

***lenovo***

ThinkServer TS130  
Hardware Maintenance Manual



ThinkThink**ThinkServer**Think

**Machine Types:** 1098, 1100, 1105, and 1106

**Note:** Before using this information and the product it supports, read the general information in Appendix C “Notices” on page 109 and the *Warranty and Support Information* document on the documentation DVD.

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## Chapter 1. About this manual

This *Hardware Maintenance Manual* contains information to help you solve problems that might occur in your server. It describes the diagnostic tools that come with the server, error codes and suggested actions, and instructions for replacing failing components.

Replaceable components are of three types:

- **Self-service customer replaceable unit (CRU):** Replacement of self-service CRUs is your responsibility. If Lenovo® installs a self-service CRU at your request, you will be charged for the installation.
- **Optional-service customer replaceable unit:** You may install an optional-service CRU yourself or request Lenovo to install it, at no additional charge, under the type of warranty service that is designated for the server.
- **Field replaceable unit (FRU):** FRUs must be installed only by trained service technicians.

The most recent version of this document is available at <http://www.lenovo.com/support>.

Before servicing a Lenovo product, be sure to read the Safety Information. See “Important Safety Information” on page 1.

For information about the terms of the warranty and getting service and assistance, see the *Warranty and Support Information* document.

---

### Important Safety Information

Be sure to read all caution and danger statements in this book before performing any of the instructions.

Veillez lire toutes les consignes de type DANGER et ATTENTION du présent document avant d'exécuter les instructions.

Lesen Sie unbedingt alle Hinweise vom Typ “ACHTUNG” oder “VORSICHT” in dieser Dokumentation, bevor Sie irgendwelche Vorgänge durchführen.

Leggere le istruzioni introdotte da ATTENZIONE e PERICOLO presenti nel manuale prima di eseguire una qualsiasi delle istruzioni.

Certifique-se de ler todas as instruções de cuidado e perigo neste manual antes de executar qualquer uma das instruções.

Es importante que lea todas las declaraciones de precaución y de peligro de este manual antes de seguir las instrucciones.

تأكد من قراءة كل التحذيرات الموجودة في هذا الكتاب قبل اتباع هذه التعليمات .

执行任何说明之前，请确保已阅读本书中的所有警告和危险声明。

執行任何指示前，請確實閱讀本書中的所有警告及危險聲明。

ודאו שקראתם את כל הודעות האזהרה והסכנה במסמך זה לפני שתבצעו פעולה כלשהי.

본 사용 설명서에 기재된 내용을 실행하기 전에 모든 주의사항 및 위험사항을 숙지하십시오.

---

## Safety information

**Important:** Each caution and danger statement in this document is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document. For example, if a danger statement is labeled “Statement 1,” translations for this danger statement are in the *Safety Information* document under “Statement 1.”

Be sure to read and understand all caution and danger statements in this document before you perform the procedures. Read and understand any additional safety information that comes with the server or optional device before you install, remove, or replace the device.

### Statement 1



### DANGER

**Electrical current from power, telephone, and communication cables is hazardous.**

**To avoid a shock hazard:**

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

#### To connect:

1. Turn everything OFF.
2. First, attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn devices ON.

#### To disconnect:

1. Turn everything OFF.
2. First, remove power cords from outlet.
3. Remove signal cables from connectors.
4. Remove all cables from devices.

## Statement 2



**DANGER**

**Danger of explosion if battery is incorrectly replaced.**

When replacing the lithium coin cell battery, use only the same or an equivalent type that is recommended by the manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

**Do not:**

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Dispose of the battery as required by local ordinances or regulations.

## Statement 3



### **CAUTION:**

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

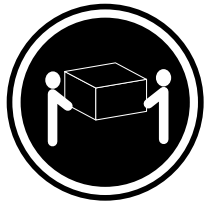


**DANGER**

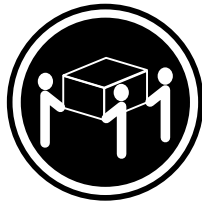
**Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.**

**Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**

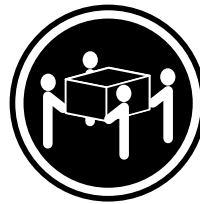
#### Statement 4



≥ 18 kg (39.7 lb)  
< 32 kg (70.5 lb)



≥ 32 kg (70.5 lb)  
< 55 kg (121.2 lb)



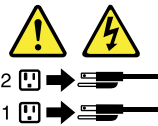
≥ 55 kg (121.2 lb)  
< 100 kg (220.5 lb)

**CAUTION:**  
Use safe practices when lifting.

#### Statement 5



**CAUTION:**  
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



#### Statement 6



**CAUTION:**  
If you install a strain-relief bracket option over the end of the power cord that is connected to the device, you must connect the other end of the power cord to an easily accessible power source.

#### Statement 7



**CAUTION:**  
If the device has doors, be sure to remove or secure the doors before moving or lifting the device to avoid personal injury. The doors will not support the weight of the device.



**Statement 8**



**CAUTION:**

Never remove the cover on a power supply or any part that has the following label attached.



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

**Statement 9**



**CAUTION:**

To avoid personal injury, disconnect the hot-swap fan cables before removing the fan from the device.

**Statement 10**



**CAUTION:**

The following label indicates sharp edges, corners, or joints nearby.



**Statement 11**



**CAUTION:**

The following label indicates a hot surface nearby.



**Statement 12**



**DANGER**

Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device for electrical specifications.

### Statement 13



#### CAUTION:

Make sure that the rack is secured properly to avoid tipping when the server unit is extended.

### Statement 14



#### CAUTION:

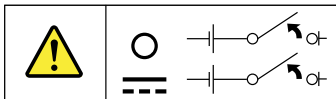
Some accessory or option board outputs exceed Class 2 or limited power source limits and must be installed with appropriate interconnecting cabling in accordance with the national electric code.

### Statement 15



#### CAUTION:

The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.



### Statement 16



#### CAUTION:

To reduce the risk of electric shock or energy hazards:

- This equipment must be installed by trained service personnel in a restricted-access location, as defined by the NEC and the latest edition of IEC 60950, *The Standard for Safety of Information Technology Equipment*.
- Connect the equipment to a reliably grounded safety extra low voltage (SELV) source. An SELV source is a secondary circuit that is designed so that normal and single fault conditions do not cause the voltages to exceed a safe level (60 V direct current).
- The branch circuit overcurrent protection must be rated in accordance with local building codes.
- Use 16 American Wire Gauge (AWG) or 1.3 mm<sup>2</sup> copper conductor only, not exceeding 3 meters in length.
- Torque the wiring-terminal screws to 12 inch-pounds (1.4 newton-meters).
- Incorporate a readily available approved and rated disconnect device in the field wiring.

### Statement 17



#### CAUTION:

This product contains a Class 1M laser. Do not view directly with optical instruments.

**Statement 18**



**CAUTION:**

Do not place any object on top of rack-mounted devices.

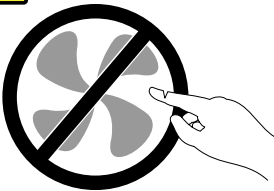


**Statement 19**



**CAUTION:**

Hazardous moving parts. Keep fingers and other body parts away.



**Statement 20**



**CAUTION:**

The battery is a lithium ion battery. To avoid possible explosion, do not burn the battery. Exchange it only with the Lenovo-approved part. Recycle or discard the battery as instructed by local regulations.

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## Important information about replacing RoHS compliant FRUs

RoHS, The Restriction of Hazardous Substances in Electrical and Electronic Equipment Directive (2002/95/EC) is a European Union legal requirement affecting the global electronics industry. RoHS requirements must be implemented on Lenovo products placed on the market and sold in the European Union after June 2006. Products on the market before June 2006 are not required to have RoHS compliant parts. If the parts are not compliant originally, replacement parts can also be noncompliant, but in all cases, if the parts are compliant, the replacement parts must also be compliant.

**Note:** RoHS and non-RoHS FRU part numbers with the same fit and function are identified with unique FRU part numbers.

Lenovo plans to transition to RoHS compliance well before the implementation date and expects its suppliers to be ready to support Lenovo's requirements and schedule in the EU. Products sold in 2005 will contain some RoHS compliant FRUs. The following statement pertains to these products and any product Lenovo produces containing RoHS compliant parts.

RoHS compliant ThinkServer® TS130 parts have unique FRU part numbers. Before or after June 2006, failed RoHS compliant parts must always be replaced using RoHS compliant FRUs, so only the FRUs identified as compliant in the system Hardware Maintenance Manual or direct substitutions for those FRUs can be used.

Products marketed before June 2006		Products marketed after June 2006	
Current or original part	Replacement FRU	Current or original part	Replacement FRU
Non-RoHS	Can be Non-RoHS	Must be RoHS	Must be RoHS
Non-RoHS	Can be RoHS		
Non-RoHS	Can sub to RoHS		
RoHS	Must be RoHS		

**Note:** A direct substitution is a part with a different FRU part number that is automatically shipped by the distribution center at the time of order.

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## **Chapter 2. General information**

This chapter provides some general information about your server.

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### **Features and specifications**

The following table provides information about the features and specifications of the server. Depending on the server model, some features might not be available, or some specifications might not apply. For information about your specific model, use the Setup Utility program. See “Using the Setup Utility program” on page 83.

Table 1. Features and specifications

<p><b>Microprocessor(s):</b> Support up to two Intel® Xeon® dual-core, quad-core, or hex-core microprocessors (internal cache size varies by model type)</p> <p>For the specific type and speed information about the microprocessor, use the Setup Utility program. See “Using the Setup Utility program” on page 83.</p> <p>For a list of supported microprocessors, go to <a href="http://www.lenovo.com/thinkserver">http://www.lenovo.com/thinkserver</a> and click <b>Options</b> under the <b>Products</b> tab.</p> <p><b>Memory</b></p> <ul style="list-style-type: none"> <li>• Supports up to four DDR3 ECC UDIMMs (double data rate 3 error correction code unbuffered dual inline memory modules)</li> <li>• Types: 1333 MHz, DDR3 registered SDRAM DIMMs</li> </ul> <p><b>Internal drives</b></p> <ul style="list-style-type: none"> <li>• Serial Advanced Technology Attachment (SATA) hard disk drive</li> <li>• SATA optical drive</li> </ul> <p><b>Video subsystem</b></p> <ul style="list-style-type: none"> <li>• Integrated graphics for a Video Graphics Array (VGA) connector and a DisplayPort connector</li> </ul> <p><b>Connectivity</b></p> <ul style="list-style-type: none"> <li>• 100/1000 Mbps integrated Ethernet controller</li> </ul> <p><b>Power supply:</b> Your server comes with one of the following power supplies:</p> <ul style="list-style-type: none"> <li>• 280-watt auto-sensing power supply</li> <li>• 320-watt auto-sensing power supply</li> </ul>	<p><b>Expansion</b></p> <ul style="list-style-type: none"> <li>• Two optical drive bays</li> <li>• Two hard disk drive bays</li> <li>• Two PCI card slots</li> <li>• One PCI Express x1 card slot</li> <li>• One PCI Express x16 card slot</li> </ul> <p><b>System management features</b></p> <ul style="list-style-type: none"> <li>• Ability to store power-on self-test (POST) hardware test results</li> <li>• Automatic power-on startup</li> <li>• Intel Active Management Technology (AMT)</li> <li>• Intel Hyper-Threading technology (some models)</li> <li>• Intel Rapid Storage Technology (RST)</li> <li>• Preboot Execution Environment (PXE)</li> <li>• System Management (SM) UEFI and SM software</li> <li>• Wake on LAN</li> <li>• Wake on Ring (in the Setup Utility program, this feature is called Serial Port Ring Detect for an external modem)</li> </ul> <p><b>Input/Output (I/O) features</b></p> <ul style="list-style-type: none"> <li>• Eight Universal Serial Bus (USB) connectors (two on the front panel and six on the rear panel)</li> <li>• One 9-pin serial port</li> <li>• One Ethernet connector</li> <li>• One DisplayPort connector</li> <li>• One VGA monitor connector</li> <li>• Three audio connectors on the rear panel (audio line-in connector, audio line-out connector, and microphone connector)</li> </ul> <p><b>Preinstalled operating system</b></p> <p>Some models are preinstalled with one of the following operating systems:</p> <ul style="list-style-type: none"> <li>• Microsoft® Windows Server® 2008 R2 Foundation</li> <li>• Microsoft Windows® Small Business Server (SBS) Aurora</li> </ul> <p><b>Operating system(s), supported</b></p> <ul style="list-style-type: none"> <li>• Microsoft Windows Server 2008 R2 Foundation</li> <li>• Microsoft Windows Server 2008 R2 (Service Pack 1)</li> <li>• Microsoft Windows Small Business Server (SBS) Aurora</li> <li>• Microsoft Windows Small Business Server (SBS) 7</li> <li>• Microsoft Windows Multipoint Server</li> </ul>
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Table 1. Features and specifications (continued)

<p><b>Integrated functions:</b></p> <ul style="list-style-type: none"> <li>• Ethernet controllers (The server comes with two integrated Gigabit Ethernet controllers, which support connection to 100 Mbps or 1000 Mbps network.)</li> <li>• One serial port</li> <li>• One Video Graphics Array (VGA) monitor connector</li> <li>• Six USB connectors (two front and four rear)</li> <li>• One RJ-45 Ethernet connectors on the rear panel</li> <li>• Eight diagnostic LEDs</li> </ul> <p><b>Size:</b></p> <ul style="list-style-type: none"> <li>• Width: 174.8 mm (6.88 inches)</li> <li>• Height: 377.3 mm (14.85 inches)</li> <li>• Depth: 406.7 mm (16.01 inches)</li> </ul> <p><b>Weight:</b> Maximum configuration: 11.2 kg (24.7 lbs)</p> <p><b>Electrical input</b></p> <ul style="list-style-type: none"> <li>• Input voltage: <ul style="list-style-type: none"> <li>– Low range: <ul style="list-style-type: none"> <li>Minimum: 90 V ac</li> <li>Maximum: 137 V ac</li> </ul> </li> <li>– High range: <ul style="list-style-type: none"> <li>Minimum: 180 V ac</li> <li>Maximum: 264 V ac</li> </ul> </li> </ul> </li> </ul>	<p><b>Environment</b></p> <ul style="list-style-type: none"> <li>• Air temperature: <ul style="list-style-type: none"> <li>Operating: 10°C to 35°C (50°F to 95°F)</li> <li>Non-operating: -40°C to 60°C (14°F to 140°F) (with package)</li> <li>Non-operating: -10°C to 60°C (14°F to 140°F) (without package)</li> </ul> </li> <li>• Humidity: <ul style="list-style-type: none"> <li>Operating: 10% to 80% (non-condensing) (10% per hour)</li> <li>Non-operating: 10% to 90% (non-condensing) (10% per hour)</li> </ul> </li> <li>• Altitude: <ul style="list-style-type: none"> <li>Operating: -50 to 10 000 ft (-15.2 to 3 048 m)</li> <li>Non-operating: -50 to 35 000 ft (-15.2 to 10 668 m)</li> </ul> </li> </ul> <p><b>Security features</b></p> <ul style="list-style-type: none"> <li>• Computrace</li> <li>• Enabling or disabling a device</li> <li>• Enabling or disabling USB connectors individually</li> <li>• Hard disk drive password</li> <li>• Power-On Password (POP) and Administrator Password for UEFI access</li> <li>• Startup sequence control</li> <li>• Startup without keyboard or mouse</li> <li>• Support for an integrated cable lock (Kensington lock)</li> <li>• Support for a padlock</li> <li>• Trusted Platform Module (TPM)</li> </ul>
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## Software programs

Lenovo provides software to help get your server up and running.

