



ThinkStation
User Guide



ThinkThink**ThinkStation**Think

Machine Types: 4215, 4219, 4220, 4221, and 4222

lenovo

ThinkStation
User Guide

Note

Before using this information and the product it supports, be sure to read and understand the *ThinkStation Safety and Warranty Guide* and "Notices," on page 73.

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Important safety information

CAUTION:

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

If you no longer have a copy of the *ThinkStation Safety and Warranty Guide*, you can obtain a Portable Document Format (PDF) version from the Lenovo® Support Web site at:

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

Chapter 1. Product overview

This chapter provides information about the computer features, specifications, preinstalled software programs, part and connector locations, and internal drives.

Features

This section provides information about the computer features.

System information

The following information covers a variety of models. For information about your specific model, use the Setup Utility program. See Chapter 4, "Using the Setup Utility program," on page 53.

Microprocessor

- Intel® Core™ i3 microprocessor
- Intel Core i5 microprocessor
- Intel Pentium® microprocessor
- Intel Xeon® microprocessor
- Internal cache (size varies by model type)

Memory

- Supports up to four DDR3 ECC UDIMMs (double data rate 3 error correction code unbuffered dual inline memory modules) or DDR3 Non-ECC UDIMMs

Drives

- Card reader (installed in some models)
- Optical drive
- Serial Advanced Technology Attachment (SATA) internal hard disk drive

Video subsystem

- Integrated graphics card for a VGA (Video Graphics Array) connector and a DisplayPort connector (not applicable on some models)
- PCI (Peripheral Component Interconnect) Express x16 graphics card slot on the system board for a discrete graphics card

Audio subsystem

- Integrated high-definition (HD) audio
- Audio line-in connector, audio line-out connector, and microphone connector on the rear panel
- Microphone connector and headphone connector on the front panel
- Internal speaker (installed in some models)

Connectivity

- 100/1000 Mbps integrated Ethernet controller
- PCI Fax modem (some models)

System management features

- Ability to store power-on self-test (POST) hardware test results
- Automatic power-on startup
- Intel Active Management Technology (AMT)
- Intel Hyper-Threading technology (some models)
- Intel Rapid Storage Technology (RST)
- Preboot Execution Environment (PXE)
- Rapid Storage Technology (RST)
- System Management (SM) Basic Input/Output System (BIOS) and SM software
- Wake on LAN
- Wake on Ring (in the Setup Utility program, this feature is called Serial Port Ring Detect for an external modem)
- Windows Management Instrumentation (WMI)

Input/Output (I/O) features

- 9-pin serial port (one standard and one optional)
- Eight USB (Universal Serial Bus) connectors (two on the front panel and six on the rear panel)
- One Ethernet connector
- One DisplayPort connector (not applicable on some models)
- One VGA monitor connector (not applicable on some models)
- Three audio connectors on the rear panel (audio line-in connector, audio line-out connector, and microphone connector)
- Two audio connectors on the front panel (microphone connector and headphone connector)

Expansion

- One card reader bay
- Two hard disk drive bays
- Two optical drive bays
- Two PCI card slots
- One PCI Express x1 card slot
- One PCI Express x16 graphics card slot

Power supply

- 280-watt auto-sensing power supply
- Advanced Configuration and Power Interface (ACPI) support

Security features

- Computrace
- Cover presence switch (also called intrusion switch, some models)
- Enabling or disabling a device
- Enabling or disabling USB connectors individually
- Hard disk drive password
- Keyboard with fingerprint reader (some models)
- Power-On Password (POP) and Administrator Password for BIOS access
- Startup sequence control
- Startup without keyboard or mouse
- Support for an integrated cable lock (Kensington lock)
- Support for a padlock
- Trusted Platform Module (TPM)

Software programs, preinstalled

Your computer might come with preinstalled software programs. If it does, an operating system, device drivers to support built-in features, and other support programs are included. For more information, see “Software overview” on page 5.

Operating system, preinstalled

- Microsoft® Windows® 7
- Microsoft Windows Vista®
- Microsoft Windows XP Professional
(preinstalled through downgrade rights in Windows 7 Professional, Windows 7 Ultimate, Windows Vista Business, or Windows Vista Ultimate)

Operating systems, certified or tested for compatibility¹ (varies by model type)

- Linux®

1. The operating systems listed here are being certified or tested for compatibility at the time this publication goes to press. Additional operating systems might be identified by Lenovo as compatible with your computer following the publication of this booklet. Corrections and additions to this list are subject to change. To determine if an operating system has been certified or tested for compatibility, check the Web site of the operating system vendor.

Specifications

This section lists the physical specifications for your computer.

Dimensions

Width: 174.8 mm (6.88 inches)

Height: 425.2 mm (16.74 inches) (floor to top of handle)

Depth: 430.8 mm (16.96 inches)

Weight

Maximum configuration: 11.2 kg (24.7 lbs)

Environment

Air temperature:

Operating: 10° to 35°C (50° to 95°F)

Non-operating: -40° to 60°C (-40° to 140°F) (with package)

Non-operating: -10° to 60°C (14° to 140°F) (without package)

Humidity:

Operating: 20% to 80% (non-condensing)

Non-operating: 20% to 90% (non-condensing)

Maximum altitude:

Operating: -50 to 10 000 ft (-15.2 to 3 048 m)

Non-operating: -50 to 35 000 ft (-15.2 to 10 668 m)

Electrical input

Input voltage:

Low range:

Minimum: 100 V ac

Maximum: 127 V ac

Input frequency range: 50 to 60 Hz

Voltage-selection switch setting: 115 V ac

High range:

Minimum: 200 V ac

Maximum: 240 V ac

Input frequency range: 50 to 60 Hz

Voltage-selection switch setting: 230 V ac

Software overview

The computer comes with a preinstalled operating system and several preinstalled applications.

Software provided by Lenovo

The following software programs are provided by Lenovo to help you improve productivity and reduce the cost associated with maintaining your computer. Software programs provided with your computer might vary depending on your computer model type and preinstalled operating system.

Lenovo ThinkVantage Tools

The Lenovo ThinkVantage® Tools program guides you to a host of information sources and provides easy access to various tools to help you work more easily and securely. For more information, see “Lenovo ThinkVantage Tools” on page 69.

Note: The Lenovo ThinkVantage Tools program is only available on computers with the Windows 7 operating system from Lenovo.

Lenovo Welcome

The Lenovo Welcome program introduces you to some innovative built-in features of Lenovo and guides you through a few important setup tasks to help you make the most of your computer.

Note: The Lenovo Welcome program is only available on computers preinstalled with the Windows 7 operating system or the Windows Vista operating system from Lenovo.

ThinkVantage Rescue and Recovery

The ThinkVantage Rescue and Recovery® program is a one button recovery and restore solution that includes a set of self recovery tools to help users diagnose computer problems, get help, and recover from system crashes quickly, even if the primary operating system will not start.

Product Recovery

The Product Recovery program enables you to restore the contents of the hard disk drive to the factory default settings.

Fingerprint Software

The integrated fingerprint reader provided on some keyboards enables you to enroll your fingerprint and associate it with your power-on password, hard disk drive password, and Windows password. As a result, fingerprint authentication can replace passwords and enable simple and secure user access. A fingerprint reader keyboard is available with select computers or can be purchased for computers that support this option.

Lenovo ThinkVantage Toolbox

The Lenovo ThinkVantage Toolbox program helps you maintain your computer, improve computing security, diagnose computer problems, get familiar with the innovative technologies provided by Lenovo, and get more information about your computer. See “Lenovo ThinkVantage Toolbox” on page 64 for detailed information.

Note: The Lenovo ThinkVantage Toolbox program is only available on computers preinstalled with the Windows 7 operating system from Lenovo.

Lenovo System Toolbox

The Lenovo System Toolbox diagnostic program is preinstalled on your hard disk drive. This diagnostic program works through the Windows operating system to diagnose hardware problems and report operating-system-controlled settings that can cause hardware failures. See “Lenovo System Toolbox” on page 64 for more information.

Note: The Lenovo System Toolbox program is only available on computers preinstalled with the Windows Vista operating system or the Windows XP operating system from Lenovo.

PC-Doctor for Rescue and Recovery

The PC-Doctor for Rescue and Recovery diagnostic program is preinstalled on your hard disk drive. It is part of the Rescue and Recovery workspace on each Lenovo computer to diagnose hardware problems and report operating-system-controlled settings that can cause hardware failures. Use the PC-Doctor for Rescue and Recovery if you are unable to start the Windows operating system. See “PC-Doctor for Rescue and Recovery” on page 65 for more information.

Adobe Reader

The Adobe Reader program is a tool used to view, print, and search PDF documents.

See “Online Books folder” on page 69 for more information about accessing the online books and the Lenovo Web site.

Antivirus software

Your computer comes with antivirus software that you can use to detect and eliminate viruses. Lenovo provides a full version of antivirus software on your hard disk drive with a free 30-day subscription. After 30 days, you must renew the license to continue receiving the antivirus program updates.

Locations

Locating connectors on the front of your computer

Figure 1 shows the locations of the connectors on the front of your computer.

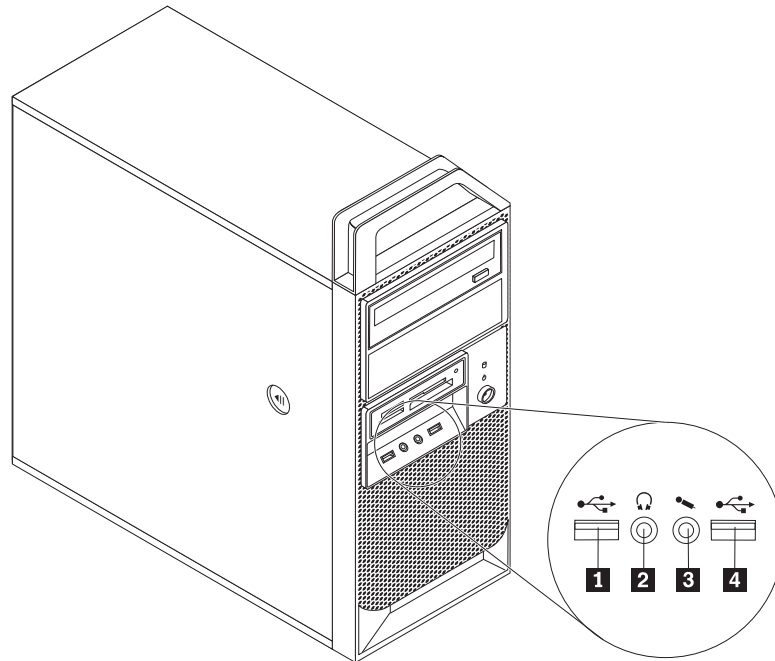


Figure 1. Front connector locations

1 USB connector
2 Headphone connector

3 Microphone connector
4 USB connector

Locating connectors on the rear of your computer

Figure 2 shows the locations of the 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.

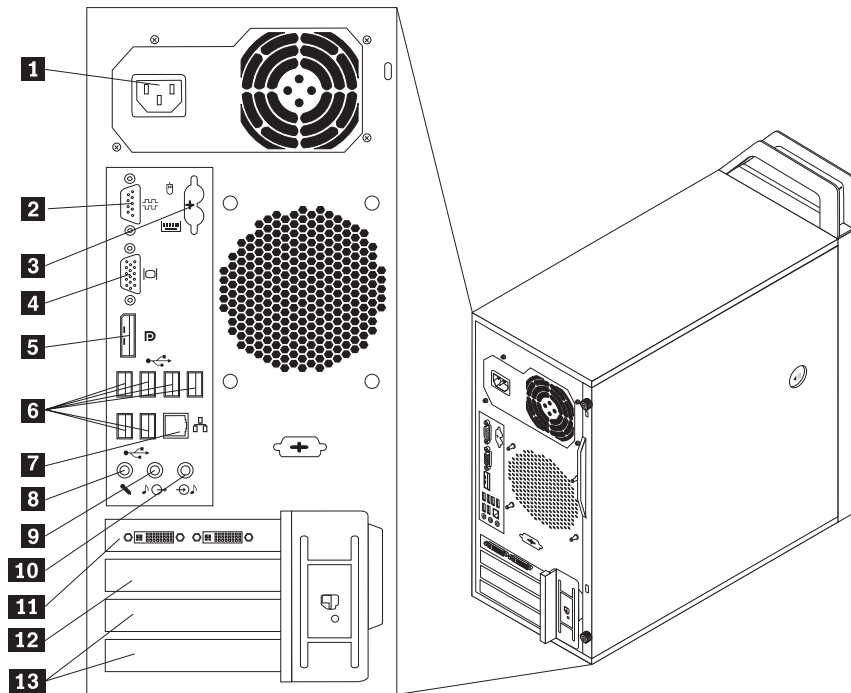


Figure 2. Rear connector locations

- | | |
|---|--|
| 1 Power cord connector | 8 Microphone connector |
| 2 Serial port | 9 Audio line-out connector |
| 3 PS/2 [®] keyboard and mouse connectors (optional) | 10 Audio line-in connector |
| 4 VGA monitor connector (not applicable on some models) | 11 PCI Express x16 graphics card slot |
| 5 DisplayPort connector (not applicable on some models) | 12 PCI Express x1 card slot |
| 6 USB connectors (6) | 13 PCI card slots (2) |
| 7 Ethernet connector | |

Connector	Description
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.
DisplayPort connector	Used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a DisplayPort connector.
DVI connector	Used to attach a DVI monitor or other devices that use a DVI connector.
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.
Microphone connector	Used to attach a microphone to your computer when you want to record sound or if you use speech-recognition software.
Serial port	Used to attach an external modem, a serial printer, or other devices that use a 9-pin serial port.
PS/2 keyboard connector (optional)	Used to attach a keyboard that uses a PS/2 keyboard connector.
PS/2 mouse connector (optional)	Used to attach a mouse, a trackball, or other pointing devices that use a PS/2 mouse connector.
USB connector	Used to attach a device that requires a USB connector, such as a USB keyboard, a USB mouse, a USB scanner, or a 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.
VGA monitor connector	Used to attach a VGA monitor or other devices that use a VGA monitor connector.

Locating components

Figure 3 shows the locations of the various components in your computer. To remove the computer cover, see “Removing the computer cover” on page 14.

