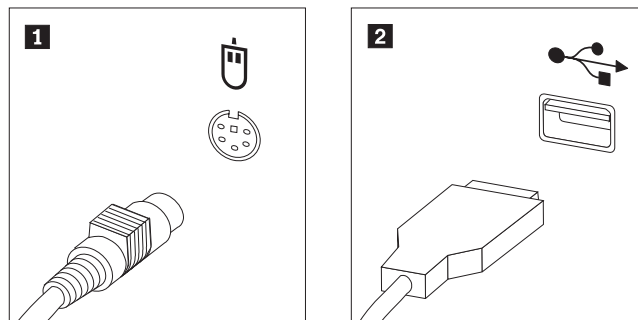


Figure 30. Replacing a mouse

4. Disconnect the failing mouse cable from the computer.
5. Connect the new mouse cable to one of the USB connectors.
6. Go to Chapter 4, "Completing the parts replacement," on page 45.

Chapter 4. Completing the parts replacement

After replacing the parts, close the cover and reconnect cables, including telephone lines and power cords. Also, depending on the part that was replaced, you might need to confirm the updated information in the Setup Utility program. Refer to "Using the Setup Utility program" in the *User Guide* for this product.

To complete the parts replacement:

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer. See "Locating internal components" on page 7, for the location of various components.
2. Make sure that the cables are routed correctly.

Important

Correctly route all power supply cables to avoid interference with the drive bay assembly. Keep cables clear of the hinges and sides of the computer chassis.

3. Close the computer cover.
4. If a cover lock is installed, lock the cover.
5. Reconnect the external cables and power cords to the computer. See "Locating connectors on the rear of your computer" on page 6.
6. If you are replacing the system board or microprocessor, you must update (flash) the BIOS. See "Updating (flashing) BIOS from a diskette or CD-ROM."
7. To update your configuration, see "Using the Setup Utility program" in the *ThinkStation User Guide*.

Note: 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.

Updating (flashing) BIOS from a diskette or CD-ROM

Important

Start the Setup Utility program to view your system information. See "Using the Setup Utility program" in the *User Guide* for this product. If the serial number and the machine type/model listed on the Main menu do not match what is printed on the label of your computer, you must update (flash) the BIOS to change the serial number and the machine type/model.

To update (flash) the BIOS from a diskette or CD-ROM, do the following:

1. Insert a system program update (flash) diskette or CD into the diskette drive or optical drive. System program updates are available at <http://www.lenovo.com/support> on the World Wide Web.

Note: If you are inserting a CD-ROM into the optical drive, make sure that the computer is turned on.

2. Turn on the computer. If it is on already, you must turn it off and back on again. The update begins.
3. When you are prompted to select a language, press the number on your keyboard that corresponds to the language and then press **Enter**.
4. When prompted to change the serial number, press **Y**.
5. Type the seven-character serial number of your computer and then press **Enter**.
6. When prompted to change the machine type/model, press **Y**.
7. Type the seven-character machine type/model of your computer and then press **Enter**.
8. Follow the instructions on the screen to complete the update.

Recovering from a POST/BIOS update failure

If power to your computer is interrupted while POST/BIOS is being updated (flash update), your computer might not restart correctly. If this happens, perform the following procedure commonly called Boot-block Recovery.

1. Turn off the computer and any attached devices, such as printers, monitors, and external drives.
2. Unplug all power cords from electrical outlets, and open the computer cover. See "Opening the cover" on page 12.
3. Access the system board. See "Accessing system board components and drives" on page 15.
4. Locate the Clear CMOS/Recovery jumper on the system board. See "Identifying parts on the system board" on page 9.
5. Remove any cables that impede access to the Clear CMOS/Recovery jumper.
6. Move the jumper from the standard position (pins 1 and 2) to pins 2 and 3.
7. Reinstall the adapter cards (some models).
8. Close the computer cover and reconnect any cables that were disconnected.
9. Reconnect the power cords for the computer and monitor to electrical outlets.
10. Insert the POST/BIOS update (flash) diskette into drive A, and turn on the computer and the monitor.
11. The recovery session will take two to three minutes. During this time you will hear a series of beeps. After the update session is completed, there will be no video, the series of beeps will end, and the system will automatically turn off. Remove the diskette from the diskette drive.
12. Repeat steps 2 through 5.
13. Replace the Clear CMOS/Recovery jumper to its original position.
14. Reinstall the adapter cards (some models) if removed.
15. Close the computer cover and reconnect any cables that were disconnected.
16. Turn on the computer to restart the operating system.