### EasyStartup

The ThinkServer EasyStartup program simplifies the process of configuring RAID and installing supported Microsoft Windows and Linux operating systems and device drivers on your server. The EasyStartup program is provided with your server on the *ThinkServer EasyStartup DVD*. The DVD is self-starting (bootable). The user guide for the EasyStartup program is on the DVD and can be accessed directly from the program interface. For additional information, see “Using the ThinkServer EasyStartup program” on page 102.

## Reliability, availability, and serviceability

Reliability, availability, and serviceability (hereafter referred to as RAS) are three important server design features. The RAS features help you to ensure the integrity of the data stored on the server, the availability of the server when you need it, and the ease with which you can diagnose and correct problems.

The server has the following RAS features:

- Advanced Configuration and Power Interface (ACPI)
- Advanced Desktop Management Interface (DMI)
- Automatic memory downsizing on error detection
- Automatic restart on non-maskable interrupt (NMI)
- Availability of microcode level
- Built-in, menu-driven setup, system configuration, and RAID configuration
- Built-in monitoring for fan, temperature, and voltage
- Cooling fans with speed-sensing capability
- ECC DDR3 SDRAM with Serial Presence Detect (SPD)
- Error codes and messages to help you identify problems
- Generating error logs for the power-on self-test (POST) failures
- Hot-swap SAS hard disk drives
- Integrated Ethernet controllers
- Intelligent Platform Management Interface (IPMI) 2.0
- Power-on self-test (POST)
- Standby voltage for system-management features and monitoring
- System-error light-emitting diode (LED) on the front panel
- Vital product data (VPD), including the serial number information and replacement part numbers, stored in the nonvolatile memory for easier remote maintenance



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## Chapter 3. Diagnostics and troubleshooting

This chapter introduces some basic diagnostic and troubleshooting programs. If your server problem is not described here, see Appendix B “Help and service” on page 107 for additional troubleshooting resources.

This chapter provides instructions on the following topics:

- “PC-Doctor for DOS” on page 13
- “Basic troubleshooting” on page 15
- “Troubleshooting tables” on page 16

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### PC-Doctor for DOS

The PC-Doctor for DOS diagnostic program is used to test hardware components of your server. It is also used to report operating-system-controlled settings that interfere with the correct operation of your server. If you are unable to isolate and repair the problem yourself after running the PC-Doctor for DOS diagnostic program, save and print the log files created by the PC-Doctor for DOS diagnostic program. You will need the log files when you speak to a Lenovo technical support representative.

You can 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. 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.
2. Make sure the server 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 server to access the diagnostic program.

3. Follow the instructions on the screen to select the diagnostic test that 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.

## Navigating through the diagnostic program

Use the cursor movement keys to navigate through the menus.

- To select a menu item, press Enter.
- To return to the previous menu, press Esc.
- To view the help information system, press F1.

## Running tests

There are four ways to run the diagnostic tests.

- Using the cursor movement keys, select **Run Normal Test** or **Run Quick Test** from the **Diagnostics** menu and then press Enter. This automatically runs a pre-defined group of tests from each test category. By selecting **Run Quick Test**, a quick test will be started. By selecting **Run Normal Test**, a more extensive set of tests will be started and will take longer to complete.
- Press F5 to automatically run all selected tests in all categories.
- From within a test category, press Ctrl+Enter to automatically run only the selected tests in that category.
- Using the cursor movement keys, highlight a single test within a test category, and then press Enter. This runs only that test.

Press Esc at any time to stop the testing process.

Test results (N/A, PASSED, FAILED, ABORTED) are displayed in the field beside the test description and in the test log. See “Viewing the test log” on page 15.

To select one or more tests, do the following:

1. Open the corresponding test category.
2. Using the cursor movement keys, select the desired test.
3. Press the space bar. A selected test is marked by >>. Pressing the space bar again de-selects a test and removes the >> mark.
4. Repeat steps 2 and 3 above to select all desired tests.

## Test results

Diagnostics test results produce the following error code format:

Function Code	Failure Type	DeviceID	Date	ChkDigits	Text
---------------	--------------	----------	------	-----------	------

- **Function Code:** Represents the feature or function within the server.
- **Failure Type:** Represents the type of error encountered.
- **DeviceID:** Contains the component's unit ID that corresponds to a certain disk drive, removable media drive, serial or parallel port, processor, specific RIMM, or a device on the PCI bus.
- **Date:** Contains the date when the diagnostic test was run. The date is retrieved from CMOS and is displayed in the YYYYMMDD format.
- **ChkDigits:** Contains a 2-digit check-digit value to ensure the following:
  - Diagnostics were run on the specified date.
  - Diagnostics were run on the specified server.
  - The diagnostic error code is recorded correctly.

- **Text:** Description of the error.

**Note:** See “POST error codes” on page 17 for error code listings.

## Formatting the hard disk drive

The diagnostics program offers two hard disk drive formatting methods:

- Quick Erase
- Full Erase

The quick erase method provides a DOS utility that performs the following:

- Destroys the Master Boot Record (MBR) on the hard disk drive.
- Destroys all copies of the FAT Table on all partitions (both the master and backup).
- Destroys the partition table.
- Provides messages that warn the user that this is a non-recoverable process.

The full erase method provides a DOS utility that performs the following:

- Performs all the steps in quick erase.
- Provides a DOS utility that writes random data to all sectors of the hard disk drive.
- Provides an estimate of time to completion along with a visual representation of completion status.
- Provides messages that warn the user about a non-recoverable process.

<b>Important:</b> Make sure that all data is backed up before using the quick erase or full erase function.
---

To run a quick erase or full erase operation, do the following:

1. Select the **UTILITY** option on the toolbar and press Enter.
2. Select either the **QUICK ERASE HARD DISK** or **FULL ERASE HARD DISK** option and follow the instructions on the screen.

## Viewing the test log

Errors reported by the diagnostic test will be displayed as a failure.

To view details of a failure or to view a list of test results, use the following procedure from any test category screen:

1. Press F3 to activate the log file.
2. Press F3 again to save the file or press F2 to print the file.

---

## Basic troubleshooting

The following tables provide information to help you troubleshoot your server problems.

**Note:** If you cannot correct the problem, have the server serviced. For a list of service and support telephone numbers, refer to the *Warranty and Support Information* document at:  
<http://www.lenovo.com/support/phone>

## General problems

The following table describes the general problems and suggested actions to correct detected problems.

Symptom	Action
The server does not start when you press the power switch.	Verify that: <ul style="list-style-type: none"> <li>The power cord is correctly connected to the rear of the server and to a working electrical outlet.</li> <li>If your server has a secondary power switch on the rear of the server, make sure that it is switched on.</li> <li>The power indicator on the front of the server is on.</li> <li>The server voltage matches the voltage available at the electrical outlet for your country or region.</li> </ul>
The monitor screen is blank.	Verify that: <ul style="list-style-type: none"> <li>The monitor signal cable is correctly connected to the monitor and to the appropriate monitor connector on the server.</li> <li>The monitor power cord is correctly connected to the monitor and to a working electrical outlet.</li> <li>The monitor is turned on and the brightness and contrast controls are set correctly.</li> <li>The server voltage matches the voltage available at the electrical outlet for your country or region.</li> <li>If your server has two monitor connectors, be sure to use the connector on the graphics card.</li> </ul>
The operating system does not start.	Verify that 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 99.
The server beeps multiple times before the operating system starts.	Verify that no keys are stuck.

## Troubleshooting tables

Use the troubleshooting tables to find solutions to problems that have identifiable symptoms.

If you have just added new software or a new optional device and the server is not working, do the following before using the troubleshooting tables:

1. Check the system-error LED on the operator information panel to see if it is lit.
2. Remove the software or device that you just added.
3. Run the diagnostic tests to determine whether the server is running correctly.
4. Reinstall the new software or new device.

## Hard disk drive boot error

A hard disk drive boot error can have the following causes.

Symptom	FRU/Action
The startup drive is not in the boot sequence in configuration.	Check the configuration and ensure the startup drive is in the boot sequence.
No operating system is installed on the boot drive.	Install an operating system on the boot drive.

Symptom	FRU/Action
The boot sector on the startup drive is corrupted.	The drive must be formatted. Do the following: <ol style="list-style-type: none"> <li>1. Attempt to back up the data on the failing hard disk drive.</li> <li>2. Using the operating system programs, format the hard disk drive.</li> </ol>
The drive is defective.	Replace the hard disk drive.

## Power supply problems

If you suspect a power supply problem, use the following procedures.

Check/Verify	FRU/Action
Check the following for proper installation. <ul style="list-style-type: none"> <li>• Power cord</li> <li>• On/Off switch connector</li> <li>• On/Off switch power supply connector</li> <li>• System board power supply connectors</li> <li>• Microprocessor connection</li> </ul>	Reseat connectors.
Check the power cord for continuity.	Power cord
Check the power-on switch for continuity.	Power-on switch

## Beep symptoms

Beep symptoms are tones or a series of tones separated by pauses (intervals without sound) during the POST.

The following table describes beep symptoms and provides suggested actions to correct detected problems.

Symptom	Error	FRU/Action
3 short beeps and 1 long beep	Memory not detected	Perform the following actions in order: <ol style="list-style-type: none"> <li>1. Make sure that the memory module(s) are properly seated in the connector(s).</li> <li>2. Replace the memory module(s).</li> <li>3. Replace the system board.</li> </ol>
2 short beeps	Common POST error	Indicates that an error has occurred during the POST.

## POST error codes

Each time you turn on the system, it performs a series of tests that checks the operation of the system and options. This series of tests is called the *power-on self-test*, or *POST*.

The POST performs the following operations:

- Checks some basic system board operations
- Checks the memory operation
- Checks the video operation
- Verifies that the boot drive is working

If the POST detects a problem, an error message will be displayed on the screen. A single problem can cause several error messages. When you correct the cause of the first error message, probably the other error messages will not be displayed the next time you turn on the computer.

POST error code	POST error message	Description/Action
00CE	Machine Type or Serial Number is INVALID	This error message is displayed when the machine type or the serial number is invalid.
0210	Stuck key	This error message is displayed when a key is kept pressed for a long time.
0211	Keyboard not found	This error message is displayed when there is no keyboard detected.
0135	Fan failure	The system might be overheating.  Press F1 to enter the Setup Utility program. Then press F10 to save the operation and exit the Setup Utility program.  <b>Note:</b> If the problem is caused by the microprocessor fan, pressing F10 will not solve the problem.
0164	Memory size decreased	This error message is displayed when the memory size has decreased.  Press F1 to enter the Setup Utility program. Then press F10 to save the operation and exit the Setup Utility program.
1762	Configuration change has occurred	This error message is displayed when a hard disk drive or optical drive change has been made.  Press F1 to enter the Setup Utility program. Then press F10 to save the operation and exit the Setup Utility program.
1820	More than one external fingerprint reader is attached. Power off and remove all but the reader that you set up within your main operating system.	If more than one external fingerprint reader is connected to a computer, this error message will be displayed to inform you to remove all of the fingerprint keyboards except the one compatible with the fingerprint application on your computer.
1962	No operating system found. Press any key to repeat boot sequence.	This error occurs only after the POST is completed. Press any key to repeat boot sequence.
0162	Setup data integrity check failure	Press F1 to enter the Setup Utility program. Then press F10 to save the operation and exit the Setup Utility program.
0167	No processor microcode update found	This error message indicates that there is no microcode update image for the current microprocessor.
0175	System security - Security data corrupted	Press F1 to enter the Setup Utility program. Then press F10 to save the operation and exit the Setup Utility program.

POST error code	POST error message	Description/Action
0176	System security - The system has been tampered with	This error message is displayed when the computer is turned on with the cover open or removed.  Press F1 to enter the Setup Utility program. Then press F10 to save the operation and exit the Setup Utility program.
0189	System security - Can not read the Security EEPROM	This error message indicates that the Security EEPROM might be broken or have been removed.  Press F1 to enter the Setup Utility program. Then press F10 to save the operation and exit the Setup Utility program.
0197	System security - Unauthorized security data change detected	Press F1 to enter the Setup Utility program. Then press F10 to save the operation and exit the Setup Utility program.
0190	System security - Invalid security change requested	Press F1 to enter the Setup Utility program. Then press F10 to save the operation and exit the Setup Utility program.
0199	System security - Security password retry count exceeded	Press F1 to enter the Setup Utility program. Then press F10 to save the operation and exit the Setup Utility program.