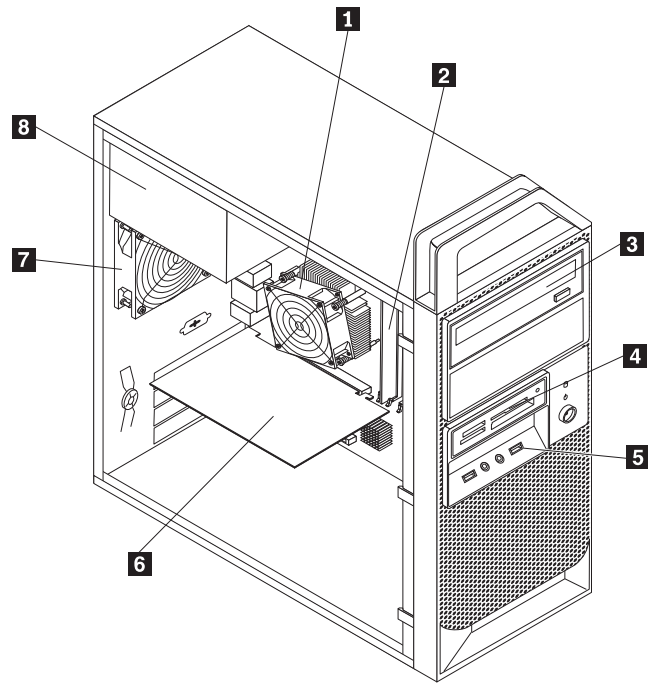


Figure 3. Component locations

- | | |
|--|---|
| 1 Microprocessor, heat sink, and heat sink fan assembly | 5 Front audio and USB assembly |
| 2 Memory module | 6 PCI card
(installed in some models) |
| 3 Optical drive | 7 Rear fan assembly |
| 4 Card reader
(installed in some models) | 8 Power supply assembly |

Locating parts on the system board

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

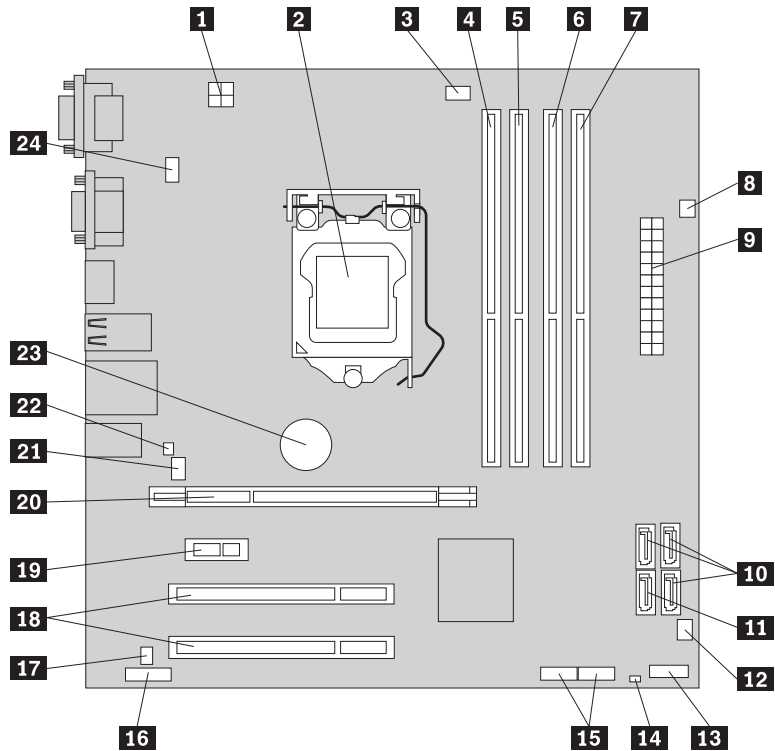


Figure 4. System board part locations

- | | |
|---------------------------------------|---|
| 1 4-pin power connector | 13 Front panel connector |
| 2 Microprocessor | 14 Clear CMOS (Complementary Metal Oxide Semiconductor) /Recovery jumper |
| 3 Microprocessor fan connector | 15 Front USB connectors (2) |
| 4 DIMM 2 | 16 Front audio connector |
| 5 DIMM 1 | 17 Internal speaker connector |
| 6 DIMM 4 | 18 PCI card slots (2) |
| 7 DIMM 3 | 19 PCI Express x1 card slot |
| 8 Thermal sensor connector | 20 PCI Express x16 graphics card slot |
| 9 24-pin power connector | 21 System fan connector |
| 10 SATA connectors (3) | 22 Cover presence switch connector (Intrusion switch connector) |
| 11 eSATA connector | 23 Battery |
| 12 Power fan connector | 24 PS/2 keyboard and mouse connector |

Locating 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 enable your computer to read other types of media. Your computer comes with the following factory-installed drives:

- A Serial Advanced Technology Attachment (SATA) optical drive in bay 1
- A 3.5-inch card reader in bay 3 (installed in some models)
- A 3.5-inch SATA hard disk drive in bay 5

Internal drives are installed in bays. In this manual, the bays are referred to as bay 1, bay 2, and so on. Figure 5 shows the locations of the drive bays.

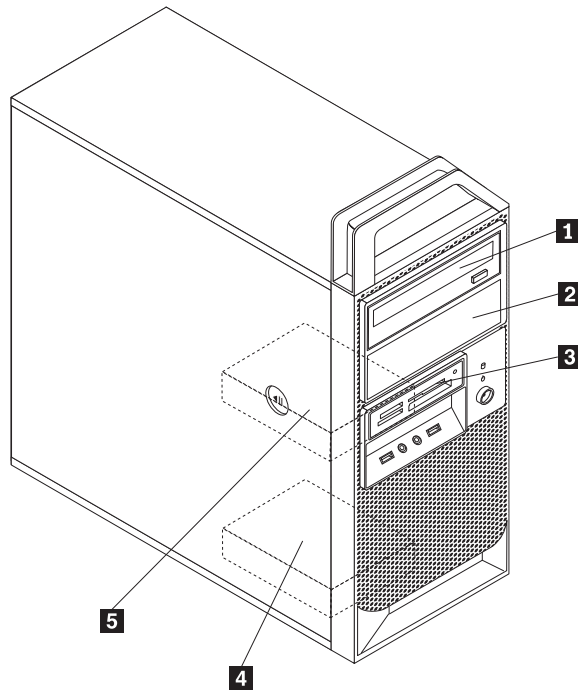


Figure 5. Drive bay locations

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

- | | |
|---|--|
| 1 Bay 1 - Maximum height: 43.0 mm (1.7 inches) | Optical drive |
| 2 Bay 2 - Maximum height: 43.0 mm (1.7 inches) | Optical drive |
| 3 Bay 3 - Maximum height: 25.8 mm (1.0 inch) | 3.5-inch card reader (installed in some models) |
| 4 Bay 4 - Maximum height: 25.8 mm (1.0 inch) | 3.5-inch secondary SATA hard disk drive (installed in some models) |
| 5 Bay 5 - Maximum height: 25.8 mm (1.0 inch) | 3.5-inch primary SATA hard disk drive |

Chapter 2. Installing or replacing hardware

This chapter provides instructions on how to install or replace 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 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 PCI cards, 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.

Installing or replacing hardware

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

Attention

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

Notes:

1. Use only computer parts provided by Lenovo.
2. When installing or replacing an option, use the appropriate instructions in this section along with the instructions that come with the option.

Installing 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 “Locating connectors on the front of your computer” on page 7 and “Locating connectors on the rear of your computer” on page 8 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.

Removing the computer cover

Attention

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

This section provides instructions on how to remove the computer cover.

CAUTION:



Turn off the computer and wait three to five minutes to let the computer cool before removing the computer cover.

To remove the computer cover, do the following:

1. Remove any media from the drives and turn off all attached devices and the computer.
2. Disconnect all power cords from electrical outlets.
3. Disconnect the power cords, Input/Output (I/O) cables, and any other cables that are connected to the computer. See “Locating connectors on the front of your computer” on page 7 and “Locating connectors on the rear of your computer” on page 8.
4. Remove any locking device that secures the computer cover, such as a padlock or an integrated cable lock. See “Integrated cable lock” on page 42 and “Padlock” on page 43.
5. Remove any thumbscrews that secure the computer cover.

6. Press the cover-release button on the side of the computer and slide the cover to the rear of the computer to remove the cover.

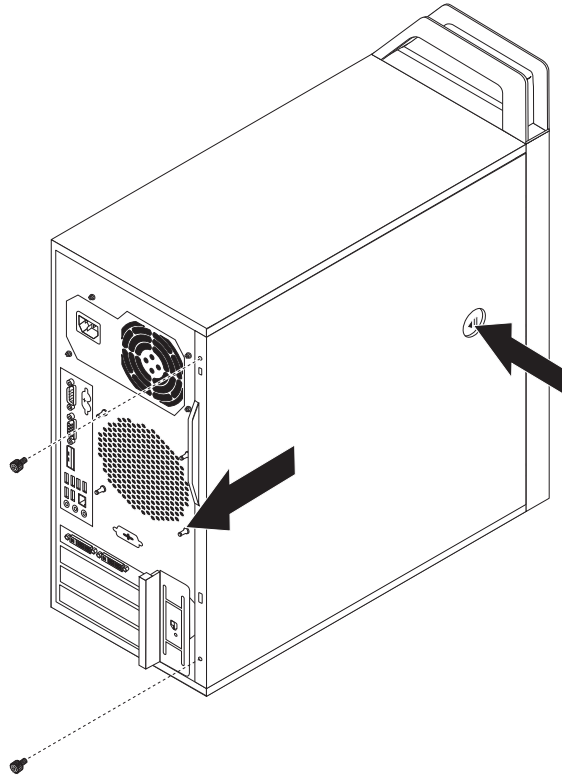


Figure 6. Removing the computer cover

Removing and reinstalling the front bezel

Attention

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

This section provides instructions on how to remove and reinstall the front bezel.

To remove and reinstall the front bezel, do the following:

1. Remove the computer cover. See “Removing the computer cover” on page 14.

2. Remove the front bezel by releasing the three plastic tabs on the left side and pivoting the front bezel outward.

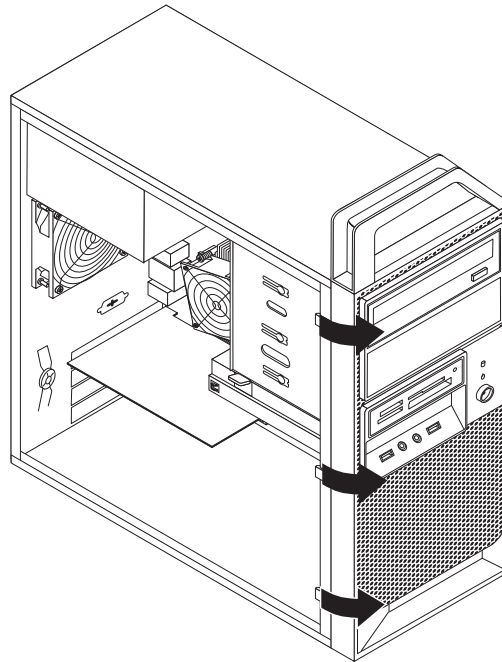


Figure 7. Removing the front bezel

3. To reinstall the front bezel, align the three plastic tabs on the right side of the front bezel with the corresponding holes in the chassis, then pivot the front bezel inwards until it snaps into position on the left side.
4. To complete the installation, go to “Completing the parts replacement” on page 40.

Installing or replacing a PCI card

Attention

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

This section provides instructions on how to install or replace a PCI card. Your computer has two standard PCI card slots, one PCI Express x1 card slot, and one PCI Express x16 graphics card slot.

To install or replace a PCI card, do the following:

1. Remove the computer cover. See “Removing the computer cover” on page 14.

2. At the rear of the computer, press the release button **1** to open the card latch **2**.

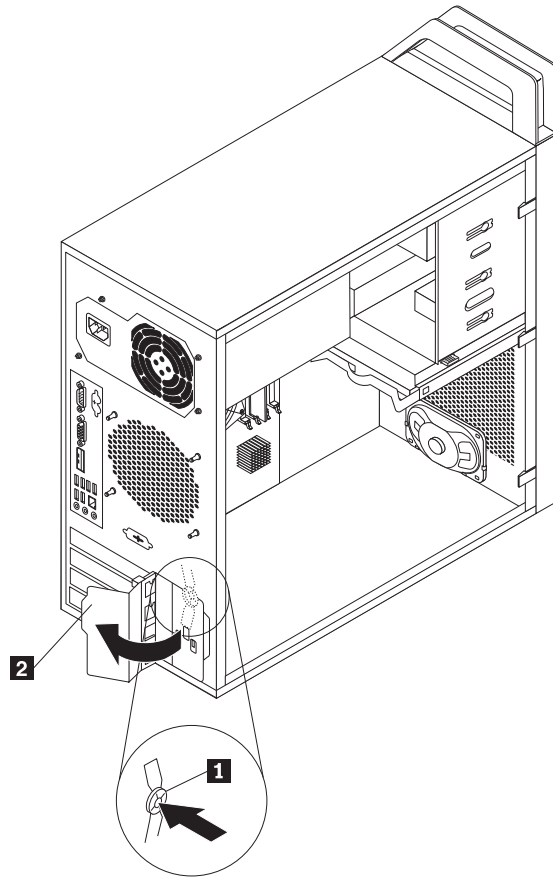


Figure 8. Opening the PCI card latch

3. If you are installing a PCI card, remove the appropriate metal slot cover. If you are replacing an old PCI card, grasp the old card that is currently installed and gently pull it out of the slot.

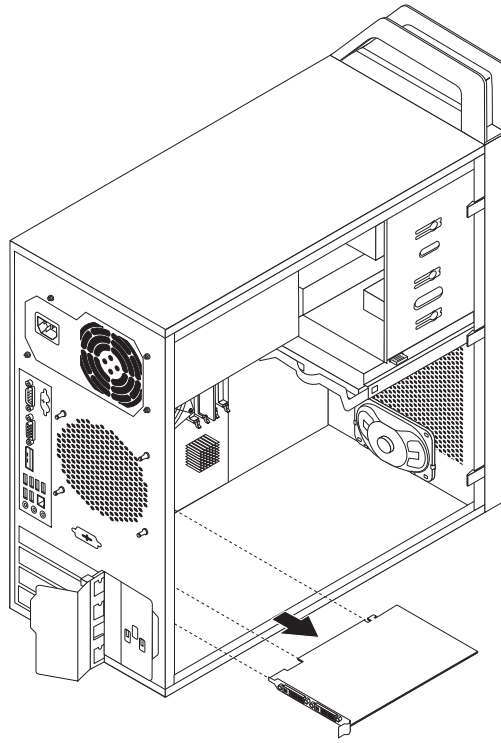


Figure 9. Removing a PCI card

Note: The card fits tightly into the card slot. If necessary, alternate moving each side of the card a small amount until it is removed from the card slot.