Obtaining device drivers

You can obtain device drivers for operating systems that are not preinstalled at <http://www.lenovo.com/support/> on the World Wide Web. Installation instructions are provided in README files with the device-driver files.

Chapter 5. Security features

To help prevent hardware theft and unauthorized access to your computer, several security lock options are available. In addition to a physical lock, unauthorized use of your computer can be prevented by a software lock that locks the keyboard until a correct password is typed in.

Make sure that any security cables that you install do not interfere with other computer cables.

Locking devices

This section describes the different kinds of locking devices for this product.

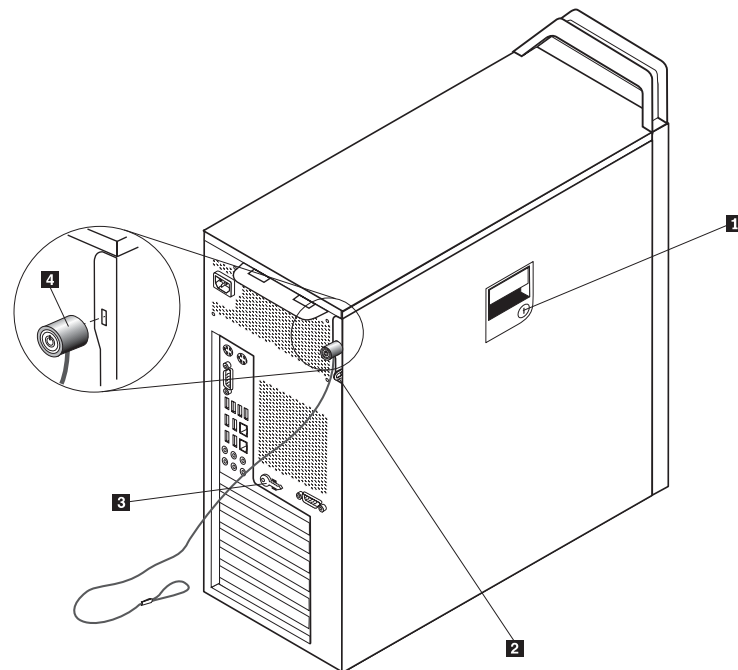


Figure 31. Integrated cable lock

A keylock **1** comes with this product built into the side cover. The keys **3** for the side cover are attached to the rear of the machine. For security remove the keys to a secure place when using them to lock the side cover.

A optional padlock with a 5 mm (.20 inches) shackle can be used to secure the product cover used the padlock hasp **2**.

An optional integrated cable lock **4** (sometimes referred to as the Kensington lock), can be used to secure your computer to a desk, table, or other non-permanent fixture. The cable lock attaches to a security slot at the rear of your computer and is operated with a key. See Figure 31. The cable lock also locks the buttons used to open the computer cover. This is the same type of lock used with many notebook computers. You can order a security cable directly from Lenovo.

Go to
<http://www.lenovo.com/support/>
and search on *Kensington*.

Password protection

To deter unauthorized use of your computer, you can use the Setup Utility program to set a password. When you turn on your computer, you are prompted to type the password to unlock the keyboard for normal use.

What to do next:

- To work with another option, go to the appropriate section.
- To complete the installation, go to Chapter 4, "Completing the parts replacement," on page 45.

Appendix. Notices

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Part Number: 43C9745

Printed in USA

(1P) P/N: 43C9745