## EasyStartup problems

The following table describes the EasyStartup problems and provides suggested actions to correct detected problems.

Table 2. *ThinkServer EasyStartup DVD*

Follow the suggested actions in the order in which they are listed in the Action column until the problem is resolved.	
Symptom	Action
The <i>ThinkServer EasyStartup DVD</i> will not start.	<ul style="list-style-type: none"> <li>Make sure the server supports the EasyStartup program and has a startable (bootable) DVD drive.</li> <li>If the startup (boot) sequence settings have been changed, make sure the DVD drive is first in the startup sequence.</li> <li>If more than one DVD drive is installed, make sure that only one DVD drive is set as the primary drive. Start the EasyStartup DVD from the primary DVD drive.</li> </ul>
The operating system installation program continuously loops.	Make more space available on the hard disk drive.
The EasyStartup program will not start the operating system medium.	Make sure that the operating system medium is supported by the EasyStartup program. See the <i>EasyStartup User Guide</i> for a list of supported operating system versions. The <i>EasyStartup User Guide</i> and compatibility notes are available through the EasyStartup program.

## Miscellaneous error messages

Symptom	FRU/Action
Changing display colors	Display/Monitor
Computer will not turn off. See "Hard disk drive boot error" on page 17.	<ol style="list-style-type: none"> <li>1. Power switch</li> <li>2. System board</li> <li>3. Riser card, if installed.</li> </ol>
Computer will not RPL from server	<ol style="list-style-type: none"> <li>1. Ensure that <b>Network</b> is set as the first device or it is after <b>CD/DVD</b> in the startup sequence.</li> <li>2. Ensure that the network adapter is enabled for RPL.</li> <li>3. Network adapter (Advise the network administrator of new MAC address)</li> </ol>
Computer will not perform a Wake On LAN® (if applicable)	<ol style="list-style-type: none"> <li>1. Check the power supply and signal cable connections to the network adapter.</li> <li>2. Ensure that the operating system settings are set to enable Wake on LAN.</li> <li>3. Ensure that the Wake On LAN feature is enabled in Setup/Configuration (see "Starting the Setup Utility program" on page 83.)</li> <li>4. Ensure that the network administrator is using the correct MAC address.</li> <li>5. Ensure that no interrupt or I/O address conflicts.</li> <li>6. Check the network adapter.</li> </ol>
Dead computer. See "Hard disk drive boot error" on page 17.	<ol style="list-style-type: none"> <li>1. Power supply</li> <li>2. System board</li> </ol>
Diskette drive in-use light remains on or does not light when drive is active.	<ol style="list-style-type: none"> <li>1. Diskette drive</li> <li>2. System board</li> <li>3. Diskette drive cable</li> </ol>
Blank screen except for flashing cursor.	<ol style="list-style-type: none"> <li>1. System board</li> <li>2. Primary hard disk drive</li> <li>3. Hard disk drive cable</li> </ol>
Incorrect memory size during POST	<ol style="list-style-type: none"> <li>1. Run the memory tests.</li> <li>2. Check the memory modules.</li> <li>3. Check the system board.</li> </ol>
"Insert a Diskette" icon appears with a known-good diagnostics diskette in the first 3.5-inch diskette drive.	<ol style="list-style-type: none"> <li>1. System board</li> <li>2. Diskette drive cable</li> <li>3. Network adapter</li> </ol>
Intensity or color varies from left to right of characters and color bars	<ol style="list-style-type: none"> <li>1. Display</li> <li>2. Video adapter (if present)</li> <li>3. System board</li> </ol>
No power or fan not running	See "Hard disk drive boot error" on page 17.
Non-system disk or disk error-type message with a known-good diagnostic diskette.	<ol style="list-style-type: none"> <li>1. Diskette drive</li> <li>2. System board</li> <li>3. Diskette drive cable</li> </ol>



Symptom	FRU/Action
Other display symptoms not listed above (including blank or illegible display)	<ol style="list-style-type: none"> <li>1. Display</li> <li>2. System board</li> </ol>
Turn on indicator or hard disk drive in-use light not on, but computer works correctly	<ol style="list-style-type: none"> <li>1. Power switch/LED assembly</li> <li>2. System board</li> </ol>
Printer problems	<ol style="list-style-type: none"> <li>1. Printer</li> <li>2. System board</li> </ol>
Program loads from the hard disk with a known-good diagnostics diskette in the first 3.5-inch diskette drive	<ol style="list-style-type: none"> <li>1. Run the Setup Utility program and check startup sequence.</li> <li>2. Check the diskette drive.</li> <li>3. Check the diskette drive cable.</li> <li>4. Check the system board.</li> <li>5. Check the power supply.</li> </ol>
RPL computer cannot access programs from its own hard disk drive.	<ol style="list-style-type: none"> <li>1. If the network administrator is using the LCCM Hybrid RPL, check startup sequence: <ol style="list-style-type: none"> <li>a. <b>First device - Network</b></li> <li>b. <b>Second device - Hard disk drive</b></li> </ol> </li> <li>2. Check the hard disk drive.</li> </ol>
RPL computer does not RPL from server	<ol style="list-style-type: none"> <li>1. Check the startup sequence.</li> <li>2. Check the network adapter LED status.</li> </ol>
Serial or parallel port device failure (system board port)	<ol style="list-style-type: none"> <li>1. Run an external device self-test.</li> <li>2. Check the external device.</li> <li>3. Check the cable.</li> <li>4. Check the system board.</li> </ol>
Serial or parallel port device failure (adapter port)	<ol style="list-style-type: none"> <li>1. Run an external device self-test.</li> <li>2. Check the external device.</li> <li>3. Check the cable.</li> <li>4. Check the alternate adapter.</li> <li>5. Check the system board.</li> </ol>
Some or all keys on the keyboard do not work	<ol style="list-style-type: none"> <li>1. Keyboard</li> <li>2. Keyboard cable</li> <li>3. System board</li> </ol>

## Undetermined problems

This topic provides instructions on how to find out the failing components.

To find out the failing components, do the following:

1. Turn off the server.
2. Remove or disconnect the following components (if installed) one at a time.
  - a. External devices (modem, printer, or mouse)
  - b. Any adapters
  - c. Memory modules
  - d. Extended video memory

- e. External cache
  - f. External cache RAM
  - g. Hard disk drive
  - h. Diskette drive
3. Turn on the server to re-test the system.
  4. Repeat steps 1 through 3 until you find the failing components. If all devices and adapters have been removed, and the problem continues, replace the system board.

---

## Chapter 4. Locating parts, controls, LEDs, and connectors

This chapter provides information to help you locate your server parts, controls, light-emitting diodes (LEDs), and connectors.

---

### Front view

Figure 1 “Front control and connector locations” on page 23 shows the locations of the controls and connectors on the front of your server.

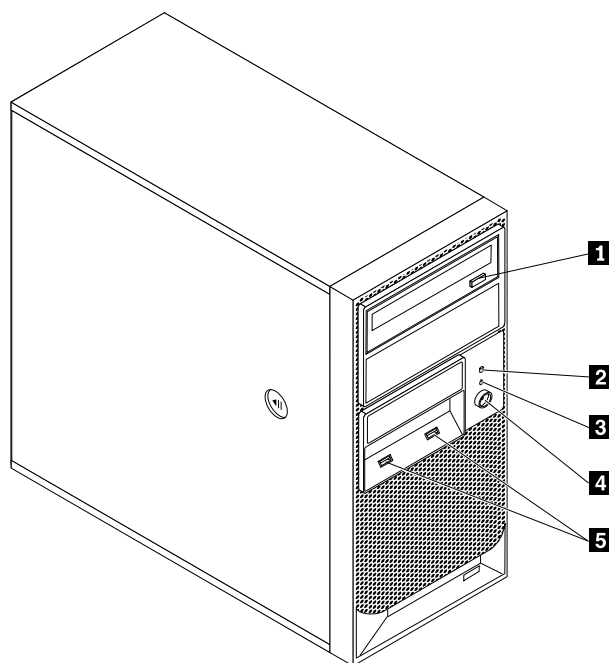


Figure 1. Front control and connector locations

- |   |                             |
|---|-----------------------------|
| <b>1</b> Optical drive eject/close button | <b>4</b> Power switch       |
| <b>2</b> Hard disk drive activity LED     | <b>5</b> USB connectors (2) |
| <b>3</b> Power-on LED                     |                             |

---

### Front control panel LEDs

The following table describes the meaning of the LEDs on the front control panel.

Table 3. Front control panel LEDs

LED	State	Color	Description
Power LED	On	Green	The server power is on.
	Blinking	Green	The server power is in ACPI S1 mode, which is also known as Power On Suspend (POS) mode. In this mode, the microprocessor is not working while other hardware devices are still working.
	Off	Off	The server power is off.
Hard disk drive LED	Off	Off	The hard disk drive is not active.
	Blinking	Green	The hard disk drive is active.

## Rear view

Figure 2 “Rear connector locations” on page 24 shows the locations of the connectors on the rear of your server. Some connectors on the rear of your server are color-coded to help you determine where to connect the cables in your server.

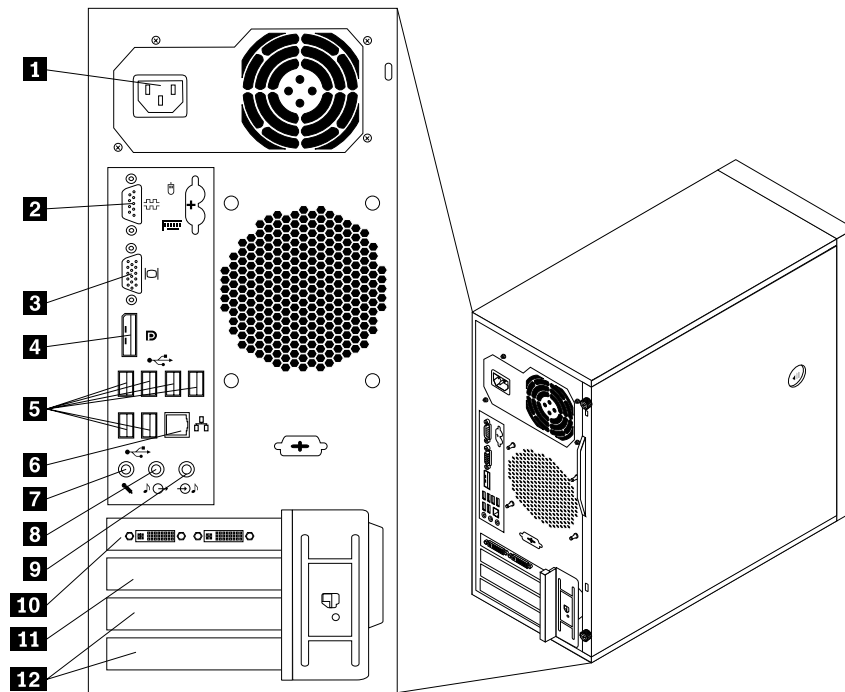


Figure 2. Rear connector locations

- |                                |                                     |
|--------------------------------|-------------------------------------|
| <b>1</b> Power cord connector  | <b>7</b> Microphone connector       |
| <b>2</b> Serial port           | <b>8</b> Audio line-out connector   |
| <b>3</b> VGA monitor connector | <b>9</b> Audio line-in connector    |
| <b>4</b> DisplayPort connector | <b>10</b> PCI Express x16 card slot |
| <b>5</b> USB connectors (6)    | <b>11</b> PCI Express x1 card slot  |
| <b>6</b> Ethernet connector    | <b>12</b> PCI card slots (2)        |

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 connects the audio line-out connector of the device to the audio line-in connector of the server.
Audio line-out connector	Used to send audio signals from the server 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.
Ethernet connector	Used to attach an Ethernet cable for a local area network (LAN). <b>Note:</b> To operate the server within FCC Class B limits, use a Category 5 Ethernet cable.
Microphone connector	Used to attach a microphone to your server 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.
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 parts on the system board

Figure 3 “System board part locations” on page 26 shows the locations of the parts on the system board.

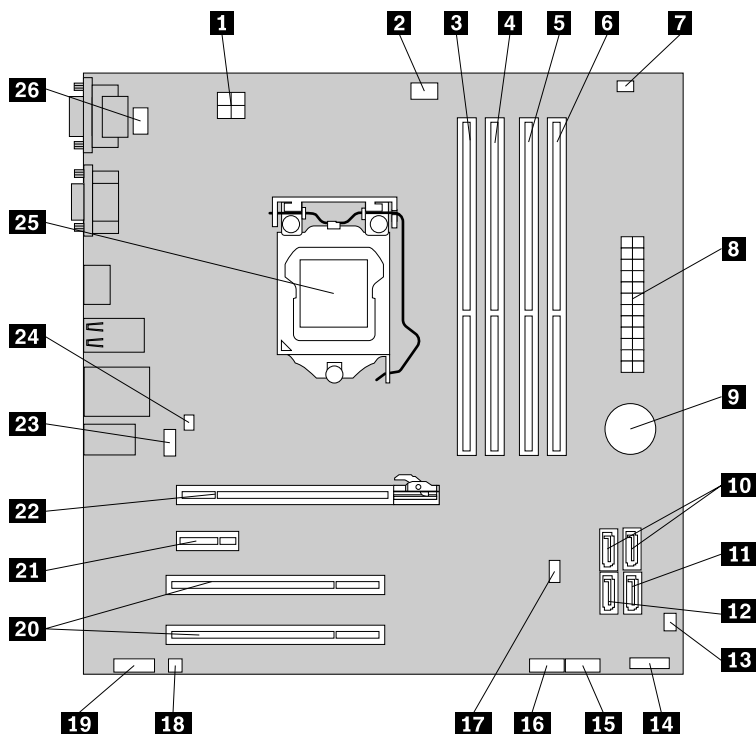


Figure 3. System board part locations

- |   |   |
|---|---|
| <b>1</b> 4-pin power connector                          | <b>14</b> Front panel connector for power switch and LED indicators   |
| <b>2</b> Microprocessor fan connector                   | <b>15</b> Front USB connector 1 (for connecting USB port 1 and 2 on the front bezel)                        |
| <b>3</b> Memory slot 1 (DIMM1)                          | <b>16</b> Front USB connector 2 (for connecting additional USB devices)                                     |
| <b>4</b> Memory slot 2 (DIMM2)                          | <b>17</b> Clear CMOS (Complementary Metal Oxide Semiconductor) /Recovery jumper                             |
| <b>5</b> Memory slot 3 (DIMM3)                          | <b>18</b> Internal speaker connector  |
| <b>6</b> Memory slot 4 (DIMM4)                          | <b>19</b> Front audio connector (for connecting the microphone and headphone connectors on the front bezel) |
| <b>7</b> Thermal sensor connector                       | <b>20</b> PCI card slots (2)  |
| <b>8</b> 24-pin power connector                         | <b>21</b> PCI Express x1 card slot  |
| <b>9</b> Battery  | <b>22</b> PCI Express x16 graphics card slot  |
| <b>10</b> SATA connectors 1 and 2 (SATA 3.0 connectors) | <b>23</b> Rear fan connector  |
| <b>11</b> SATA connector 3 (SATA 2.0 connector)         | <b>24</b> Cover presence switch connector (Intrusion switch connector)                                      |
| <b>12</b> eSATA connector                               | <b>25</b> Microprocessor  |
| <b>13</b> Front fan connector                           | <b>26</b> PS/2 keyboard and mouse connector   |

---

## Internal components

Figure 4 “Component locations” on page 27 shows the locations of the various components in your server. To remove the server cover and access to the inside of the server, see “Removing the server cover” on page 33.