4. Remove the new PCI card from its static-protective package.
5. Install the new PCI card into the appropriate slot on the system board. See “Locating parts on the system board” on page 11.

Note: If you are installing a PCI Express x16 graphics card, make sure the memory slot retaining clips are closed before you install the graphics card.

- Pivot the card latch to the closed position to secure the PCI card.

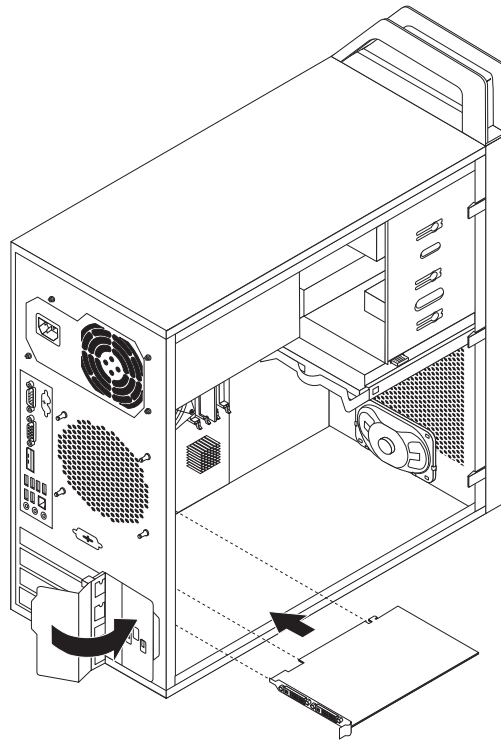


Figure 10. Installing a PCI card

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 40.

Installing or replacing a memory module

Attention

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

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

Your computer has four slots for installing or replacing memory modules that provide up to a maximum of 16 GB system memory. When installing or replacing a memory module, use the following guidelines:

- Use either DDR3 ECC UDIMMs or DDR3 Non-ECC UDIMMs for your computer. Do not install both DDR3 ECC UDIMMs and DDR3 Non-ECC UDIMMs in the same computer.

- Use 1 GB, 2 GB, or 4 GB memory modules in any combination up to a maximum of 16 GB.
- Install memory modules in the sequence of DIMM 1, DIMM 3, DIMM 2, and DIMM 4. See “Locating parts on the system board” on page 11.

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

1. Remove the computer cover. See “Removing the computer cover” on page 14.
2. Locate the memory slots. See “Locating parts on the system board” on page 11.
3. Remove any parts that might prevent your access to the memory slots. Depending on your computer model, you might need to remove the PCI Express x16 graphics card for easier access to the memory slots. See “Installing or replacing a PCI card” on page 16.
4. Open the retaining clips.

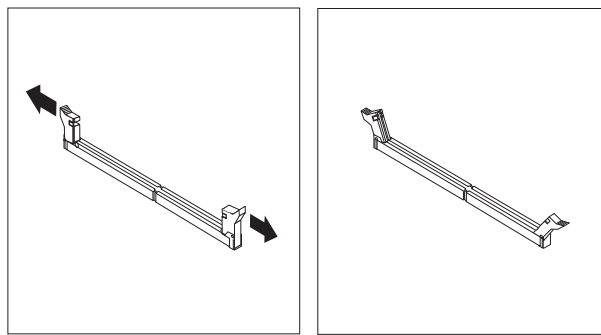


Figure 11. Opening the retaining clips

If you are replacing an old memory module, open the retaining clips and gently pull the memory module out of the memory slot.

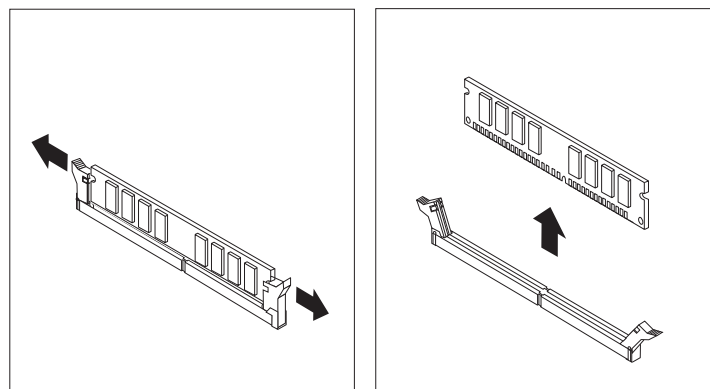


Figure 12. Removing a memory module

5. Position the new memory module over the memory slot. Make sure that the notch **1** on the memory module aligns correctly with the slot key **2** on the system board. Push the memory module straight down into the slot until the retaining clips close.

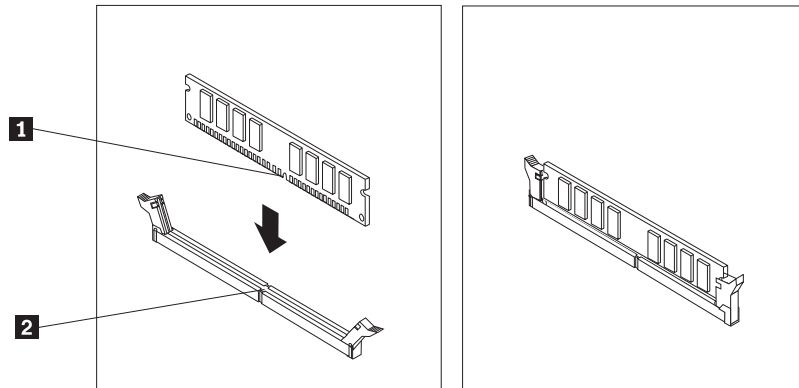


Figure 13. Installing a memory module

6. Reinstall the PCI Express x16 graphics card if you have removed it.

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 40.

Installing or replacing the optical drive

Attention

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

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

To install or replace an optical drive, do the following:

1. Remove the computer cover. See “Removing the computer cover” on page 14.
2. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 15.
3. Depending on whether you are installing or replacing an optical drive, do one of the following:
 - If you are installing a secondary optical drive, remove the plastic panel in the front bezel for the drive bay you want to use. If there is a metal static shield installed in the drive bay, remove the metal static shield.

- If you are replacing an optical drive, disconnect the signal cable and the power cable from the rear of the optical drive, press the blue release button, and then slide the optical drive out of the front of the computer.

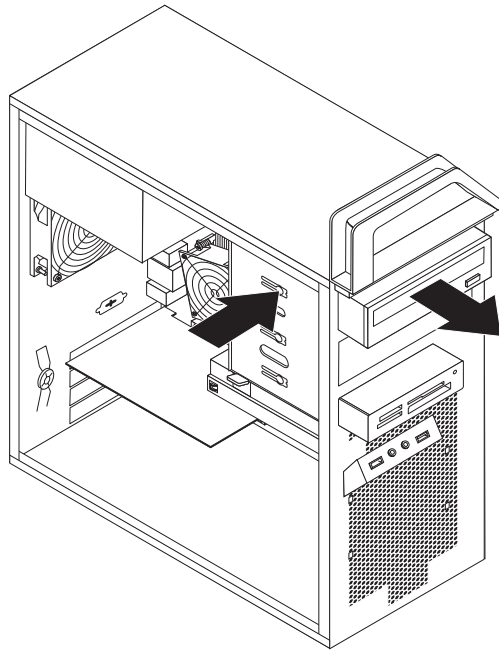


Figure 14. Removing the optical drive

4. Install the optical drive retainer on the side of the new optical drive.

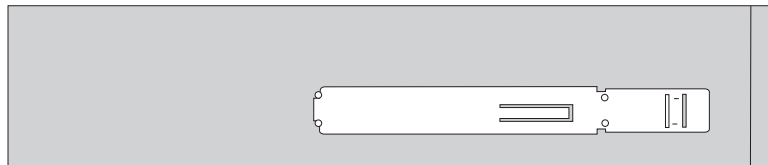


Figure 15. Installing the optical drive retainer

- Slide the new optical drive into the drive bay from the front of the computer until the optical drive snaps into position.

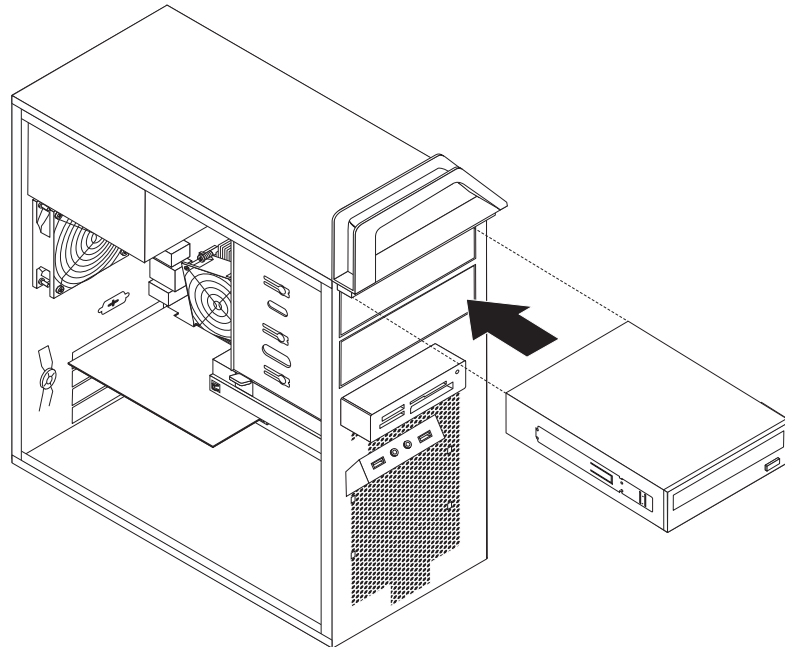


Figure 16. Installing the optical drive

- Connect the signal cable and the power cable to the new optical drive.

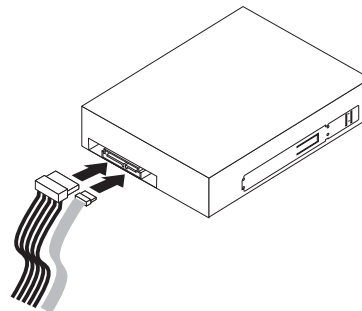


Figure 17. Connecting the optical drive

- Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 15.

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 40.

Replacing the power supply assembly

Attention

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

This section provides instructions on how to replace the power supply assembly.

To replace the power supply assembly, do the following:

1. Remove the computer cover. See "Removing the computer cover" on page 14.
2. Disconnect the power supply assembly cables from the system board and all drives. See "Locating parts on the system board" on page 11.
3. Release the power supply assembly cables from the cable clips and ties in the chassis.
4. Lay the computer on its side and remove the four screws at the rear of the chassis that secure the power supply assembly.

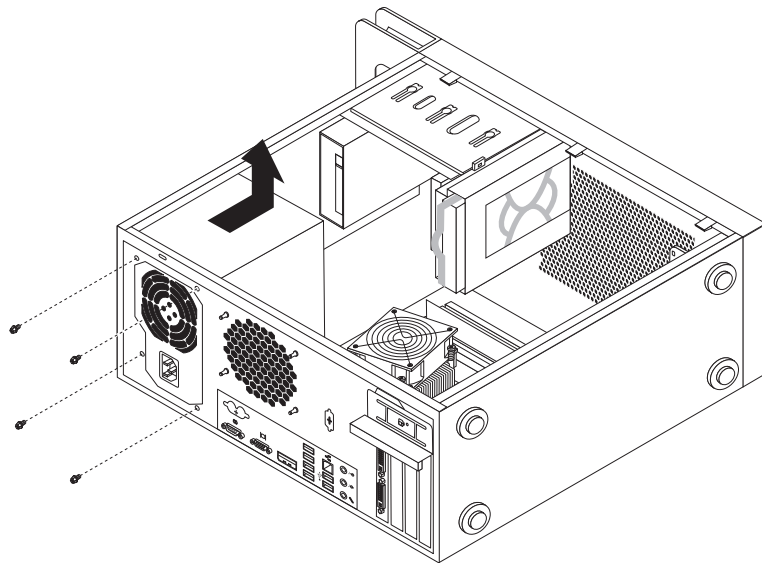


Figure 18. Removing the screws for the power supply assembly

5. Slide the power supply assembly to the front of the computer and then lift it out of the chassis.
6. Ensure that the new power supply assembly is the correct replacement.
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.
8. Install and tighten the four screws to secure the power supply assembly.

Note: Use only screws provided by Lenovo.

9. Reconnect the power supply assembly cables to the system board and each of the drives.

10. 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 replacement, go to “Completing the parts replacement” on page 40.

Replacing the heat sink and fan assembly

Attention

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

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

CAUTION:



The heat sink and fan assembly might be very hot. Turn off the computer and wait three to five minutes to let the computer cool before removing the computer cover.

To replace the heat sink and fan assembly, do the following:

1. Remove the computer cover. See “Removing the computer cover” on page 14.
2. Lay the computer on its side for easier access to the system board.
3. Locate the heat sink and fan assembly. See “Locating parts on the system board” on page 11.
4. Disconnect the heat sink and fan assembly cable from the microprocessor fan connector on the system board. See “Locating parts on the system board” on page 11.

- Carefully remove the four screws **1** that secure the heat sink and fan assembly to the system board.

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

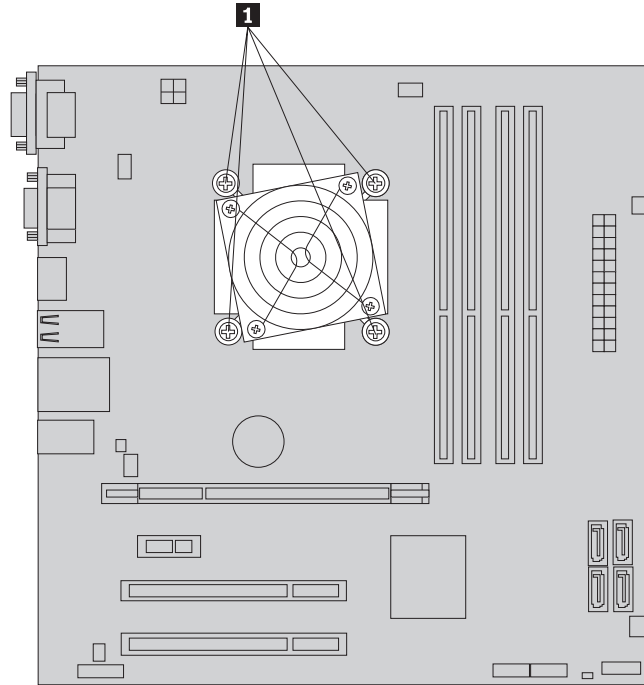


Figure 19. Removing the heat sink and fan assembly

- 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.
- Position the new heat sink and fan assembly on the system board so that the four screws are aligned with the corresponding holes in the system board and the heat sink and fan assembly cable can be easily connected to the microprocessor fan connector on the system board.
 - Alternate tightening each screw a small and equal amount until the heat sink and fan assembly is secured to the system board. Do not over-tighten the screws.
 - Connect the heat sink and fan assembly cable to the microprocessor fan connector on the system board. See “Locating parts on the system board” on page 11.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 40.

Replacing the primary hard disk drive

Attention

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

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

To replace the primary hard disk drive, do the following:

1. Remove the computer cover. See “Removing the computer cover” on page 14.
2. Locate the primary hard disk drive. See “Locating internal drives” on page 11.
3. Disconnect the signal cable and the power cable from the hard disk drive.
4. Press the blue release tab **1** down, slide the hard disk drive cage **2** to the rear of the computer, and then pivot it outward.

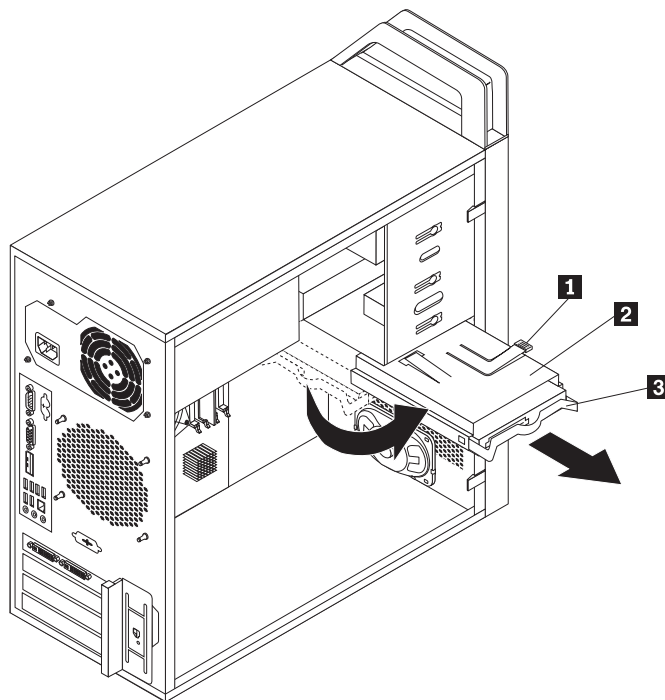


Figure 20. Removing the primary hard disk drive

5. Remove the hard disk drive cage from the chassis by sliding it outward.

6. Pull on the blue handle **3** to release and remove the hard disk drive from the drive cage.
7. Flex the sides of the blue bracket to remove the hard disk drive from the bracket.
8. To install a new hard disk drive into the blue bracket, flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the hard disk drive. Do not touch the circuit board **5** on the bottom of the hard disk drive.

Note: If you are installing a 2.5-inch hard disk drive, install the hard disk drive into a 2.5-inch to 3.5-inch hard disk drive tray first and then install the tray into the blue bracket.

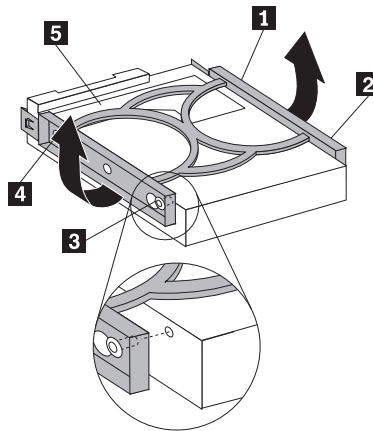


Figure 21. Installing the hard disk drive into the bracket

9. Slide the new hard disk drive into the drive cage until it snaps into position.

10. Align the drive cage pivot pin with the slot **1** in the upper drive cage and slide the hard disk drive cage into the chassis.
11. Connect the signal cable and the power cable to the new hard disk drive.
12. Press down on the metal latch **2** and pivot the drive cage into place, and then slide it to the front of the computer until it snaps into position.

Note: There are two arrows, one on the upper drive cage and one on the hard disk drive cage. The arrows are aligned when the hard disk drive is in the proper position.

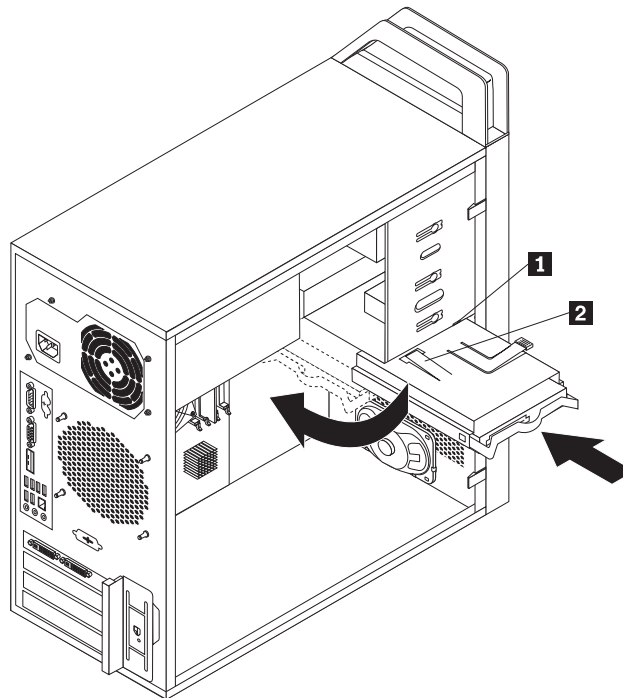


Figure 22. Installing the primary hard disk drive

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 40.

Replacing the secondary hard disk drive

Attention

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

This section provides instructions on how to replace the secondary hard disk drive. Not all computers have the secondary hard disk drive.

To replace the secondary hard disk drive, do the following:

1. Remove the computer cover. See “Removing the computer cover” on page 14.
2. Locate the secondary hard disk drive. See “Locating internal drives” on page 11.
3. Disconnect the signal cable and the power cable from the hard disk drive.
4. Press the blue release button to release the hard disk drive cage and then lift the hard disk drive cage out of the chassis.

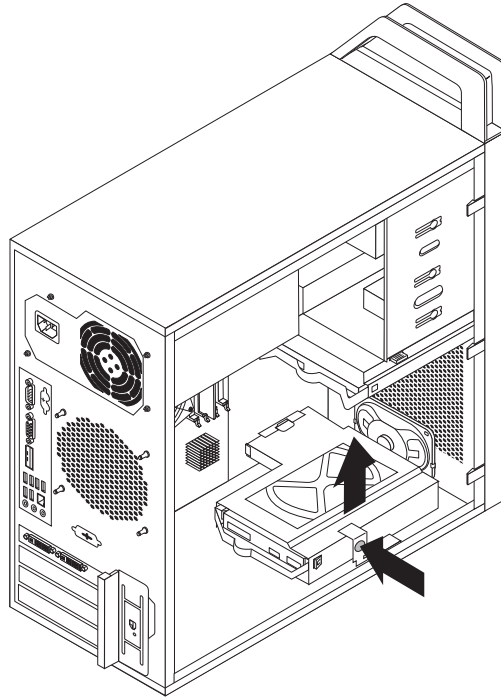


Figure 23. Removing the secondary hard disk drive

5. Pull on the blue handle to release and remove the hard disk drive from the hard disk drive cage.
6. Flex the sides of the blue bracket to remove the hard disk drive from the bracket.

7. To install a new hard disk drive into the blue bracket, flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the hard disk drive. Do not touch the circuit board **5** on the bottom of the hard disk drive.

Note: If you are installing a 2.5-inch hard disk drive, install the hard disk drive into a 2.5-inch to 3.5-inch hard disk drive tray first and then install the tray into the blue bracket.

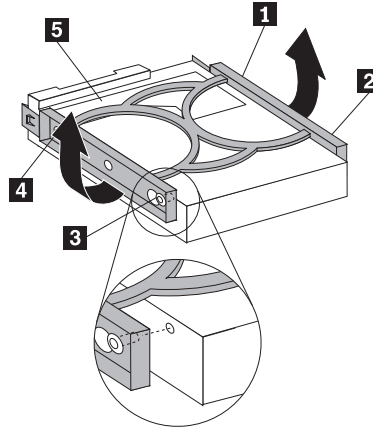


Figure 24. Installing the hard disk drive into the bracket

8. Slide the new hard disk drive into the hard disk drive cage until it snaps into position.

9. Install the hard disk drive cage into the chassis until it snaps into position underneath the metal tab. Make sure that the hard disk drive cage release button is secured in the chassis.

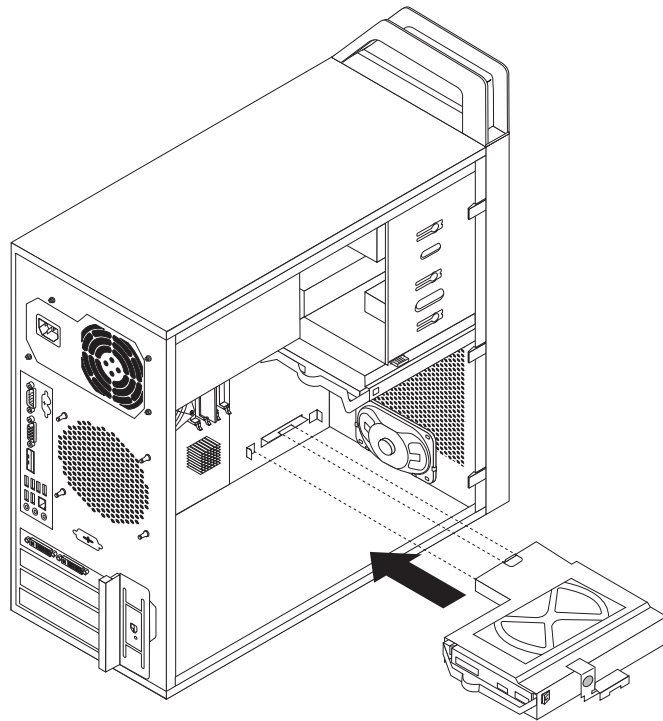


Figure 25. Installing the secondary hard disk drive

10. Connect the signal cable and the power cable to the new hard disk drive.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 40.

Replacing the card reader

Attention

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

This section provides instructions on how to replace the card reader.

To replace the card reader, do the following:

1. Remove the computer cover. See “Removing the computer cover” on page 14.

2. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 15.
3. Disconnect the card reader cable from the front USB connector on the system board. See “Locating parts on the system board” on page 11.

Note: If your computer has a secondary hard disk drive installed, remove the secondary hard disk drive to get easier access to the front USB connector on the system board.

4. Press the blue release button and slide the card reader out of the front of the computer.

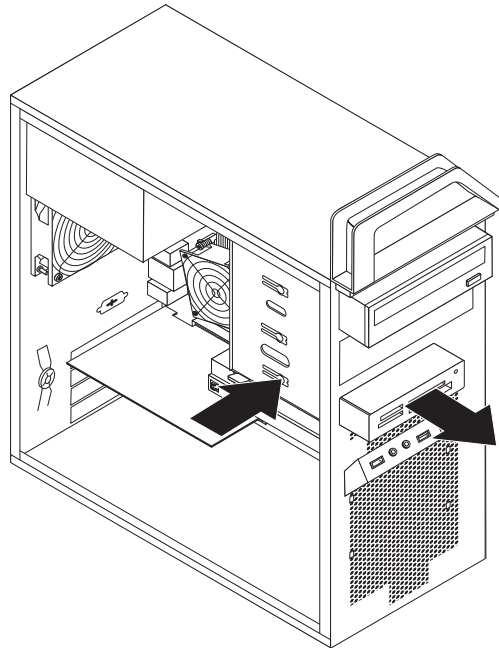


Figure 26. Removing the card reader

5. Install the card reader retainer on the side of the new card reader.

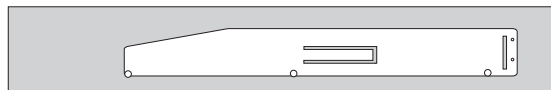


Figure 27. Installing the card reader retainer

6. Slide the new card reader into the drive bay until it snaps into position.
7. Connect the card reader cable to the available front USB connector on the system board. See “Locating parts on the system board” on page 11.
8. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 15.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 40.

Replacing the front fan assembly

Attention

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

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

Note: Not all computers have the front fan assembly.

To replace the front fan assembly, do the following:

1. Remove the computer cover. See “Removing the computer cover” on page 14.
2. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 15.
3. Disconnect the front fan assembly cable from the power fan connector on the system board. See “Locating parts on the system board” on page 11.

Note: If your computer has a secondary hard disk drive installed, remove the secondary hard disk drive to get easier access to the power fan connector on the system board. See “Replacing the secondary hard disk drive” on page 29.

4. Release the two tabs **1** that attach the front fan assembly to the chassis as shown and then completely remove the front fan from the chassis.

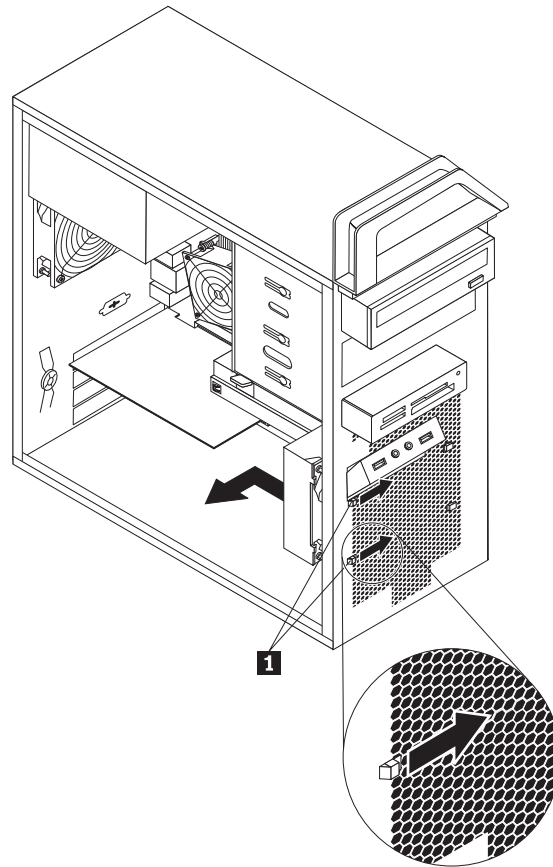


Figure 28. Removing the front fan assembly

5. Insert the two tabs **2** of the new front fan assembly into the corresponding holes in the chassis, and press the other two tabs **1** through the holes until the front fan assembly is secured in place.