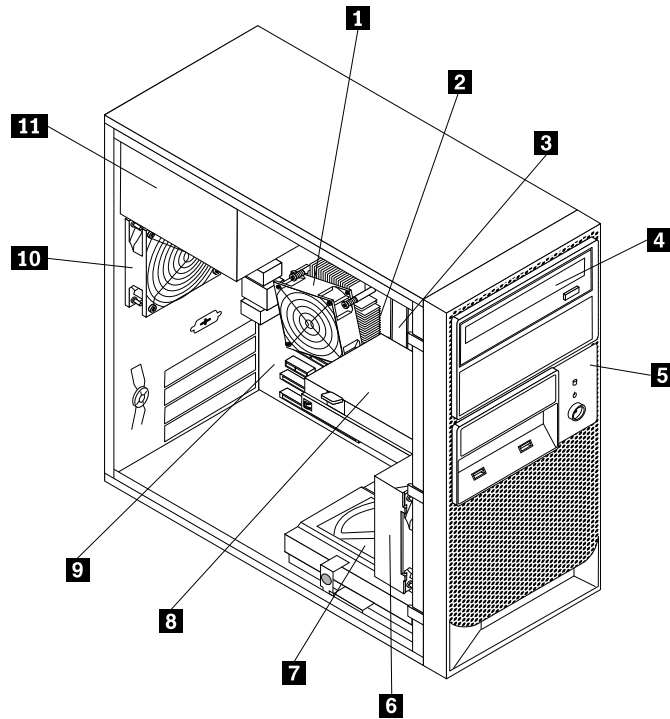


Figure 4. Component locations

- |          |                    |           |  |
|----------|--------------------|-----------|--|
| <b>1</b> | Heat sink          | <b>7</b>  | Secondary hard disk drive (installed in some models) |
| <b>2</b> | Microprocessor     | <b>8</b>  | Primary hard disk drive                              |
| <b>3</b> | Memory modules     | <b>9</b>  | System board   |
| <b>4</b> | Optical drive      | <b>10</b> | Rear fan assembly                                    |
| <b>5</b> | Front bezel        | <b>11</b> | Power supply   |
| <b>6</b> | Front fan assembly |           |  |





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## Chapter 5. Replacing FRUs

This chapter provides detailed instructions for replacing FRUs in the server.

FRU replacements are to be done only by trained service technicians.

This chapter does not contain the remove or replace procedure for all FRUs. Only the major FRUs are documented.

---

### Guidelines

This section provides some guidelines that you should read and understand before using your server.

#### Basic guidelines

Before you use the server, be sure to read and understand the following guidelines:

- Be sure to read and understand the *Safety Information* and the *Warranty and Support Information* on the *ThinkServer Documentation DVD* that comes with your product, and “Guidelines” on page 29. These information will help you work safely. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>
- When you install your new server, take the opportunity to download and apply the most recent firmware updates. This step will help to ensure that any known issues are addressed and that your server is ready to function at maximum levels of performance. To download firmware updates for your server, do the following:
  1. Go to <http://www.lenovo.com/support>.
  2. Click **Download & Drivers** → **ThinkServer** and then follow the instructions on the Web page to download firmware updates for your server.
- Before you install optional hardware devices, make sure that the server is working correctly. If an operating system is installed, turn on the server and make sure that the operating system starts. If no operating system is installed, make sure that a 19990305 error code is displayed, indicating that an operating system was not found but the server is working correctly. If the server is not working correctly, refer to the chapter Chapter 3 “Diagnostics and troubleshooting” on page 13 for detailed diagnostic information.
- Observe good housekeeping in the area where you are working. Put removed covers and other parts in a safe place.
- If you must turn on the server while the server cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you can stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to drives.
- Have a small flat-blade screwdriver available.

- To view the error LEDs on the system board and internal components, leave the server connected to power.
- You do not have to turn off the server to install or replace hot-swap fans, redundant hot-swap ac power supplies, or hot-plug USB devices. However, you must turn off the server before performing any steps that involve installing, removing, or replacing adapter cables or non-hot-swap optional devices or components.
- After completing any installation, removal, or replacement procedure, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported optional devices for the server, go to <http://www.lenovo.com/thinkserver>.
- When working inside the server, you might find some tasks easier if you lay the server on its side. You might need to first pivot the foot stands inward and then lay the computer on its side.

## System reliability guidelines

To help ensure proper cooling and system reliability, make sure that you follow these guidelines:

- Every drive bay has an internal drive installed or an Electro Magnetic Compatibility (EMC) shield installed.
- If the server has redundant power, every power supply bay has a power supply assembly installed.
- Leave adequate space around the server to make sure that the server cooling system works well.
- Properly route the cables. For some options, such as PCI cards, follow the cabling instructions that come with the options.
- Make sure that you replace a failed fan within 48 hours.
- When replacing a hot-swap drive, install the new hot-swap drive within two minutes of removal.
- Do not remove any air duct or air baffles while the server is running. Operating the server without the air duct or air baffles might cause the microprocessor to overheat.
- The second microprocessor socket always contains either a microprocessor socket cover or a microprocessor and heat sink.

## Handling static-sensitive devices

### **Attention:**

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

When you handle server parts and components, take these precautions to avoid static-electricity damage:

- Limit your movement. Movement can cause static electricity to build up around you.
- Wear an electrostatic-discharge wrist strap, if one is available.
- Always carefully handle the parts and other components (such as PCI cards, memory modules, system boards, and microprocessors) by its edges or its frame. Do not touch solder joints, pins, or 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 new part to a metal expansion-slot cover or other unpainted metal surface on the server for at least two seconds. This reduces static electricity from the package and your body.
- Remove the new part from the static-protective package and directly install it in the server without placing it on any other surface. If it is hard for you to do this in your specific situation, place the static-protective package of the new part on a smooth, level surface, and then place the new part on the static-protective package.
- Do not place the part on the server cover or other metal surface.

- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

## Working inside the server with the power on

**Attention:**

Static electricity that is released to internal server components when the server is turned on might cause the server to halt, which might result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when you work inside the server with the power on.

The server supports hot-swap devices and is designed to operate safely while it is turned on and the cover is removed. Follow these guidelines when you work inside the server with the power on:

- Avoid wearing loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie or scarf to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket, such as pens and pencils. These items might fall into the server as you lean over it.
- Avoid dropping any metallic objects into the server, such as paper clips, hairpins, and screws.

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## Guidelines for trained service technicians

This section contains information for trained service technicians.

### Inspecting for unsafe conditions

Use the information in this section to help you identify potential unsafe conditions in a Lenovo product that you are working on. Each Lenovo product, as it was designed and manufactured, has required safety items to protect users and service technicians from injury. The information in this section addresses only those items. Use good judgment to identify potential unsafe conditions that might be caused by non-Lenovo alterations or attachment of non-Lenovo features or options that are not addressed in this section. If you identify an unsafe condition, you must determine how serious the hazard is and whether you must correct the problem before you work on the product.

Consider the following conditions and the safety hazards that they present:

- Electrical hazards, especially primary power. Primary voltage on the frame can cause serious or fatal electrical shock.
- Explosive hazards, such as a damaged CRT face or a bulging capacitor.
- Mechanical hazards, such as loose or missing hardware.

To inspect the product for potential unsafe conditions, complete the following steps:

1. Make sure that the power is off and the power cord is disconnected.
2. Make sure that the exterior cover is not damaged, loose, or broken, and observe any sharp edges.
3. Check the power cord:
  - Make sure that the third-wire ground connector is in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
  - Make sure that the power cord is the correct type.
  - Make sure that the insulation is not frayed or worn.

4. Remove the cover.
5. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.
6. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

## Guidelines for servicing electrical equipment

Observe the following guidelines when servicing electrical equipment:

- Check the area for electrical hazards such as moist floors, nongrounded power extension cords, power surges, and missing safety grounds.
- Use only approved tools and test equipment. Some hand tools have handles that are covered with a soft material that does not provide insulation from live electrical currents.
- Regularly inspect and maintain your electrical hand tools for safe operational condition. Do not use worn or broken tools or testers.
- Do not touch the reflective surface of a dental mirror to a live electrical circuit. The surface is conductive and can cause personal injury or equipment damage if it touches a live electrical circuit.
- Some rubber floor mats contain small conductive fibers to decrease electrostatic discharge. Do not use this type of mat to protect yourself from electrical shock.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Locate the emergency power-off (EPO) switch, disconnecting switch, or electrical outlet so that you can turn off the power quickly in the event of an electrical accident.
- Disconnect all power before you perform a mechanical inspection, work near power supplies, or remove or install main units.
- Before you work on the equipment, disconnect the power cord. If you cannot disconnect the power cord, have the customer power-off the wall box that supplies power to the equipment and lock the wall box in the off position.
- Never assume that power has been disconnected from a circuit. Check it to make sure that it has been disconnected.
- If you have to work on equipment that has exposed electrical circuits, observe the following precautions:
  - Make sure that another person who is familiar with the power-off controls is near you and is available to turn off the power if necessary.
  - When you are working with powered-on electrical equipment, use only one hand. Keep the other hand in your pocket or behind your back to avoid creating a complete circuit that could cause an electrical shock.
  - When you use a tester, set the controls correctly and use the approved probe leads and accessories for that tester.
  - Stand on a suitable rubber mat to insulate you from grounds such as metal floor strips and equipment frames.
- Use extreme care when you measure high voltages.
- To ensure proper grounding of components such as power supplies, pumps, blowers, fans, and motor generators, do not service these components outside of their normal operating locations.
- If an electrical accident occurs, use caution, turn off the power, and send another person to get medical aid.

## Removing the server cover

### Attention:

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to: <http://www.lenovo.com/support>

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

### CAUTION:



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

To remove the server cover, do the following:

1. Remove any media from the drives and turn off all attached devices and the server.
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 server. See “Front view” on page 23 and “Rear view” on page 24.
4. Remove any locking device that secures the server cover, such as a padlock or an integrated cable lock.
5. Remove the two thumbscrews that secure the server cover.
6. Press the cover-release button on the side of the server and slide the cover to the rear of the server to remove the cover.

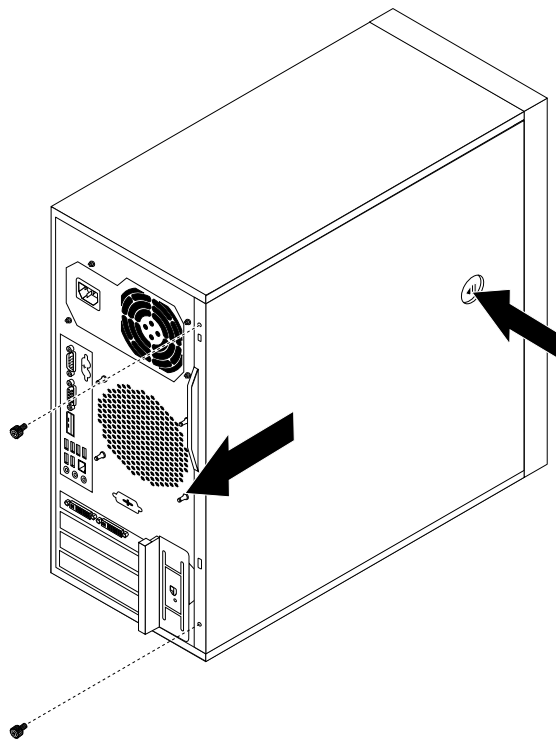


Figure 5. Removing the server cover

## Removing and reinstalling the front bezel

**Attention:**

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, 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 all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. Remove the front bezel by releasing the three plastic tabs on the left side and pivoting the front bezel outward.

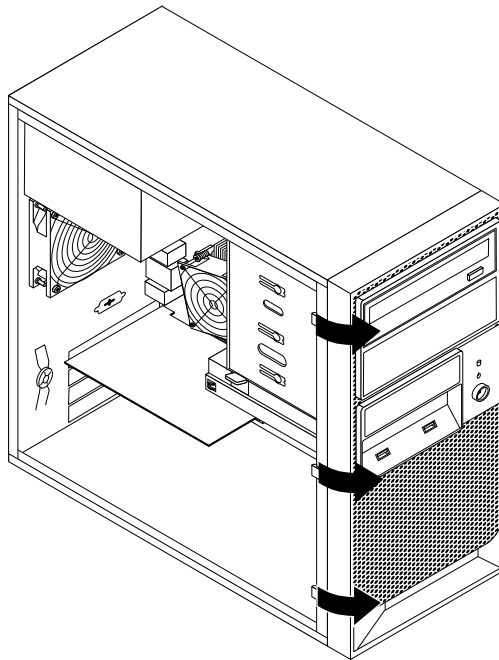


Figure 6. Removing the front bezel

4. 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 inward until it snaps into position on the left side.