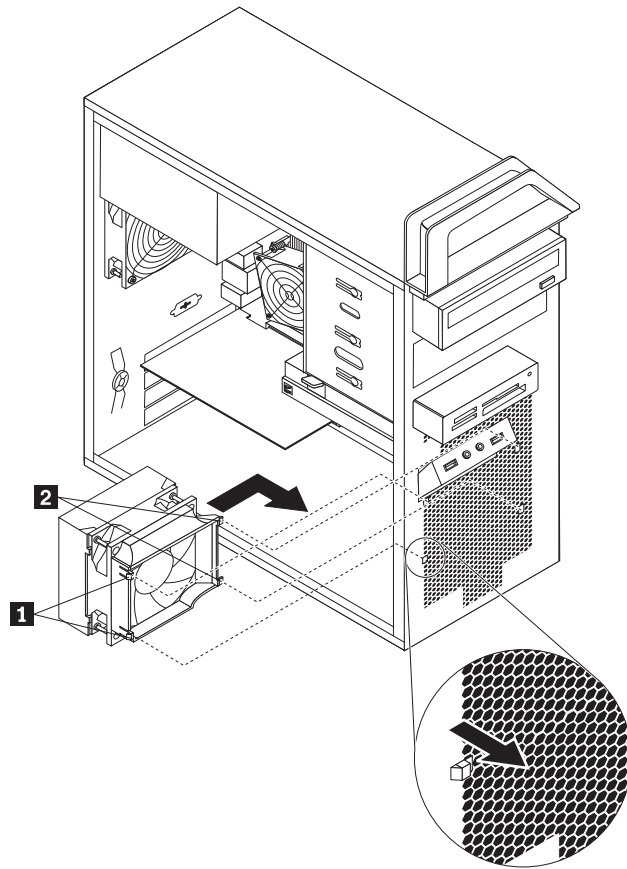


Figure 29. Installing the front fan assembly

6. Connect the front fan assembly cable to the power fan connector on the system board.
7. Reinstall the secondary hard disk drive if removed. See “Replacing the secondary hard disk drive” on page 29.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 40.

Replacing the rear fan assembly

Attention

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

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

To replace the rear fan assembly, do the following:

1. Remove the computer cover. See “Removing the computer cover” on page 14.
2. Locate the rear fan assembly. See “Locating components” on page 10.
3. Disconnect the rear fan assembly cable from the system fan connector on the system board. See “Locating parts on the system board” on page 11.
4. The rear fan assembly is attached to the chassis by four rubber mounts. Remove the rear fan assembly by breaking or cutting the four rubber mounts and gently pulling the rear fan assembly out of the chassis.

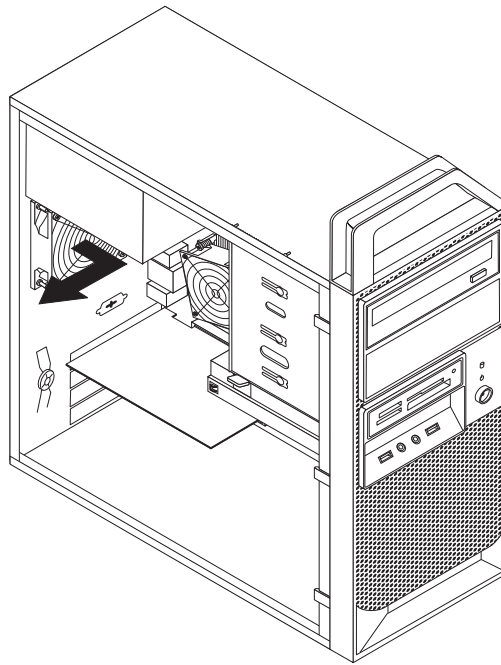


Figure 30. Removing the rear fan assembly

5. Install the new rear fan assembly by aligning the new rubber mounts with the corresponding holes in the chassis and push the rubber mounts through the holes.

Note: The new rear fan assembly you received will have four new rubber mounts attached.

- Pull on the tips of the rubber mounts until the rear fan assembly is secured in place.

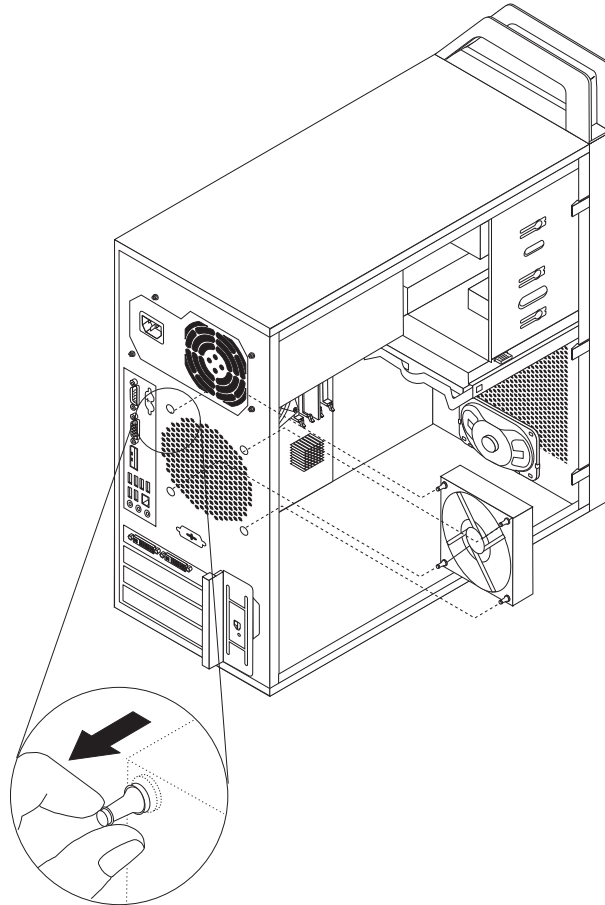


Figure 31. Installing the rear fan assembly

- Connect the rear fan assembly cable to the system fan connector on the system board.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 40.

Replacing the keyboard

Attention

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

This section provides instructions on how to replace the keyboard.

To replace the keyboard, do the following:

1. Remove any media from the drives. Then, turn off all attached devices and the computer.
2. Disconnect all power cords from electrical outlets.
3. Disconnect the old keyboard cable from the computer.

Note: Your keyboard might be connected to a PS/2 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 8 or “Locating connectors on the front of your computer” on page 7.

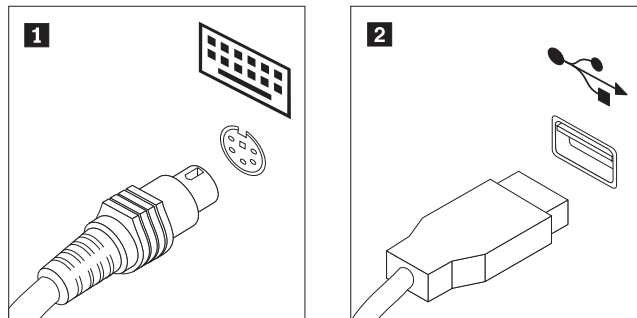


Figure 32. Keyboard connectors

4. Connect a new keyboard to the appropriate connector on the computer.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 40.

Replacing the mouse

Attention

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

This section provides instructions on how to replace the mouse.

To replace the mouse, do the following:

1. Remove any media from the drives. Then, turn off all attached devices and the computer.
2. Disconnect all power cords from electrical outlets.

3. Disconnect the old mouse cable from the computer.

Note: Your mouse might be connected to a PS/2 mouse connector **1** or a USB connector **2**. Depending on where your mouse is connected, see “Locating connectors on the rear of your computer” on page 8 or “Locating connectors on the front of your computer” on page 7.

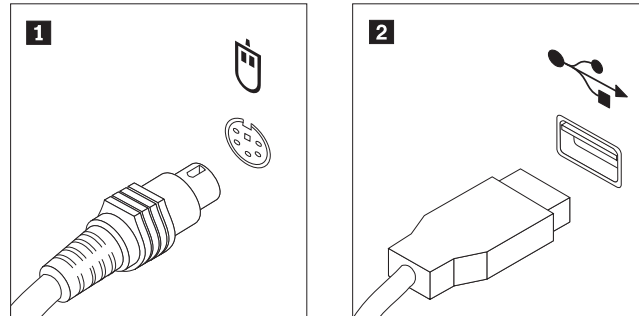


Figure 33. Mouse connectors

4. Connect a new mouse cable to the appropriate connector on the computer.

What to do next:

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

Completing the parts replacement

After completing the installation or replacement for all parts, you need to 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 Chapter 4, “Using the Setup Utility program,” on page 53.

To reinstall the computer cover and reconnect cables to your computer, do the following:

1. Make sure that all components have been reassembled correctly and that no tools or loose screws are left inside your computer. See “Locating components” on page 10 for the locations of various components in your computer.
2. If you have removed the front bezel, reinstall it. See “Removing and reinstalling the front bezel” on page 15.
3. Make sure 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.

4. 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.

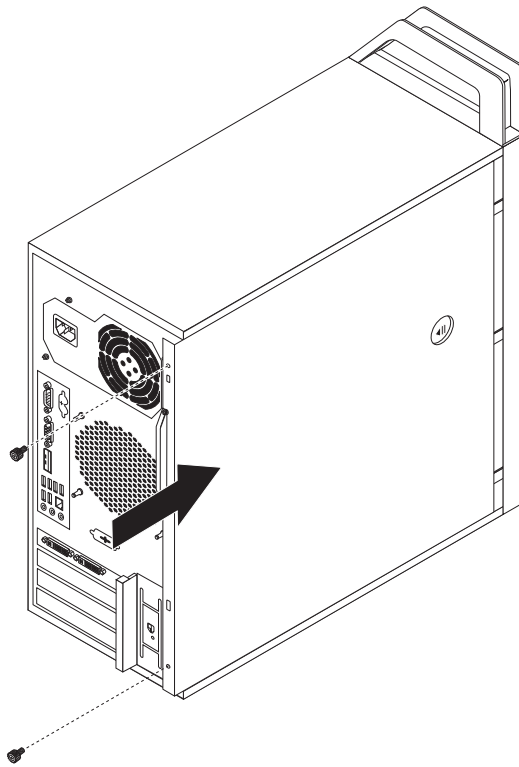


Figure 34. Reinstalling the computer cover

5. If the computer cover is secured with thumbscrews, install them.
6. If there is a padlock available, lock the computer cover. See “Padlock” on page 43.
7. If there is an integrated cable lock available, lock the computer.
8. Reconnect the external cables and power cords to the computer. See “Locating connectors on the rear of your computer” on page 8.
9. To update your configuration, refer to Chapter 4, “Using the Setup Utility program,” on page 53.

Note: In most areas of the world, Lenovo requires the return of the defective Customer Replaceable Unit (CRU). Information about this will come with the CRU or will come a few days after the CRU arrives.

Obtaining device drivers

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

Installing security features

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

Note: Make sure that any security cables you installed do not interfere with other computer cables.

Integrated cable lock

An integrated cable lock, 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 the integrated cable lock slot at the rear of your computer and is operated with a key. The cable lock also locks the buttons used to remove the computer cover. This is the same type of lock used with many notebook computers. You can order an integrated cable lock directly from Lenovo by searching for *Kensington* at:
<http://www.lenovo.com/support>

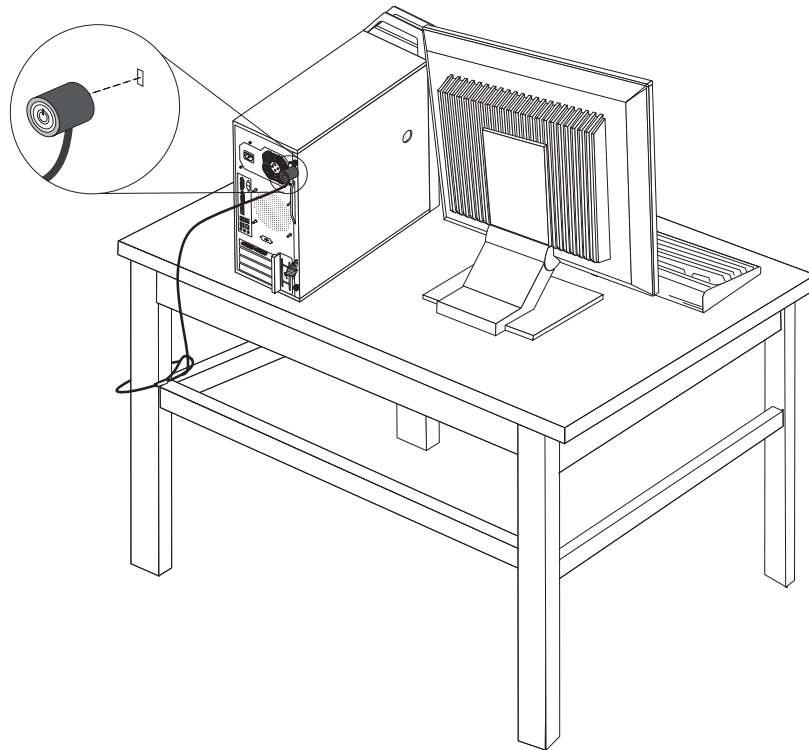


Figure 35. Installing an integrated cable lock

Padlock

Your computer is equipped with a padlock loop so that the cover cannot be removed when a padlock is installed.