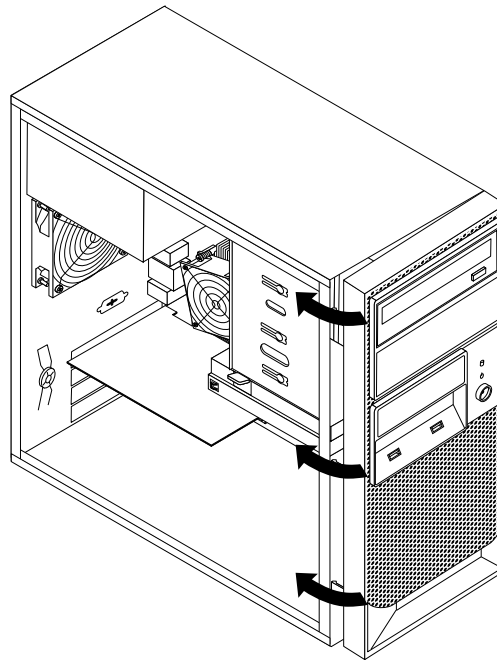


Figure 7. Reinstalling the front bezel

**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 66.

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## Installing, removing, or replacing optional hardware devices

This section provides instructions on how to install, remove, or replace optional hardware devices for your server. You can expand the capabilities of your server by adding memory modules, PCI cards, or drives, and maintain your server by replacing the failing optional hardware devices. If you are replacing an optional hardware device, perform the removal procedure and then perform the installation procedure for the optional hardware device that you want to replace.

### Installing or replacing a PCI card

**Attention:**

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>

This section provides instructions on how to install or replace a PCI card.

Your server has two standard PCI card slots, one PCI Express x1 card slot, and one PCI Express x16 card slot.

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

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. At the rear of the server, press the release button **1** to open the PCI card latch **2**.

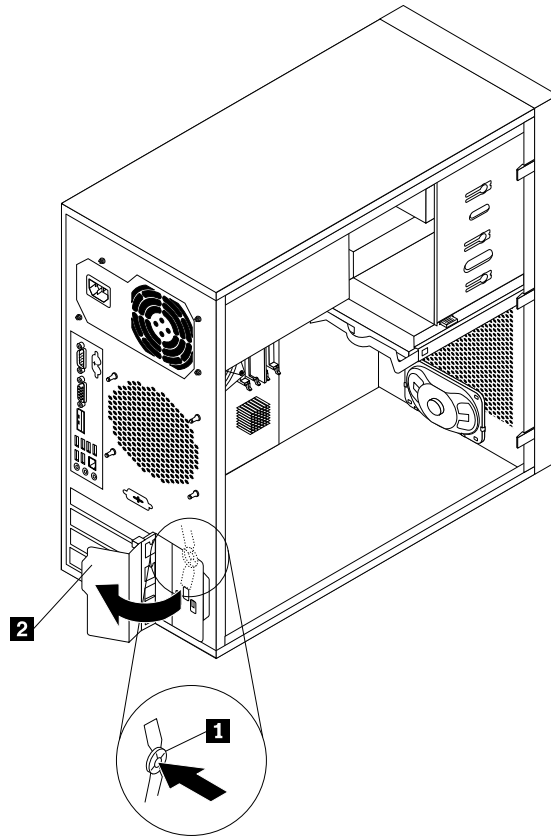


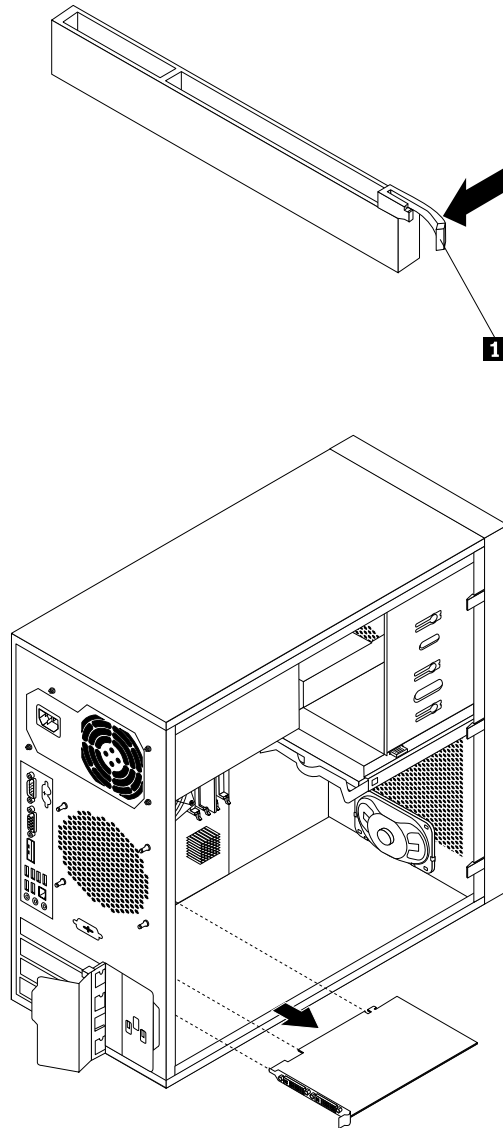
Figure 8. Opening the PCI card latch



4. 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.

**Notes:**

- a. The PCI card fits tightly into the card slot. If necessary, alternate moving each side of the card a small and equal amount until it is completely removed from the card slot.
- b. If the PCI card is held in place by a retaining latch, press the card retaining latch **1** as shown to disengage the latch. Grasp the PCI card and gently pull it out of the card slot.



*Figure 9. Removing a PCI card*

5. Remove the new PCI card from its static-protective package.
6. Install the new PCI card into the appropriate slot on the system board. See “Locating parts on the system board” on page 26.

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

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

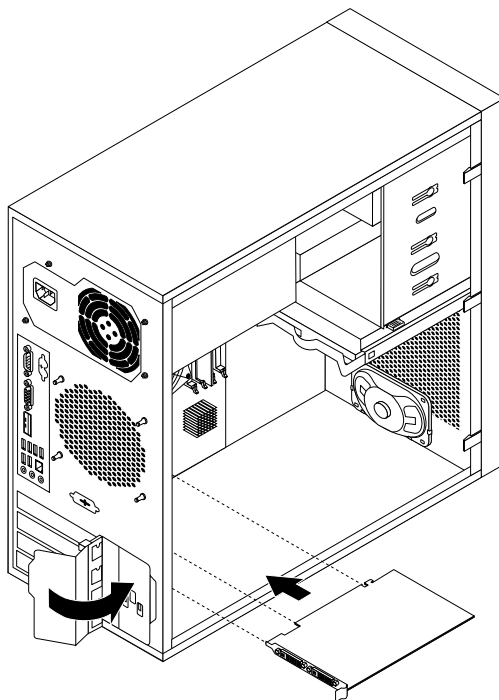


Figure 10. Installing a PCI card

**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 66.

## Installing or removing the Ethernet card

**Attention:**

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>

This section provides instructions on how to install or remove the Ethernet card. Use any documentation that came with the Ethernet card and follow those instructions in addition to the instructions in this section.

To install or remove the Ethernet card, do the following:

- Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
- Remove the server cover. See “Removing the server cover” on page 33.
- Lay the server on its side for easier operation.
- The Ethernet card is a kind of PCI card. See “Installing or replacing a PCI card” on page 35 and follow those instructions to install or remove the Ethernet card.
- If you are instructed to return the removed Ethernet card to the manufacturer, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

If you are using the Microsoft Windows operating systems, you need to install the device driver for the Ethernet card. To install the device driver on Windows operating systems, do the following:

1. Save any open documents and exit all applications.
2. Insert the *ThinkServer EasyStartup DVD* that came with your server into the DVD drive.

**Note:** You do not need to use the driver disc that came with the Ethernet card.

3. Right-click **My Computer** and select **Properties**. The System Properties window opens.
4. On the **Hardware** tab, click the **Device Manager** button. The Device Manager window opens.
5. Expand **Network adapters** and then right-click one of the Ethernet cards (PRO/1000PT or the yellow question mark).
6. Select **Update Driver...** The Hardware Update Wizard program opens.
7. Select **Install the software automatically (Recommended)** and click **Next** to continue.
8. Follow the instructions on the screen.

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 66.

## Installing or removing a memory module

### Attention:

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>

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

Your server has four slots for installing or replacing DDR3 UDIMMs that provide up to a maximum of 16 GB system memory. When installing or replacing a memory module, use the following guidelines:

- Use 1 GB, 2 GB, or 4 GB DDR3 UDIMMs 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 26.

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

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. Lay the server on its side for easier access to the system board.
4. Locate the memory slots. See “Locating parts on the system board” on page 26.
5. Remove any parts that might prevent your access to the memory slots. Depending on your server 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 35.
6. Depending on whether you are installing or replacing a memory module, do one of the following:

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

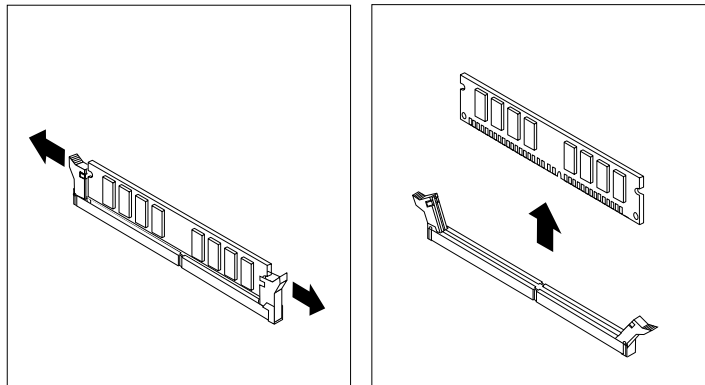


Figure 11. Removing a memory module

- If you are installing a new memory module, open the retaining clips of the memory slot into which you want to install the memory module.

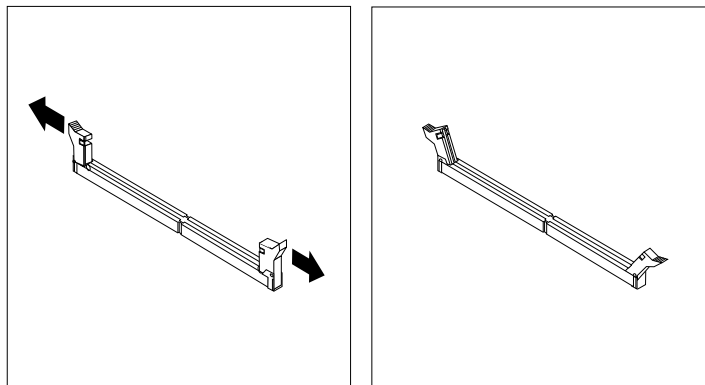


Figure 12. Opening the retaining clips

7. Touch the static-protective package that contains the new memory module to any unpainted metal surface on the outside of the server. Then, remove the new memory module from the package.

- Position the new memory module over the memory slot. Make sure that the notch **1** on the new memory module is aligned with the key **2** in the memory slot. Then, press the new memory module straight down into the memory slot until the retaining clips close and the new memory module snaps into position.

**Note:** If there is a gap between the memory module and the retaining clips, the memory module has not been correctly installed. Open the retaining clips, remove the memory module, and then reinstall it into the slot.

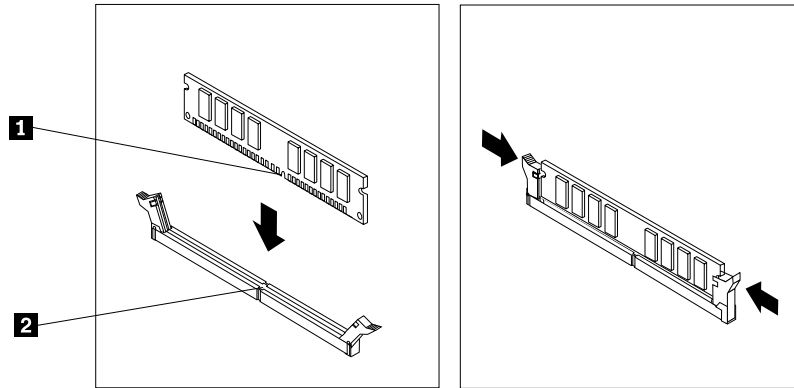


Figure 13. Installing a memory module

- 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 66.

## Installing or replacing the optical drive

**Attention:**

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, 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 all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 34.
4. 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 server.

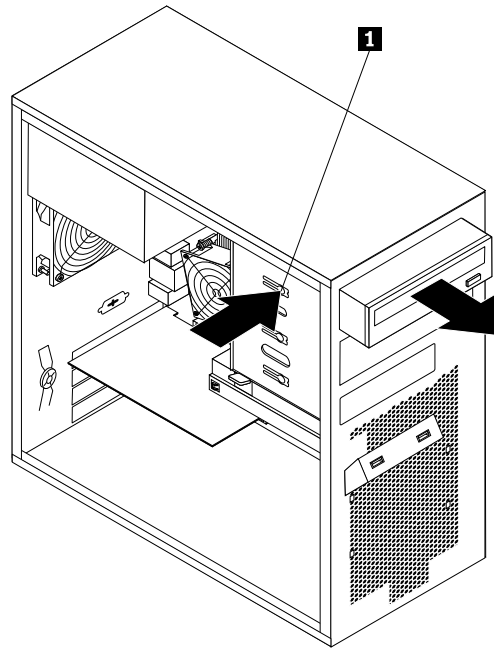


Figure 14. Removing the optical drive

5. Slide the new optical drive with the optical drive retainer **1** installed into the drive bay from the front of the server until the optical drive snaps into position.

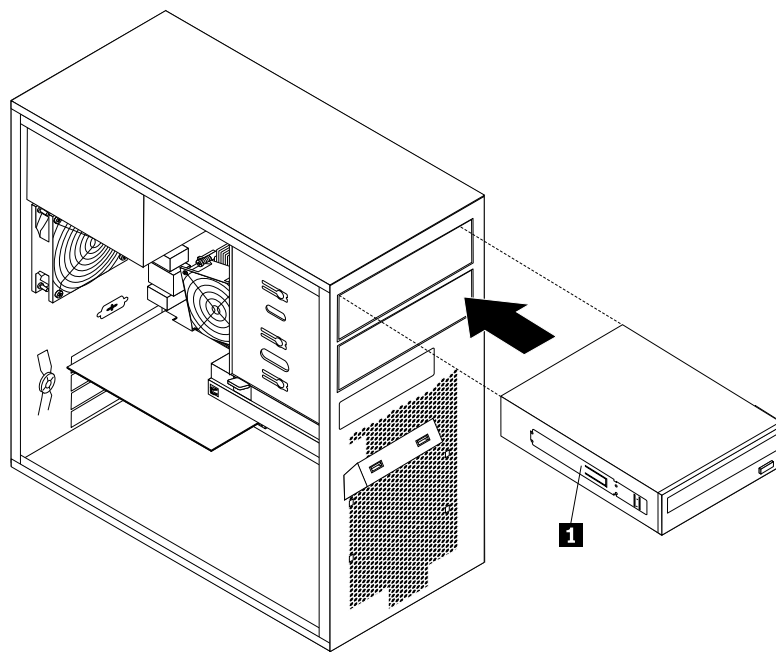


Figure 15. Installing the optical drive

6. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 34.
7. Connect one end of the signal cable to the optical drive and the other end to an available SATA connector on the system board. See “Locating parts on the system board” on page 26. Then, locate an available five-wire power connector and connect it to the SATA drive.

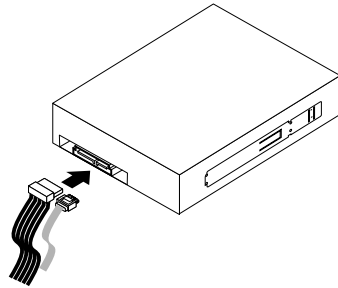


Figure 16. Connecting a SATA optical drive

#### What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 66.

## Replacing the primary hard disk drive

#### Attention:

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, 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 all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. Locate the primary hard disk drive. See “Locating parts on the system board” on page 26.
4. Disconnect the signal cable and the power cable from the rear of the hard disk drive.

5. Press the blue release tab **1** downward, slide the hard disk drive cage **2** to the rear of the server, and then pivot it outward to completely remove the drive cage from the chassis. Then, pull on the blue handle **3** to remove the hard disk drive from the drive cage.

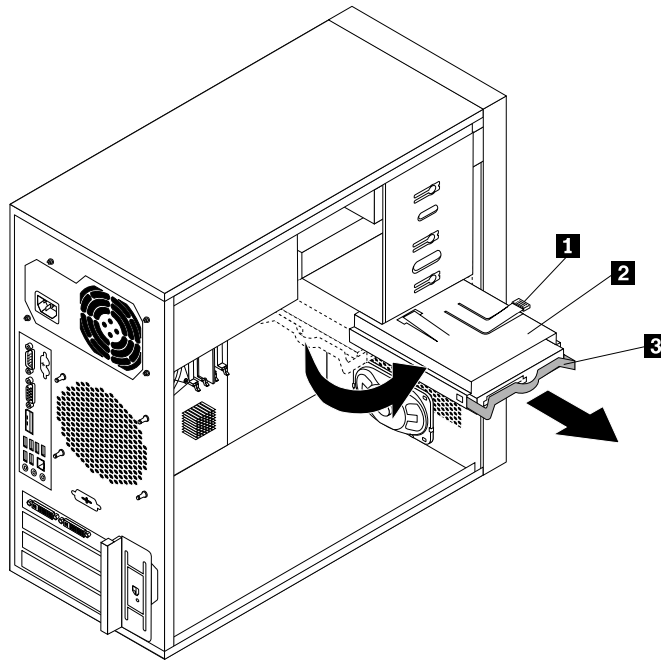


Figure 17. Removing the primary hard disk drive

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 sides of 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.

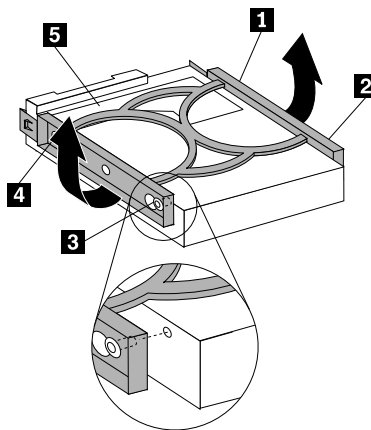


Figure 18. Installing the hard disk drive into the bracket



- Slide the new hard disk drive with the blue bracket into the drive cage until it snaps into position and align the hard disk drive cage pivot pin with the slot **1** in the upper drive cage. Then, slide the hard disk drive cage into the chassis. Press down on the metal latch **2** and pivot the hard disk drive cage into place. Then, slide the drive cage to the front of the server 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 correct position.

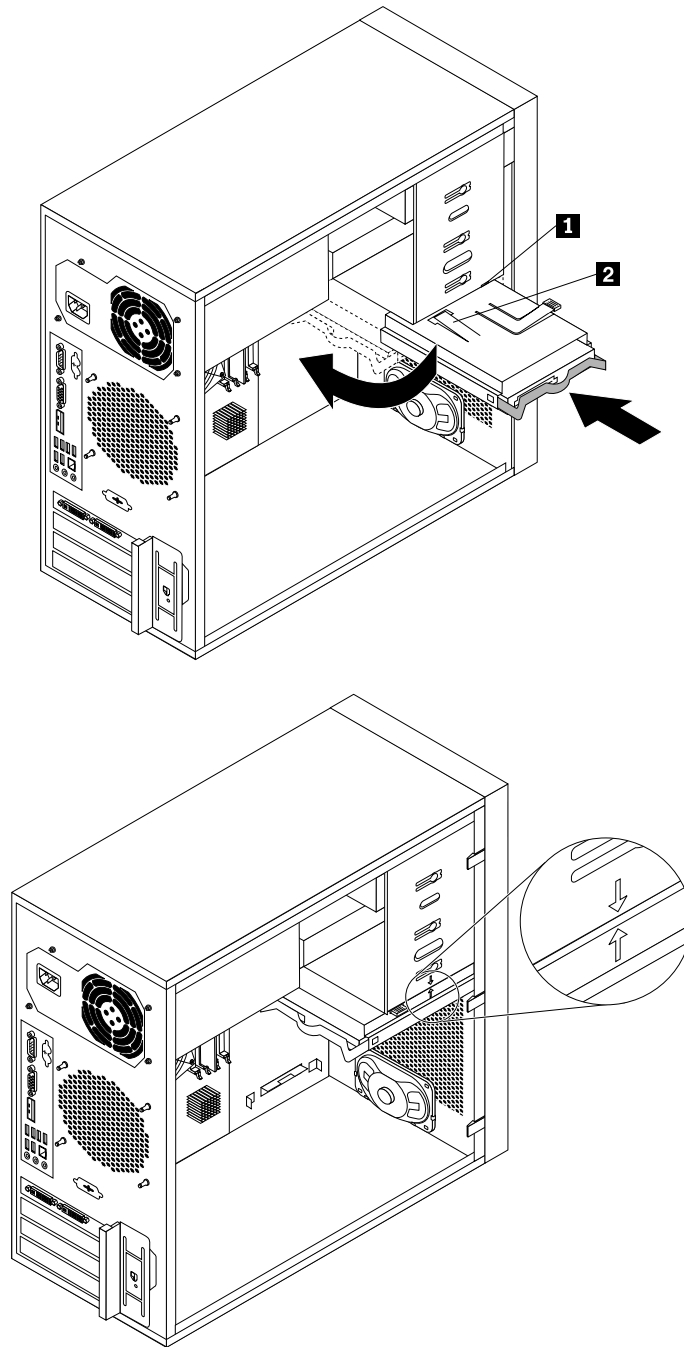


Figure 19. Installing the primary hard disk drive

9. Connect one end of the signal cable to the hard disk drive and the other end to an available SATA connector on the system board. See “Locating parts on the system board” on page 26. Then, locate an available five-wire power connector and connect it to the hard disk drive.

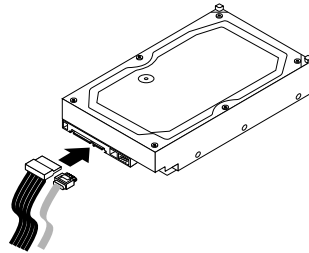


Figure 20. Connecting a SATA hard disk drive

#### 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 66.

## Installing or replacing the secondary hard disk drive

#### Attention:

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>

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

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. Locate the secondary hard disk drive. See “Locating parts on the system board” on page 26 and “Internal components” on page 27.
4. If you are replacing the secondary hard disk drive, disconnect the signal cable and the power cable from the hard disk drive.

5. Press the release button **1** to release the hard disk drive cage and then lift the hard disk drive cage out of the chassis.

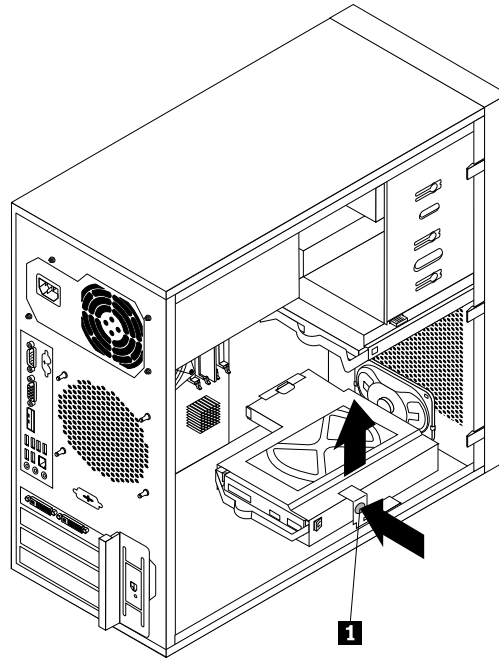


Figure 21. Removing the secondary hard disk drive

6. Pull on the blue handle to release and remove the hard disk drive from the hard disk drive cage.
7. Flex the sides of the blue bracket to remove the hard disk drive from the bracket.
8. To install the secondary hard disk drive, flex the sides of the bracket properly 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.

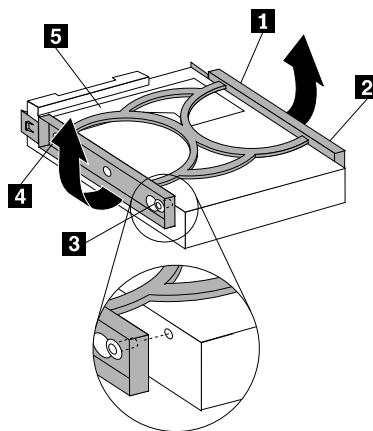


Figure 22. Installing the hard disk drive into the bracket

9. Slide the new hard disk drive with the blue bracket into the secondary hard disk drive cage until it snaps into position.
10. Slide the hard disk drive cage with the new hard disk drive into the chassis until it is directly underneath the metal tab **1**.

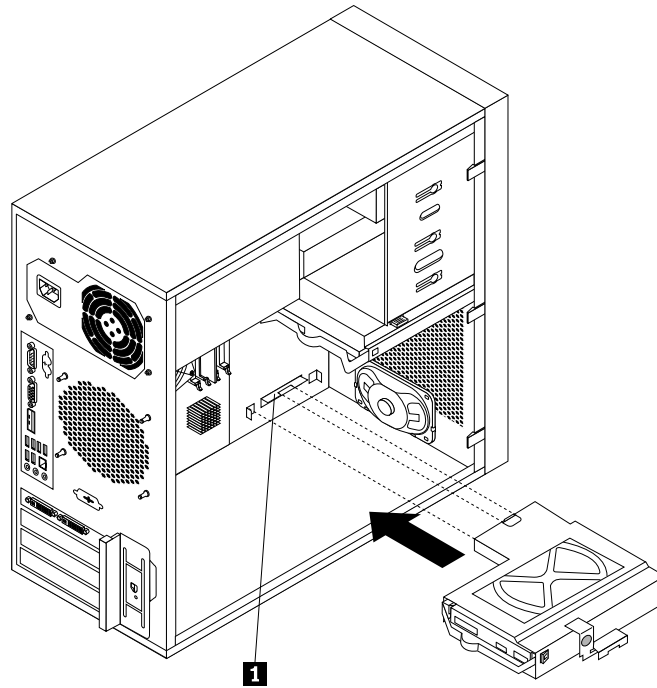


Figure 23. Installing the secondary hard disk drive

11. Press the hard disk drive cage downward until it snaps into position. Make sure that the hard disk drive cage is secured in the chassis.

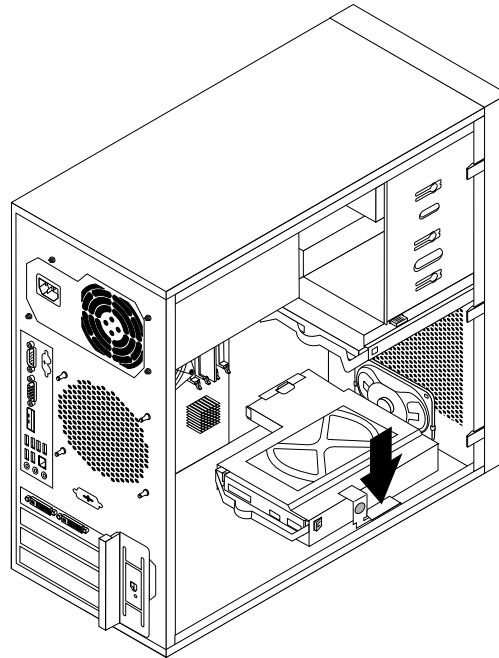


Figure 24. Installing the secondary hard disk drive

12. Connect one end of the signal cable to the hard disk drive and the other end to an available SATA connector on the system board. See “Locating parts on the system board” on page 26. Then, locate an available five-wire power connector and connect it to the hard disk drive.