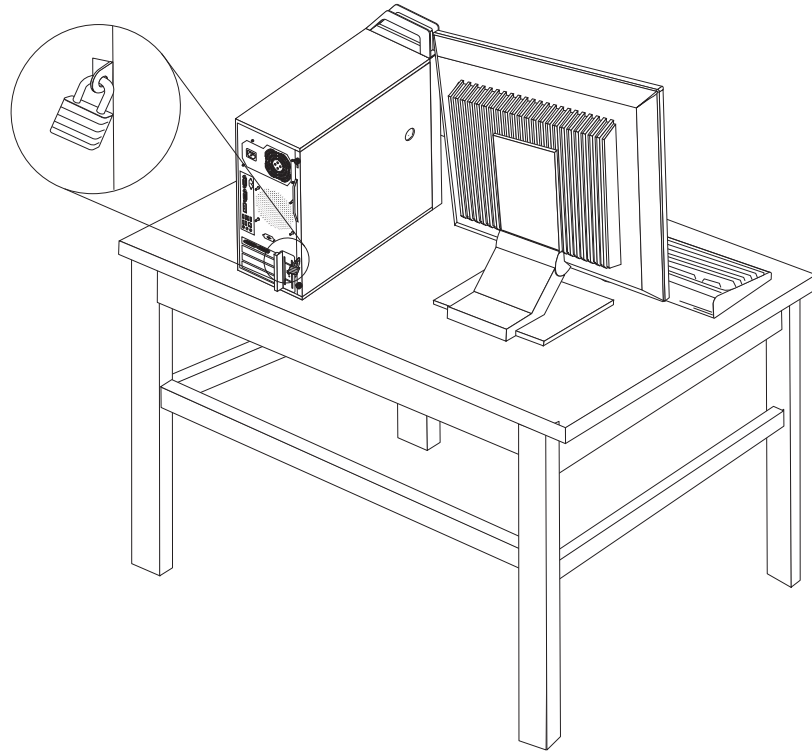


Figure 36. Installing a padlock

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. The computer cannot be used until a valid password is typed in. Refer to Chapter 4, “Using the Setup Utility program,” on page 53 for more information.

Erasing lost or forgotten passwords (clearing CMOS)

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

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

1. Remove the computer cover. See “Removing the computer cover” on page 14.
2. Locate the Clear CMOS /Recovery jumper on the system board. See “Locating parts on the system board” on page 11.
3. You might need to remove the secondary hard disk drive to access the Clear CMOS /Recovery jumper. See “Replacing the secondary hard disk drive” on page 29.
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 “Completing the parts replacement” on page 40.

6. Turn on the computer and leave it on for approximately 10 seconds. Then, turn off the computer by holding the power switch 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 secondary hard disk drive if you have removed it. See “Replacing the secondary hard disk drive” on page 29.
10. Reinstall the computer cover and connect the power cords. See “Completing the parts replacement” on page 40.

Chapter 3. Recovery information

This chapter will help you get familiar with recovery solutions provided by Lenovo. This chapter explains when and how to use the following recovery methods:

- Creating and using recovery media
- Performing backup and recovery operations
- Using the Rescue and Recovery workspace
- Creating and using rescue media
- Creating and using a recovery repair diskette
- Installing or reinstalling device drivers
- Setting a rescue device in the startup sequence
- Solving recovery problems

Notes:

1. There are a variety of methods to choose from when considering how to recover in the event of a software- or hardware-related problem. Some methods vary depending on the type of your operating system.
2. The product on the recovery media may be used only for the following purposes:
 - Restore the product preinstalled on your computer
 - Reinstall the product
 - Modify the product using the Additional Files

Creating and using recovery media

Recovery media enable you to restore the hard disk drive to the factory default settings. Recovery media are useful if you transfer the computer to another area, sell the computer, recycle the computer, or put the computer in an operational state after all other methods of recovery have failed. As a precautionary measure, it is important to create recovery media as soon as possible.

Note: The recovery operations you can perform using recovery media vary depending on the operating system from which they are created. Your Microsoft Windows license permits you to create only one data medium, so it is important that you store the created recovery medium in a safe place.

Creating recovery media

This section provides instructions on how to create recovery media on different operating systems.

Note: On the Windows 7 operating system, you can create recovery media using discs or external USB storage devices. On the Windows Vista operating system and the Windows XP operating system, you can create recovery media using discs only.

- To create recovery media on the Windows 7 operating system, click **Start** → **All Programs** → **Lenovo ThinkVantage Tools** → **Factory Recovery Disks**. Then, follow the instructions on the screen.

- To create Product Recovery discs on the Windows Vista operating system, click **Start → All Programs → ThinkVantage → Create Product Recovery Media**. Then, follow the instructions on the screen.
- To create Product Recovery discs on the Windows XP operating system, click **Start → All Programs → ThinkVantage → Create Recovery Media**. Then, follow the instructions on the screen.

Using recovery media

This section provides instructions on how to use recovery media on different operating systems.

- To use recovery media on the Windows 7 operating system or the Windows Vista operating system, do the following:

Attention: When you use recovery media to restore the computer to the factory default settings on the Windows 7 operating system or the Windows Vista operating system, all the files currently on the system drive or the hard disk drive will be deleted and replaced by the factory default settings.

1. Depending on the type of your recovery media, connect your boot medium (memory key or USB hard disk drive) to your computer, or insert the boot disc into your CD or DVD drive.
2. Restart your computer.
3. Repeatedly press and release the F12 key when turning on the computer. When the Startup Device Menu window opens, release the F12 key.
4. Depending on the type of your recovery media, select the proper startup device and press Enter. After a short delay, the Product Recovery program opens.
5. Follow the instructions on the screen.

After restoring the computer to the factory default settings, you might have to reinstall some software programs or device drivers. See “Installing or reinstalling device drivers” on page 51 for details.

- To use Product Recovery discs on the Windows XP operating system, do the following:

Attention: When you use Product Recovery discs to restore the computer to the factory default settings on the Windows XP operating system, all the files currently on the hard disk drive will be deleted and replaced by the factory default settings. During the restore process, you will be given the option to save one or more files currently on the hard disk drive to other media before the data is deleted.

1. Insert the boot disc into your CD or DVD drive.
2. Restart your computer.
3. Repeatedly press and release the F12 key when turning on the computer. When the Startup Device Menu window opens, release the F12 key.
4. Select the CD or DVD drive as the startup device and press Enter. After a short delay, the Rescue and Recovery workspace opens.
5. From the **Rescue and Recovery** menu, click **Restore your system**.
6. Follow the instructions on the screen.

Performing backup and recovery operations

The Rescue and Recovery program enables you to back up all your hard disk drive contents including the operating system, data files, software programs, and personal settings. You can designate where the Rescue and Recovery program stores the backup:

- On a protected area of your hard disk drive
- On a secondary hard disk drive installed in your computer
- On an attached external USB hard disk drive
- On a network drive
- On recordable CDs or DVDs (a recordable CD or DVD drive is required for this option)

After you have backed up the contents on the hard disk drive, you can restore the complete contents of the hard disk drive, restore only the selected files, or restore only the Windows operating system and applications.

Performing a backup operation

This section provides instructions on how to perform a backup operation using the Rescue and Recovery program on different operating systems.

- To perform a backup operation using the Rescue and Recovery program on the Windows 7 operating system, do the following:
 1. From the Windows desktop, click **Start → All Programs → Lenovo ThinkVantage Tools → Enhanced Backup and Restore**. The Rescue and Recovery program opens.
 2. From the Rescue and Recovery main window, click the **Launch advanced Rescue and Recovery** arrow.
 3. Click **Back up your hard drive** and select backup operation options. Follow the instructions on the screen.
- To perform a backup operation using the Rescue and Recovery program on the Windows Vista operating system or the Windows XP operating system, do the following:
 1. From the Windows desktop, click **Start → All Programs → ThinkVantage → Rescue and Recovery**. The Rescue and Recovery program opens.
 2. From the Rescue and Recovery main window, click **Launch advanced Rescue and Recovery → Back up your hard drive**, and select backup operation options.
 3. Follow the instructions on the screen.

Performing a recovery operation

This section provides instructions on how to perform a recovery operation using the Rescue and Recovery program on different operating systems.

- To perform a recovery operation using the Rescue and Recovery program on the Windows 7 operating system, do the following:
 1. From the Windows desktop, click **Start → All Programs → Lenovo ThinkVantage Tools → Enhanced Backup and Restore**. The Rescue and Recovery program opens.
 2. From the Rescue and Recovery main window, click the **Launch advanced Rescue and Recovery** arrow.
 3. Click the **Restore your system from a backup** icon.

4. Follow the instructions on the screen.
- To perform a recovery operation using the Rescue and Recovery program on the Windows Vista operating system or the Windows XP operating system, do the following:
 1. From the Windows desktop, click **Start** → **All Programs** → **ThinkVantage** → **Rescue and Recovery**. The Rescue and Recovery program opens.
 2. From the Rescue and Recovery main window, click **Launch advanced Rescue and Recovery**.
 3. Click the **Restore your system from a backup** icon.
 4. Follow the instructions on the screen.

For more information about performing a recovery operation from the Rescue and Recovery workspace, see “Using the Rescue and Recovery workspace.”

Using the Rescue and Recovery workspace

The Rescue and Recovery workspace resides in a protected, hidden area of your hard disk drive that operates independently from the Windows operating system. This enables you to perform recovery operations even if the Windows operating system cannot be started. You can perform the following recovery operations from the Rescue and Recovery workspace:

- **Rescue files from your hard disk drive or from a backup**

The Rescue and Recovery workspace enables you to locate files on your hard disk drive and transfer them to a network drive or other recordable media, such as a USB device, a disc, or a diskette. This solution is available, even if you did not back up your files or if changes were made to the files since your last backup operation. You can also rescue individual files from a Rescue and Recovery backup located on your local hard disk drive, a USB device, or a network drive.
- **Restore your hard disk drive from a Rescue and Recovery backup**

If you have backed up your hard disk drive using the Rescue and Recovery program, you can restore the hard disk drive from a Rescue and Recovery backup, even if you cannot start the Windows operating system.
- **Restore your hard disk drive to the factory default settings**

The Rescue and Recovery workspace enables you to restore the complete contents of your hard disk drive to the factory default settings. If you have multiple partitions on your hard disk drive, you have the option to restore the factory default settings to the C: partition and leave the other partitions intact. Because the Rescue and Recovery workspace operates independently from the Windows operating system, you can restore the factory default settings even if you cannot start the Windows operating system.

Attention: If you restore the hard disk drive from a Rescue and Recovery backup or restore the hard disk drive to the factory default settings, all files on the primary hard disk drive partition (usually drive C:) will be deleted in the recovery process. If possible, make copies of important files. If you are unable to start the Windows operating system, you can use the Rescue files feature in the Rescue and Recovery workspace to copy files from your hard disk drive to other media.

To start the Rescue and Recovery workspace, do the following:

1. Make sure the computer is turned off.
2. Repeatedly press and release the F11 key when turning on the computer.

3. When you hear beeps or see a logo screen, release the F11 key.
4. If you have set a Rescue and Recovery password, type your password when prompted. The Rescue and Recovery workspace opens after a short delay.

Note: If the Rescue and Recovery workspace fails to open, see “Solving recovery problems” on page 52.

5. Do one of the following:
 - To rescue files from your hard disk drive or from a backup, click **Rescue files** and follow the instructions on the screen.
 - To restore your hard disk drive from a Rescue and Recovery backup or to restore your hard disk drive to the factory default settings, click **Restore your system** and follow the instructions on the screen.

For more information about the features of the Rescue and Recovery workspace, click **Help**.

Notes:

1. After restoring a hard disk drive to the factory default settings, you might have to reinstall device drivers for some devices. See “Installing or reinstalling device drivers” on page 51.
2. Some computers come with Microsoft Office or Microsoft Works preinstalled. If you need to recover or reinstall your Microsoft Office or Microsoft Works applications, you must use the *Microsoft Office CD* or *Microsoft Works CD*. These CDs are provided only with computers preinstalled with Microsoft Office or Microsoft Works.

Creating and using rescue media

With rescue media, such as a disc or a USB hard disk drive, you can recover the computer from failures that prevent you from gaining access to the Rescue and Recovery workspace on your hard disk drive.

Notes:

1. The recovery operations you can perform using rescue media vary depending on the operating system.
2. The rescue discs can be started in any type of CD or DVD drive.
3. You can also run the PC-Doctor for Rescue and Recovery diagnostic program, after using a rescue medium to recover the computer from failures and gaining access to the Rescue and Recovery workspace.

Creating rescue media

This section provides instructions on how to create rescue media on different operating systems.

- To create a rescue medium on the Windows 7 operating system, do the following:
 1. From the Windows desktop, click **Start → All Programs → Lenovo ThinkVantage Tools → Enhanced Backup and Restore**. The Rescue and Recovery program opens.
 2. From the Rescue and Recovery main window, click the **Launch advanced Rescue and Recovery** arrow.
 3. Click the **Create Rescue Media** icon. The Create Rescue and Recovery Media window opens.

4. In the **Rescue Media** area, select the type of rescue media you want to create. You can create a rescue medium using a disc, a USB hard disk drive, or a secondary internal hard disk drive.
 5. Click **OK** and follow the instructions on the screen.
- To create a rescue medium on the Windows Vista operating system or the Windows XP operating system, do the following:
 1. From the Windows desktop, click **Start → All Programs → ThinkVantage → Create Recovery Media**. The Create Rescue and Recovery Media window opens.
 2. In the **Rescue Media** area, select the type of rescue media you want to create. You can create a rescue medium using a disc, a USB hard disk drive, or a secondary internal hard disk drive.
 3. Click **OK** and follow the instructions on the screen.

Using rescue media

This section provides instructions on how to use the rescue media you have created.

Note: Make sure your rescue device (optical drive, USB device, or the secondary internal hard disk drive) is set as the first boot device in the startup device sequence before doing this procedure. See “Selecting a startup device” on page 55.

To use the rescue medium you have created, do one of the following:

- If you have created the rescue medium using a disc, make sure that your computer is turned on and insert the rescue disc. Then, restart the computer. The rescue medium starts.
- If you have created the rescue medium using a USB hard disk drive, attach the USB hard disk drive to one of the USB connectors on your computer. Then, turn on the computer. The rescue medium starts.
- If you have created the rescue medium using a secondary internal hard disk drive, set the secondary internal hard disk drive as the first boot device in the startup device sequence. Then, the rescue medium starts.

When the rescue medium starts, the Rescue and Recovery workspace opens. The help information for each feature is available from the Rescue and Recovery workspace. Follow the instructions to complete the recovery process.

Creating and using a recovery repair diskette

If you are unable to access the Rescue and Recovery workspace or the Windows environment, use a recovery repair diskette to repair the Rescue and Recovery workspace or repair a file needed to enter the Windows environment. It is important to create a recovery repair diskette as early as possible and store it in a safe place as a precautionary measure.

Note: You need to have a diskette drive for creating and using a recovery repair diskette. If you do not have an internal diskette drive, you can use an external USB diskette drive.

Creating a recovery repair diskette

This section provides instructions on how to create a recovery repair diskette.

To create a recovery repair diskette, do the following:

1. Turn on the computer, and make sure that your computer has Internet access.
2. Follow the instructions on the Web site at:

<http://www.lenovo.com/think/support/site.wss/document.do?Indocid=MIGR-54483>

3. After the recovery repair diskette is created, take out the diskette from the diskette drive and label it *Recovery Repair Diskette*. Then, store it in a safe place for future use.

Using a recovery repair diskette

This section provides instructions on how to use a recovery repair diskette.

To use the recovery repair diskette you created, do the following:

1. Turn off the computer.
2. Insert the recovery repair diskette into the diskette drive.
3. Turn on the computer and follow the instructions on the screen.

Notes:

1. If the repair operation completes without any error, you will be able to access the Rescue and Recovery workspace by repeatedly pressing the F11 key while you restart your computer. When you hear beeps or see a logo screen, release the F11 key. You will also be able to access the Windows environment after the repair operation completes.
2. If an error message appears during the repair operation and the repair operation cannot be completed, you might have a problem with the partition that contains the Rescue and Recovery workspace. Use a rescue medium to access the Rescue and Recovery workspace. For information about creating and using rescue media, see "Creating and using rescue media" on page 49.

Installing or reinstalling device drivers

Before installing or reinstalling device drivers, make sure that you have a preinstalled operating system and the documentation and software media for the device.

Device drivers for factory-installed devices are located in the SWTOOLS\DRIVERS subdirectory on the computer hard disk drive (usually drive C:). The latest device drivers for factory-installed devices are also available at <http://www.lenovo.com/support>. Other device drivers are on the software media that come with individual devices.

To install or reinstall a device driver for a factory-installed device, do the following:

1. Turn on the computer.
2. Use Windows Explorer or My Computer to display the directory structure of your hard disk drive.
3. Go to the C:\SWTOOLS directory.

4. Open the DRIVERS folder. Within the DRIVERS folder, there are several subfolders named for various devices installed in your computer, such as AUDIO or VIDEO.
5. Open the appropriate device subfolder.
6. Do one of the following:
 - In the device subfolder, look for a README.txt file or a file with the .txt extension. This file might be named after the operating system, such as WIN98.txt. The TXT file contains information about how to install the device driver. Follow the instructions to complete the installation.
 - If the device subfolder contains a file with the .inf extension and you want to install the device driver using the INF file, click **Start → Help and Support** to enter the Windows Help and Support information system for the detailed information about how to install the device driver.
 - In the device subfolder, look for a SETUP.EXE file. Double-click the file and follow the instructions on the screen.

Setting a rescue device in the startup sequence

Before you start the Rescue and Recovery program from an internal hard disk drive, a disc, a USB hard disk drive, or other external devices, you must first make sure that your rescue device is set as the first boot device in the startup device sequence in the Setup Utility program. Refer to “Selecting a startup device” on page 55 for detailed information about temporarily or permanently changing the startup sequence.

Note: If you use an external device, you must first turn off your computer before connecting the external device.

For more information on the Setup Utility program, see Chapter 4, “Using the Setup Utility program,” on page 53.

Solving recovery problems

If you are unable to access the Rescue and Recovery workspace or the Windows environment, do one of the following:

- Use a rescue medium to start the Rescue and Recovery workspace. See “Creating and using rescue media” on page 49.
- Use a recovery repair diskette to repair the Rescue and Recovery workspace or repair a file needed to enter the Windows environment. See “Creating and using a recovery repair diskette” on page 50.
- Use a recovery medium if you want to restore the system drive or the hard disk drive to the factory default settings. See “Creating and using recovery media” on page 45.

Note: If you are unable to access the Rescue and Recovery workspace or the Windows environment from a rescue medium, a recovery repair diskette, or a recovery medium, you might not have the rescue device, diskette drive, or recovery device set as the first boot device in the startup device sequence. For more information, see “Setting a rescue device in the startup sequence.”

It is important to create a rescue medium, a recovery repair diskette, and a recovery medium as early as possible and store them in a safe place.

Chapter 4. Using the Setup Utility program

The Setup Utility program is used to view and change the configuration settings of your computer, regardless of which operating system you are using. However, 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. Make sure your computer is turned off.
2. Repeatedly press and release the F1 key when turning on the computer. When you hear multiple beeps or see a logo screen, release the F1 key.

Note: If a Power-On Password or an Administrator Password has been set, the Setup Utility program menu will not be displayed until you type the correct password. For more information, see “Using passwords.”

The Setup Utility program might start automatically when POST detects that hardware has been removed or new hardware has been installed in your computer.

Viewing and changing settings

The Setup Utility program menu lists various items about the system configuration. To view or change settings, start the Setup Utility program. See “Starting the Setup Utility program.” Then, follow the instructions on the screen.

When working with the Setup Utility program menu, you must use the keyboard. The keys used to perform various tasks are displayed at the bottom of each screen.

Using passwords

By using the Setup Utility program, you can set passwords to prevent unauthorized access to your computer and data. The following types of passwords are available:

- Power-On Password
- Administrator Password
- Hard Disk Password

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

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. To set a strong password, use the following guidelines:

- Have at least eight characters in length
- Contain at least one alphabetic character and one numeric character
- Setup Utility program and hard disk drive passwords are not case sensitive
- Not be your name or your user name
- Not be a common word or a common name
- Be significantly different from your previous passwords

Power-On Password

When a Power-On Password is set, you are prompted to type a valid password each time the computer is turned on. The computer cannot be used until the valid password is typed in.

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 type 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 typed in.

If both the Power-On Password and Administrator Password are set, you can type 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 hard disk drive. When a Hard Disk Password is set, you are prompted to type a valid password each time you try to access the hard disk drive.

Setting, changing, and 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 53.
2. From the Setup Utility program main menu, select **Security**.
3. Depending on the password type, select **Set Power-On Password**, **Set Administrator Password**, or **Hard Disk Security → Hard Disk Password**.
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.”

Enabling or disabling a device

This section provides information on how to enable or disable user access to the following devices:

Floppy Driver A	When this option is set to Disabled , the floppy drive cannot be accessed.
USB Setup	Use this option to enable or disable a USB connector. When a USB connector is disabled, the device connected to the USB connector cannot be used.
SATA Controller	When this option is set to Disable , all devices connected to the SATA connectors (such as hard disk drives or the optical drive) are disabled and cannot be accessed.
External SATA Port	When this option is set to Disable , the device connected to the External SATA connector cannot be accessed.

To enable or disable a device, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 53.
2. From the Setup Utility program main menu, select **Devices**.
3. Depending on the device you want to enable or disable, do one of the following:
 - Select **USB Setup** to enable or disable a USB device.
 - Select **ATA Drives Setup** to enable or disable an internal or external SATA device.
4. Select the desired settings and press Enter.
5. Press F10 to save and exit the Setup Utility program. See “Exiting from the Setup Utility program” on page 56.

Selecting a startup device

If your computer does not start up from a device such as the disc, diskette, or hard disk drive as expected, do one of the following to select the startup device you want.

Selecting a temporary startup device

Use this procedure to select a temporary startup device.

Note: Not all discs, hard disk drives, and diskettes are bootable.

1. Turn off your computer.
2. Repeatedly press and release the F12 key when turning on the computer. When the Please select boot device window displays, release the F12 key.
3. Select the desired startup device and press Enter. The computer will start up from the device you selected.

Note: Selecting a startup device from the Please select boot device window does not permanently change the startup sequence.

Selecting or changing the startup device sequence

To view or permanently change the configured startup device sequence, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 53.
2. From the Setup Utility program main menu, select **Startup**.
3. Select the devices for the Primary Boot Sequence, the Automatic Boot Sequence, and the Error Boot Sequence. Read the information displayed on the right side of the screen.
4. Press F10 to save and exit the Setup Utility program. See “Exiting from the Setup Utility program.”

Advanced settings

On some computer models, the **Advanced** menu includes a setting to enable or disable HyperThreading. This feature works only with HyperThreading-aware operating systems, such as the Windows 7 operating system and the Windows Vista operating system. The default setting for HyperThreading is enabled. However, if you are not using a HyperThreading-aware operating system and the setting for HyperThreading is **Enabled**, your computer performance might be degraded. Therefore, you should always set HyperThreading to **Disabled** unless you are sure your operating system supports HyperThreading.

Exiting from the Setup Utility program

After you finish viewing or changing settings, press Esc to return to the Setup Utility program main menu. You might have to press Esc several times. Then, do one of the following:

- If you want to save the new settings, press F10 to save and exit the Setup Utility program.
- If you do not want to save the settings, select **Exit → Discard Changes and Exit**.
- If you want to return to the default settings, press F9 to load the default settings.

Chapter 5. Configuring RAID

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

Note: The information about configuring RAID in this chapter is applicable only for a Windows environment. For information about configuring RAID in a Linux environment, contact your Linux software provider.

RAID Level

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

- RAID Level 0 – Striped disk array
 - Two hard disk drives minimum
 - Better performance without fault tolerance
- RAID Level 1 – Mirrored disk array
 - Two hard disk drives minimum
 - Improved read performance and 100% redundancy

To install a secondary hard disk drive, refer to “Replacing the secondary hard disk drive” on page 29.

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 53.
2. Select **Devices** → **ATA Drives Setup**.
3. Select **Configure SATA as** and press Enter.
4. Select **RAID** and press Enter.
5. Press F10 to save the new settings and exit the Setup Utility program.

Creating RAID volumes

This section describes how to use the Intel Matrix Storage Manager option ROM configuration utility to create RAID volumes.

To create RAID volumes, do the following:

1. Press Ctrl+I when prompted to enter the Intel Matrix Storage Manager option ROM 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 on page 57 to create additional RAID volumes, or select **Exit** and press Enter.
10. Press Y when prompted to confirm the exit.

Deleting RAID volumes

This section describes how to use the Intel Matrix Storage Manager option ROM configuration utility to delete RAID volumes.

To delete RAID volumes, do the following:

1. Press Ctrl+I when prompted to enter the Intel Matrix Storage Manager option ROM 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 hard disk drives to non-RAID.
5. After deleting a RAID volume, you can:
 - Return to step 2 to delete additional RAID volumes.
 - See “Creating RAID volumes” on page 57 for RAID volume creation.
 - Use the up and down arrow keys to select **Exit** and press Enter.
 - Use the up and down arrow keys to select **Reset Disks to Non-RAID** and press Enter.
 - a. Use the arrow keys and the space key to mark individual physical hard disk drives to be reset, and then press Enter to complete the selection.
 - b. When prompted, press Y to confirm the reset action.
 - c. After completing the Reset Disks to Non-RAID function, you can:
 - Return to step 2 to delete additional RAID volumes.
 - See “Creating RAID volumes” on page 57 for RAID volume creation.
 - Use the up and down arrow keys to select **Exit** and press Enter.

Chapter 6. Updating system programs

This chapter contains information about updating POST/BIOS and recovering from a POST/BIOS update failure.

Using system programs

System programs are the basic layer of software built into your computer. System programs include the POST, the BIOS code, and the Setup Utility program. POST is a set of tests and procedures that are performed each time you turn on your computer. BIOS is a layer of software that translates instructions from other layers of software into electrical signals that the computer hardware can execute. You can use the Setup Utility program to view and change the configuration and setup of your computer.

Your computer system board has a module called electrically erasable programmable read-only memory (EEPROM, also referred to as flash memory). You can easily update POST, BIOS, and the Setup Utility program by starting your computer with a flash update disc or running a special update program from your operating system.

Lenovo might make changes and enhancements to the POST and BIOS. When updates are released, they are available as downloadable files on the Lenovo Web site at <http://www.lenovo.com>. Instructions for using the POST/BIOS updates are available in a TXT file that is included with the update files. For most models, you can download either an update program to create a system-program-update (flash) disc or an update program that can be run from the operating system.

Note: You can download a self-starting bootable CD/DVD image (known as an ISO image) of the diagnostics program to support computers without a diskette drive. Go to:
<http://www.lenovo.com>

Updating (flashing) BIOS from a disc

This section provides instructions on how to update (flash) BIOS from a disc. System BIOS program updates are available at:
<http://www.lenovo.com/support>

To update (flash) BIOS from a disc, do the following:

1. Make sure the optical drive you want to use is set as the first boot device in the startup device sequence. See “Selecting or changing the startup device sequence” on page 56.
2. Make sure the computer is turned on. Insert the disc into the optical drive.
3. Turn off the computer and back on again. The update begins.
4. When prompted to change the serial number, press N.

Note: If you want to change the serial number, press Y when prompted. Type in the serial number and then press Enter.

5. When prompted to change the machine type/model, press N.

Note: If you want to change the machine type/model, press Y when prompted. Type in the machine type/model and then press Enter.

6. Follow the instructions on the screen to complete the update.

Updating (flashing) BIOS from your operating system

Note: Because Lenovo makes constant improvements to the Web site, the Web page contents are subject to change without notice, including the contents referenced in the following procedure.

To update (flash) BIOS from your operating system, do the following:

1. Go to <http://www.lenovo.com/support>.
2. Do the following to locate the downloadable files for your machine type:
 - a. In the **Enter a product number** field, type your machine type and click **Go**.
 - b. Click **Downloads and drivers**.
 - c. Select **BIOS** in the **Refine results** field to easily locate all the BIOS related links.
 - d. Click the BIOS update link.
 - e. Click the TXT file that contains the instructions for updating (flashing) BIOS from your operating system.
3. Print these instructions. This is very important because they are not on the screen after the download begins.
4. Follow the printed instructions to download, extract, and install 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, which is 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 remove the computer cover. Refer to "Removing the computer cover" on page 14.
3. Locate the Clear CMOS /Recovery jumper on the system board. Refer to "Locating parts on the system board" on page 11.
4. Remove any cables that impede access to the Clear CMOS /Recovery jumper.
5. You might need to remove the secondary hard disk drive to access the Clear CMOS /Recovery jumper. See "Replacing the secondary hard disk drive" on page 29.
6. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
7. Reconnect any cables that were disconnected and reinstall the secondary hard disk drive if removed. See "Replacing the secondary hard disk drive" on page 29.
8. Reinstall the computer cover and reconnect the power cords for the computer and monitor to electrical outlets. Refer to "Completing the parts replacement" on page 40.
9. Turn on the computer and the monitor. Insert the POST/BIOS update (flash) disc into the optical drive.
10. Turn the computer off and back on again. The recovery session begins.

Note: The recovery session will take two to three minutes. During this time you will hear a series of beeps.

11. After the recovery session is completed, the series of beeps will end, and the system will automatically turn off. Remove the disc from the optical drive before the system completely turns off.
12. Repeat step 2 through step 4.
13. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
14. Reconnect any cables that were disconnected and reinstall the secondary hard disk drive if removed.
15. Reinstall the computer cover and reconnect any cables that were disconnected.
16. Turn on the computer to restart the operating system.