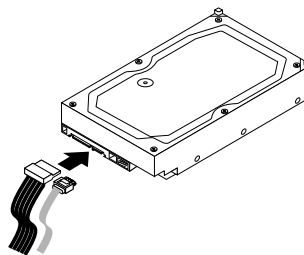


Figure 25. Connecting a SATA hard disk drive

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## Installing, removing, or replacing hardware devices

This section provides instructions on how to install, remove, or replace hardware devices for your server. You can maintain your server by replacing the failing hardware devices. If you are replacing a hardware device, perform the removal procedure and then perform the installation procedure for the hardware device that you want to replace.

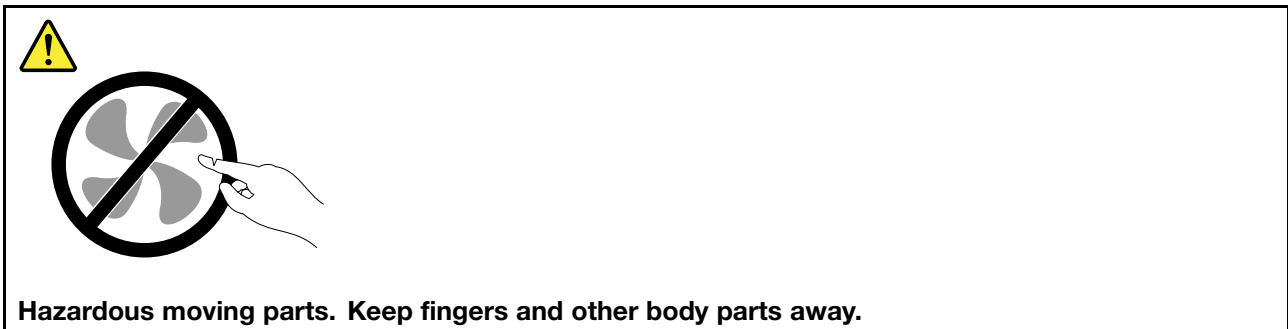
## Replacing the power supply assembly

**Attention:**

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>

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

Although there are no moving parts in your server after the power cord has been disconnected, the following warnings are required for your safety and proper Underwriters Laboratories (UL) certification.



**CAUTION:**

Never remove the cover on a power supply or any part that has the following label attached.



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

To replace the power supply assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. Lay the server on its side and disconnect the power supply assembly cables from the system board and all drives. See “Locating parts on the system board” on page 26.

4. Remove the four screws at the rear of the chassis that secure the power supply assembly.

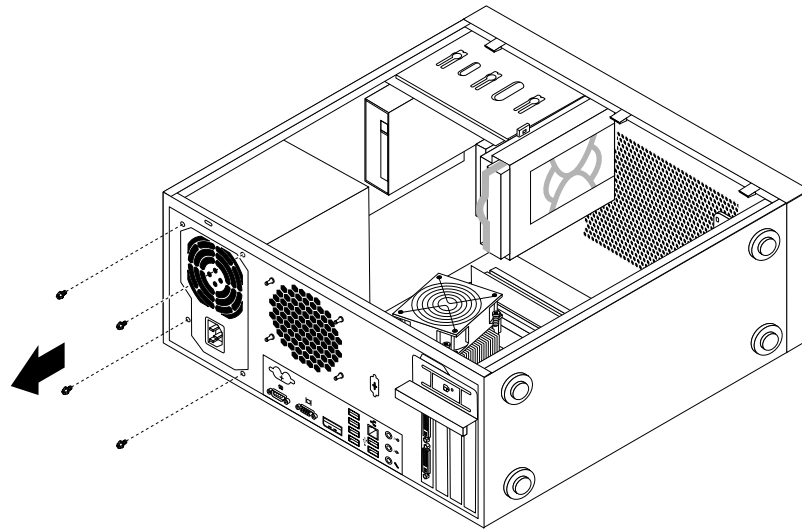


Figure 26. Removing the screws that secure the power supply assembly

5. Slide the power supply assembly a little bit forward and then remove it from the chassis.

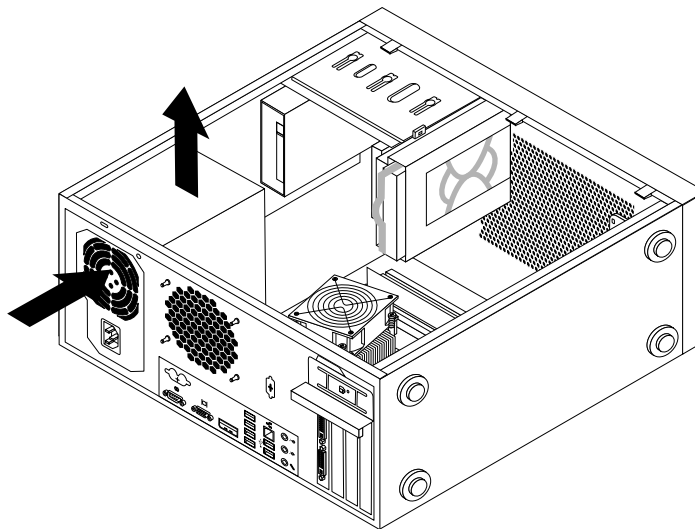


Figure 27. Removing the power supply assembly

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 66.

## Replacing the heat sink and fan assembly

**Attention:**

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>

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

**CAUTION:**

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

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

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. Lay the server on its side for easier access to the system board.
4. Locate the heat sink and fan assembly. See “Locating parts on the system board” on page 26.
5. 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 26.



6. Follow this sequence to remove the four screws that secure the heat sink and fan assembly to the system board:
  - a. Partially remove screw **1**, then fully remove screw **2**, and then fully remove screw **1**.
  - b. Partially remove screw **3**, then fully remove screw **4**, and then fully remove screw **3**.

**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.

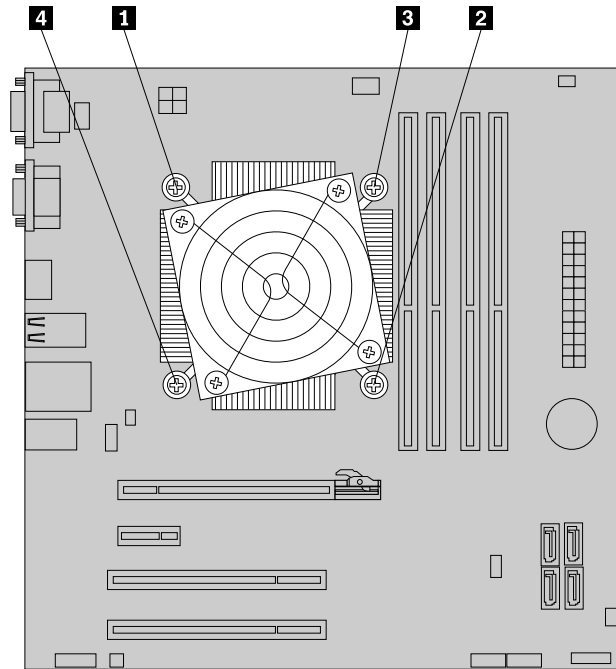


Figure 28. Removing the heat sink and fan assembly

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

**Notes:**

- a. You might have to gently twist the heat sink and fan assembly to free it from the microprocessor.
  - b. While handling the heat sink and fan assembly, do not touch the thermal grease on the bottom of it.
8. Place the new heat sink and fan assembly on the system board so that the four screws on the heat sink and fan assembly are aligned with the corresponding holes on the system board. Make sure that you properly place the heat sink and fan assembly so that you can easily connect the heat sink and fan assembly cable to the microprocessor fan connector on the system board.
  9. Follow this sequence to install the four screws to secure the new heat sink and fan assembly. See Figure 28 “Removing the heat sink and fan assembly” on page 53.
    - a. Partially tighten screw **1**, then fully tighten screw **2**, and then fully tighten screw **1**.
    - b. Partially tighten screw **3**, then fully tighten screw **4**, and then fully tighten screw **3**.

**Note:** Do not over-tighten the screws.

10. 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 26.

**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 66.

## Replacing the front audio and USB assembly

**Attention:**

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>

This section provides instructions on how to replace the front audio and USB assembly.

To replace the front audio and USB assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 34.
4. Disconnect the front audio and USB assembly cable from the system board. See “Locating parts on the system board” on page 26.
5. Note the front audio and USB assembly cable routing and remove the screw that secures the front audio and USB assembly. Then, remove the front audio and USB assembly from the chassis.

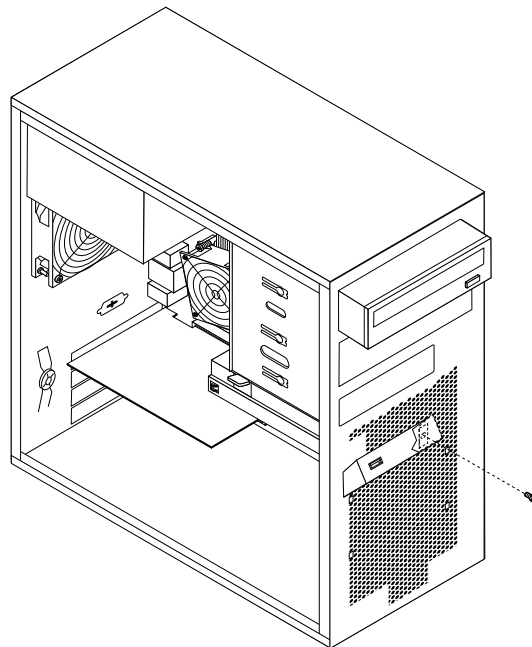


Figure 29. Removing the front audio and USB assembly

6. Route the new front audio and USB assembly through the hole in the chassis.
7. Position the new front audio and USB assembly to the chassis so that the screw hole in the new front audio and USB assembly is aligned with the corresponding hole in the chassis.
8. Install the screw to secure the new front audio and USB assembly in place.
9. Connect the new front audio and USB assembly cables to the system board. See “Locating parts on the system board” on page 26.

10. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 34.

**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 66.

## Replacing the front fan assembly

**Attention:**

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>

Depending on the model type, your server might have a front fan assembly installed. This section provides instructions on how to replace the front fan assembly.

To replace the front fan assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 34.
4. Disconnect the front fan assembly cable from the power fan connector on the system board. See “Locating parts on the system board” on page 26.

**Note:** If your server 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 “Installing or replacing the secondary hard disk drive” on page 46.

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

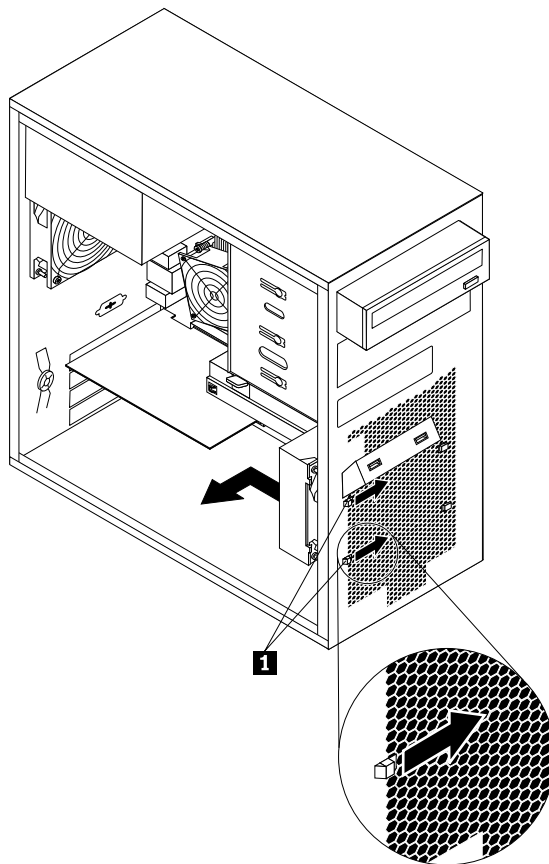


Figure 30. Removing the front fan assembly

6. 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.

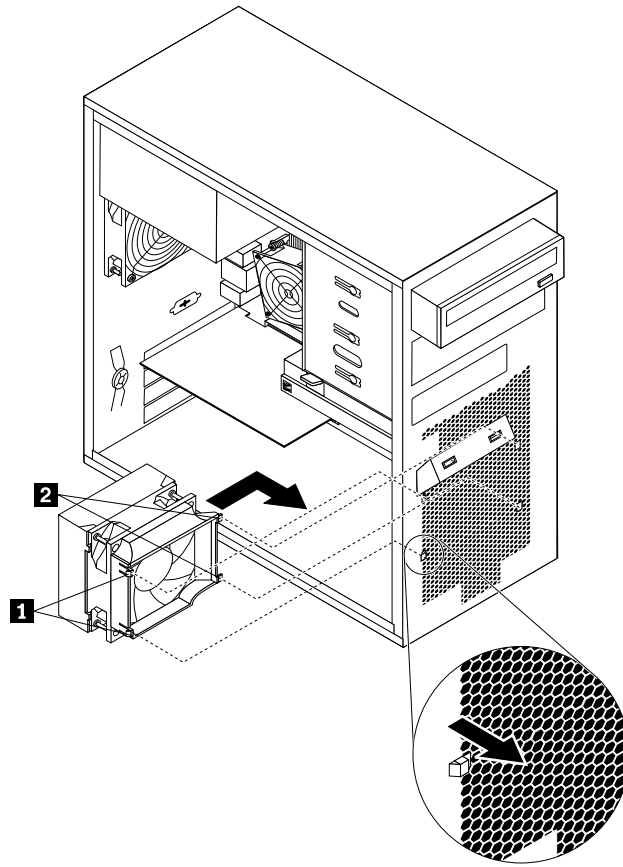


Figure 31. Installing the front fan assembly

7. Connect the new front fan assembly cable to the power fan connector on the system board. See “Locating parts on the system board” on page 26.