Chapter 7. Troubleshooting and diagnostics

This chapter describes some basic troubleshooting and diagnostic programs. If your computer problem is not described here, see Chapter 8, “Getting information, help, and service,” on page 69 for additional troubleshooting resources.

Basic troubleshooting

The following table provides information to help you troubleshoot your computer problems.

Note: If you cannot correct the problem, have the computer serviced. For a list of service and support telephone numbers, refer to the *ThinkStation Safety and Warranty Guide* that comes with your computer or go to the Lenovo Support Web site at <http://www.lenovo.com/support/phone>.

Symptom	Action
The computer does not start when you press the power switch.	Verify that: <ul style="list-style-type: none">• The power cord is correctly connected to the rear of the computer and to a working electrical outlet.• If your computer has a secondary power switch on the rear of the computer, make sure 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 monitor screen is blank.	Verify that: <ul style="list-style-type: none">• The monitor signal cable is correctly connected to the monitor and to the appropriate monitor connector on the computer.• The monitor power cord is correctly connected to the monitor and to a working electrical outlet.• The monitor is turned on and the brightness and contrast controls are set correctly.• The computer voltage matches the voltage available at the electrical outlet for your country or region.• If your computer has two monitor connectors, be sure to use the connector on the graphics card.
The keyboard does not work.	Verify that: <ul style="list-style-type: none">• The computer is turned on.• The keyboard is securely connected to a USB connector or the PS/2 keyboard connector on the computer.• No keys are stuck.
The mouse does not work.	Verify that: <ul style="list-style-type: none">• The computer is turned on.• The mouse is correctly connected to a USB connector or the PS/2 mouse connector on the computer.• The mouse is clean. Refer to “Cleaning the mouse” on page 66 for further information.

Symptom	Action
The operating system does not start.	Verify that: <ul style="list-style-type: none"> • There is no diskette in the diskette drive. • The startup sequence includes the device where the operating system resides. Usually, the operating system is on the hard disk drive. For more information, see “Selecting a startup device” on page 55.
The computer beeps multiple times before the operating system starts.	Verify that no keys are stuck.

Diagnostic programs

Diagnostic programs are used to test hardware components of your computer and report operating-system-controlled settings that can cause hardware failures. There are two programs preinstalled on your computer to help you diagnose computer problems:

- Lenovo ThinkVantage Toolbox or Lenovo System Toolbox, depending on your operating system (used when you are running the Windows operating system)
- PC-Doctor for Rescue and Recovery (used when your Windows operating system does not start)

Notes:

1. You can also download the PC-Doctor for DOS diagnostic program from <http://www.lenovo.com/support>. See “PC-Doctor for DOS” on page 65 for detailed information.
2. If you are unable to isolate and repair the problem yourself after running the diagnostic programs, save and print the log files created by the diagnostic programs. You will need the log files when you speak to a Lenovo technical support representative.

Lenovo ThinkVantage Toolbox

Note: The Lenovo ThinkVantage Toolbox program is only available on computers preinstalled with the Windows 7 operating system from Lenovo.

The Lenovo ThinkVantage Toolbox program helps you maintain your computer, improve computing security, diagnose computer problems, get familiar with the innovative technologies provided by Lenovo, and get more information about your computer. You can use the Diagnostics feature of the Lenovo ThinkVantage Toolbox program to test devices, diagnose problems, create bootable diagnostic media, update system drivers, and review system information.

To diagnose the computer problems by using the Lenovo ThinkVantage Toolbox program, click **Start** → **All Programs** → **Lenovo ThinkVantage Tools** → **System Health and Diagnostics** → **Diagnostics**. Follow the instructions on the screen. For additional information, refer to the Lenovo ThinkVantage Toolbox help system.

Lenovo System Toolbox

Note: The Lenovo System Toolbox program is only available on computers preinstalled with the Windows Vista operating system or the Windows XP operating system from Lenovo.

The Lenovo System Toolbox program is a diagnostic program that works through the Windows operating system and enables you to view symptoms and solutions for computer problems, access the Lenovo troubleshooting center, update system drivers, and review system information.

To run the Lenovo System Toolbox program, click **Start → All Programs → Lenovo Services → Lenovo System Toolbox**. Follow the instructions on the screen. For additional information about running the diagnostic program, refer to the Lenovo System Toolbox help system.

The Lenovo System Toolbox program also has problem determination aids that determine software and usage problems.

PC-Doctor for Rescue and Recovery

The PC-Doctor for Rescue and Recovery diagnostic program is part of the Rescue and Recovery workspace on each Lenovo computer. Use the PC-Doctor for Rescue and Recovery diagnostic program if you are unable to start the Windows operating system.

To run the PC-Doctor for Rescue and Recovery diagnostic program from the Rescue and Recovery workspace, do the following:

1. Turn off the computer.
2. Repeatedly press and release the F11 key when turning on the computer. When you hear beeps or see a logo screen, stop pressing the F11 key. The Rescue and Recovery workspace opens after a short delay.
3. From the Rescue and Recovery workspace, select **Launch advanced Rescue and Recovery → Diagnose hardware**. The PC-Doctor for Rescue and Recovery diagnostic program opens.
4. Select the diagnostic test you want to run. Then, follow the instructions on the screen.

For additional information about running the PC-Doctor for Rescue and Recovery diagnostic program, refer to the PC-Doctor for Rescue and Recovery help system.

Note: If you encounter failures that prevent you from gaining access to the Rescue and Recovery workspace, you can run the PC-Doctor for Rescue and Recovery diagnostic program after using a rescue medium to recover the computer from failures and gaining access to the Rescue and Recovery workspace. See “Creating and using rescue media” on page 49.

PC-Doctor for DOS

You can also download the latest version of the PC-Doctor for DOS diagnostic program from <http://www.lenovo.com/support>. The PC-Doctor for DOS diagnostic program runs independently of the Windows operating system. Use the PC-Doctor for DOS diagnostic program if you are unable to start the Windows operating system or if the two diagnostic programs preinstalled on your computer have not been successful in isolating a possible problem. You can run the PC-Doctor for DOS diagnostic program from a diagnostic disc that you created.

Creating a diagnostic disc

This section provides instructions on how to create a diagnostic disc.

To create a diagnostic disc, do the following:

1. Download a self-starting bootable CD/DVD image (known as an ISO image) of the diagnostic program from:
<http://www.lenovo.com/support>
2. Use any CD/DVD burning software to create a diagnostic disc with the ISO image.

Running the diagnostic program from a diagnostic disc

This section provides instructions on how to run the diagnostic program from a diagnostic disc that you created.

To run the diagnostic program from a diagnostic disc that you created, do the following:

1. Make sure the optical drive you want to use is set as the first boot device in the startup device sequence. See “Selecting or changing the startup device sequence” on page 56.
2. Make sure the computer is turned on and then insert the disc into the optical drive. The diagnostic program opens.

Note: You can insert the disc into the optical drive when you are setting the startup device sequence. However, if you insert the disc into the optical drive when you have already entered the operating system, you need to restart the computer to access the diagnostic program.

3. Follow the instructions on the screen to select the diagnostic test you want to run.

Note: For additional help, press the F1 key.

4. Remove the diagnostic disc from the optical drive when you complete the diagnostic process.

Cleaning the mouse

This section provides instructions on how to clean an optical or non-optical mouse.

Optical mouse

An optical mouse uses a light-emitting diode (LED) and an optical sensor to navigate the pointer. If the pointer on the screen does not move smoothly with the optical mouse, you might need to clean the mouse.

To clean the optical mouse, do the following:

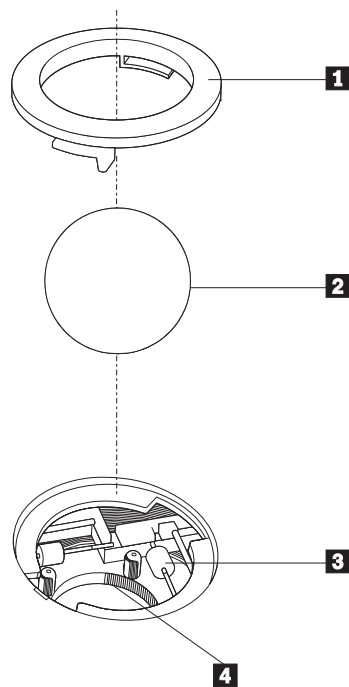
1. Turn off your computer.
2. Disconnect the mouse cable from the computer.
3. Turn the mouse upside down to look at the lens.
 - a. If there is a smudge on the lens, gently clean the area with a plain cotton-tipped swab.
 - b. If there is debris in the lens, gently blow the debris away from the area.
4. Check the surface on which you are using the mouse. If you have a very intricate picture or pattern beneath the mouse it may be difficult for the digital signal processor (DSP) to determine changes in the mouse position.
5. Reconnect the mouse cable to the computer.
6. Turn your computer back on.

Non-optical mouse

The non-optical mouse uses a ball to navigate the pointer. If the pointer on the screen does not move smoothly with the mouse, you might need to clean the mouse.

To clean a non-optical mouse, do the following:

Note: The following illustration might be slightly different from your mouse.



- 1** Retainer ring
- 2** Ball
- 3** Plastic rollers
- 4** Ball cage

1. Turn off your computer.
2. Disconnect the mouse cable from the computer.
3. Turn the mouse upside down. Twist the retainer ring **1** to the unlocked position to remove the ball.

4. Place your hand over the retainer ring and ball **2**, and then turn the mouse right-side up, so that the retainer ring and ball fall out into your hand.
5. Wash the ball in warm, soapy water then dry it with a clean cloth.
6. Blow air carefully into the ball cage **4** to dislodge dust and lint.
7. Look for a buildup of dirt on the plastic rollers **3** inside the ball cage. This buildup usually appears as a stripe running across the middle of the rollers.
8. If the rollers are dirty, clean them by using a cotton swab soaked in isopropyl (rubbing) alcohol. Turn the rollers with your finger and continue swabbing them until all the dirt is removed. Be sure the rollers are still centered in their channels after you clean them.
9. Remove any fibers from the swab that might be remaining on the rollers.
10. Replace the ball and the retainer ring. Twist the retainer ring to the locked position.
11. Reconnect the mouse cable to the computer.
12. Turn your computer back on.

Chapter 8. Getting information, help, and service

This chapter contains information about help, service, and technical assistance for products manufactured by Lenovo.

Information resources

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

Online Books folder

The Online Books folder preinstalled on your computer contains the *ThinkStation User Guide*, which provides information about your computer to help you set up, use, and maintain your computer. It requires no Internet access to view the publication.

To view the publications, click **Start** → **All Programs** → **Online Books** → **Online Books**, then double-click the appropriate publication for your computer. The publications are also available on the Lenovo Support Web site at:
<http://www.lenovo.com/support>

Notes:

1. The publications are in Portable Document Format (PDF). To view the publications, you need to have the Adobe Reader program preinstalled on your computer. If the Adobe Reader program has not been installed on your computer, a message will appear when you attempt to view the PDF file and you will be guided through the Adobe Reader program installation.
2. The publications are available in other languages on the Lenovo Support Web site at:
<http://www.lenovo.com/support>
3. If you want to install a different language version of the Adobe Reader program rather than the version preinstalled on your computer, download the language version you want from the Adobe Web site at:
<http://www.adobe.com>

Lenovo ThinkVantage Tools

The Lenovo ThinkVantage Tools program guides you to a host of information sources and provides easy access to various tools to help you work more easily and securely.

Note: The Lenovo ThinkVantage Tools program is only available on computers with the Windows 7 operating system from Lenovo.

To access the Lenovo ThinkVantage Tools program, click **Start** → **All Programs** → **Lenovo ThinkVantage Tools**.

Lenovo Welcome

The Lenovo Welcome program introduces you to some innovative built-in features of Lenovo and guides you through a few important setup tasks to help you make the most of your computer.

Note: The Lenovo Welcome program is only available on computers preinstalled with the Windows 7 operating system or the Windows Vista operating system from Lenovo.

Safety and Warranty

The *ThinkStation Safety and Warranty Guide* that is provided with your computer contains information on safety, setup, warranty, and notices. Read and understand all safety information before using this product.

Lenovo Web site (<http://www.lenovo.com>)

The Lenovo Web site provides up-to-date information and services to help you buy, upgrade, and maintain your computer. You can also do the following:

- Shop for desktop, workstation, and notebook computers, monitors, projectors, upgrades and accessories for your computer, and special offers.
- Purchase additional services, such as support for hardware, operating systems, application programs, network setup and configuration, and custom installations.
- Purchase upgrades and extended hardware repair services.
- Download the latest device drivers and software updates for your computer model.
- Access the online manuals for your products.
- Access the Lenovo Limited Warranty.
- Access troubleshooting and support information for your computer model and other supported products.
- Find the service and support phone numbers for your country or region.
- Find a Service Provider located near you.

Help and service

This section contains information about obtaining help and service.

Using the documentation and diagnostic programs

If you experience a problem with your computer, see Chapter 7, “Troubleshooting and diagnostics,” on page 63. For information on additional resources to help you troubleshoot your computer problem, see “Information resources” on page 69.

If you suspect a software problem, see the documentation that comes with the operating system or software program, including readme files and online help.

Most computers come with a set of diagnostic programs that help you identify hardware problems. For instructions on using the diagnostic programs, see “Diagnostic programs” on page 64.

You can also get the latest technical information and download device drivers and updates from Lenovo Support Web site at:
<http://www.lenovo.com/support>

Calling for service

During the warranty period, you can get help and information by telephone through the Customer Support Center.

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 application programs

Refer to the *ThinkStation Safety and Warranty Guide* that comes with your computer for a complete explanation of warranty terms. You must retain your proof of purchase to obtain warranty service.

For a list of the Lenovo Support phone numbers for your country or region, go to <http://www.lenovo.com/support/phone> or refer to the *ThinkStation Safety and Warranty Guide* that comes with your computer.

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.

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

If you travel with your computer or relocate it to a country where your desktop, workstation, or notebook computer machine type is sold, 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 where service is available, go to <http://www.lenovo.com/support>, click **Warranty**, and follow the instructions on the screen.

For technical assistance with the installation of or questions related to Service Packs for your preinstalled Microsoft Windows product, refer to the Microsoft Product Support Services Web site at <http://support.microsoft.com/directory> or you can contact the Customer Support Center. Some fees might apply.

Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and service name might vary by country or region. For more information about these services, go to the Lenovo Web site at: <http://www.lenovo.com>

Appendix. Notices

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Television output notice

The following notice applies to models that have the factory-installed television-output feature.

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- ThinkVantage

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