**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 66.

## Replacing the rear fan assembly

**Attention:**

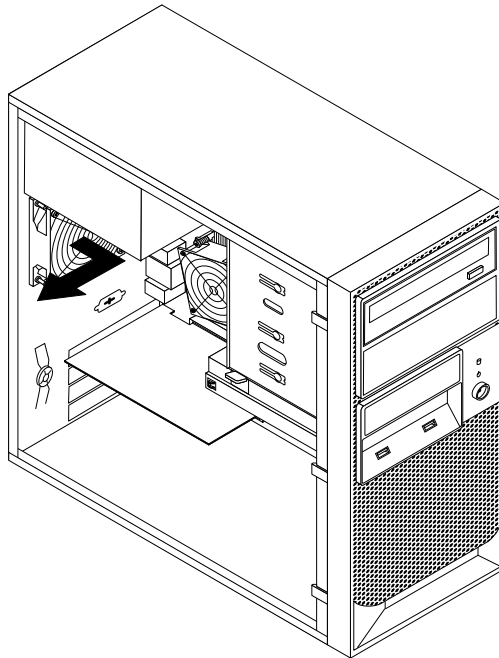
Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to: <http://www.lenovo.com/support>

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

To replace the rear fan assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See “Removing the server cover” on page 33.
3. Locate the rear fan assembly. See “Internal components” on page 27.
4. Disconnect the rear fan assembly cable from the system fan connector on the system board. See “Locating parts on the system board” on page 26.
5. The rear fan assembly is attached to the chassis by four rubber mounts. Remove the rear fan assembly by cutting the rubber mounts and gently pulling the rear fan assembly out of the chassis.



*Figure 32. Removing the rear fan assembly*

6. 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 will have four new rubber mounts attached.

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

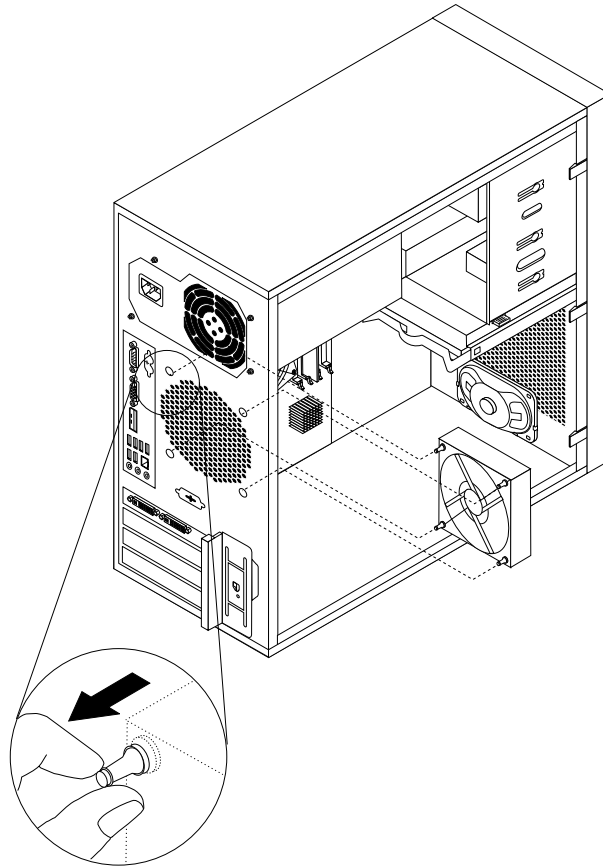


Figure 33. Installing the rear fan assembly

- Connect the new rear fan assembly cable to the system fan connector on the system board. See “Locating parts on the system board” on page 26.

**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 66.

## Replacing the microprocessor

**Attention:**

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>

This section provides instructions on how to replace the microprocessor.

**CAUTION:**



The heat sink and microprocessor 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 microprocessor, do the following:

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the server cover” on page 33.
3. Lay the computer on its side for easier access to the system board.
4. Locate the system board and disconnect all cables connected to the system board. See “Locating parts on the system board” on page 26.
5. Remove the heat sink and fan assembly. See “Replacing the heat sink and fan assembly” on page 52.

**Note:** Place the heat sink and fan assembly on its side so that the thermal grease on the bottom of it does not get in contact with anything.

6. Lift the small handle **1** and open the retainer **2** to access the microprocessor **3**.

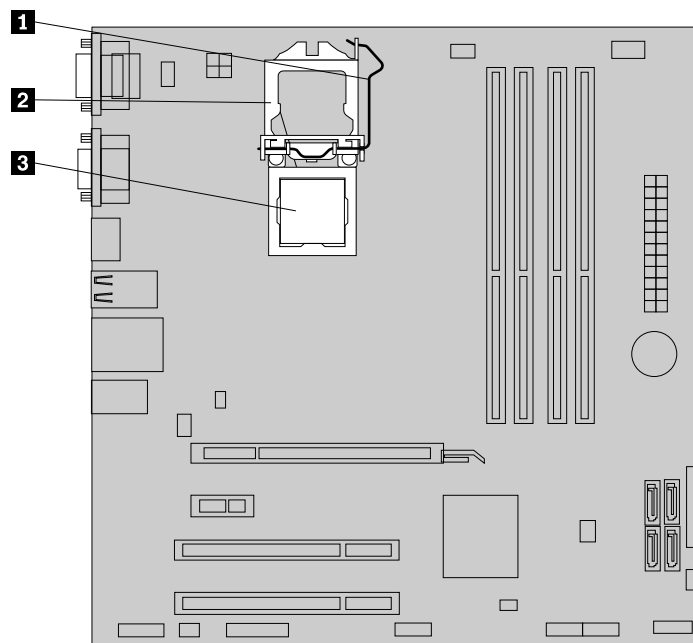


Figure 34. Accessing the microprocessor

7. Lift the microprocessor straight up and out of the microprocessor socket.

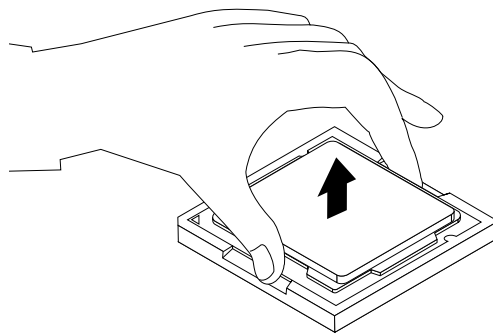
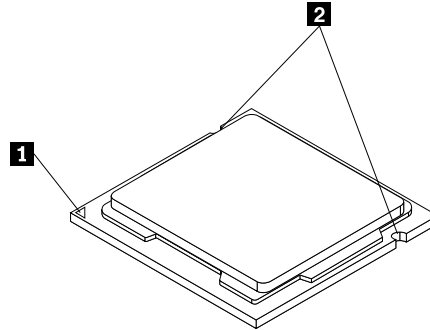


Figure 35. Removing the microprocessor

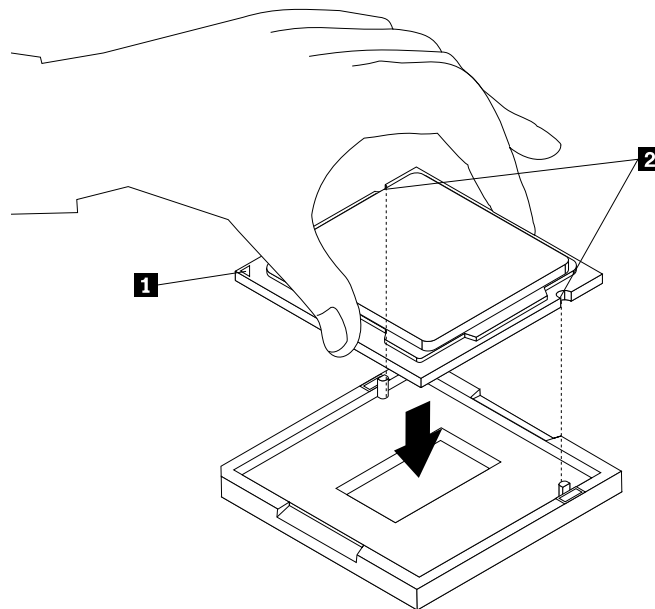


**Notes:**

- a. Your microprocessor and socket might look different from the one illustrated.
- b. Note the orientation of the microprocessor in the socket. You can either look for the small triangle **1** on one corner of the microprocessor or note the orientation of the notches **2** on the microprocessor. This is important when installing the new microprocessor on the system board.



- c. Touch only the edges of the microprocessor. Do not touch the gold contacts on the bottom.
  - d. Do not drop anything onto the microprocessor socket while it is exposed. The socket pins must be kept as clean as possible.
8. Make sure that the small handle is in the raised position and the microprocessor retainer is fully open.
  9. Remove the protective cover that protects the gold contacts of the new microprocessor.
  10. Hold the new microprocessor by its sides and align the small triangle on one corner of the new microprocessor with the corresponding small triangle on one corner of the microprocessor socket.
  11. Lower the new microprocessor straight down into the microprocessor socket on the system board.



*Figure 36. Installing the microprocessor*

12. Close the microprocessor retainer and lock it into position with the small handle to secure the new microprocessor in the socket.
13. Reinstall the heat sink and fan assembly. See “Replacing the heat sink and fan assembly” on page 52.

14. Reconnect all cables that were disconnected from 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 66.

## Replacing the system board battery

**Attention:**

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>

This section provides instructions on how to replace the system board battery.

Your server has a special type of memory that maintains the date, time, and configuration information for built-in features. The system board battery keeps this information active when you turn off the server.

The system board battery normally requires no charging or maintenance throughout its life; however, no battery lasts forever. If the system board battery fails, the date, time, and configuration information, including passwords, are lost. An error message is displayed when you turn on the server.

Be sure to consider the following information when you replace the battery in the server:

- You must replace the battery with a lithium battery of the same type from the same manufacturer.
- To avoid possible danger, be sure to read and understand the following safety statement.
- After you replace the system board battery, you must reset passwords, system date and time, and reconfigure the server.

### Statement 2



**CAUTION:**

**When replacing the lithium battery, use only the battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.**

**Do not:**

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

**Dispose of the battery as required by local ordinances or regulations.**

To replace the system board battery, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. Locate the system board battery. See “Locating parts on the system board” on page 26.

4. Remove the old system board battery.

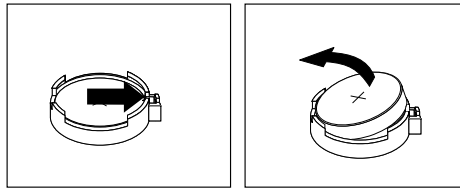


Figure 37. Removing the old system board battery

5. Install the new system board battery.

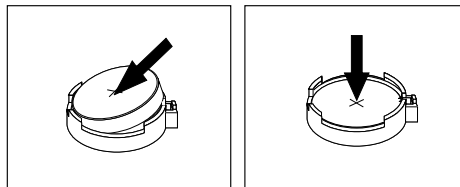


Figure 38. Installing the new system board battery

6. Reinstall the computer cover and connect the cables. See “Completing the parts replacement” on page 66.

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

7. Turn on the computer and all attached devices.
8. Use the Setup Utility program to set the date, time, and any passwords. See Chapter 7 “Configuring the server” on page 83.
9. Dispose of the failing battery as required by local ordinances or regulations.

#### 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 66.

## Replacing the system board

#### Attention:

Do not open your server or attempt any repair before reading and understanding the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that came with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>

This section provides instructions on how to replace the system board.

#### CAUTION:

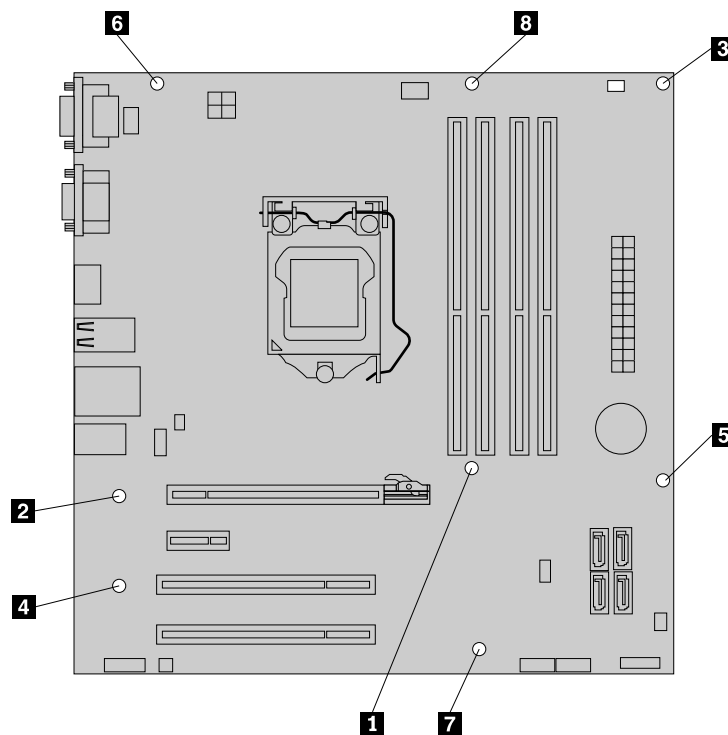


**The heat sink and microprocessor might be very hot. Turn off the computer and wait three to five minutes to let the computer cool before removing the computer cover.**

**Note:** Before replacing the system board, make sure you have a retention module for the new system board.

To replace the system board, do the following:

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the server cover” on page 33.
3. Place the computer on its side to gain easier access to the system board.
4. Remove all memory modules and PCI cards that are currently installed. See “Installing or removing a memory module” on page 39 and “Installing or replacing a PCI card” on page 35.
5. Remove the heat sink and fan assembly from the failing system board. See “Replacing the heat sink and fan assembly” on page 52.
6. Remove the microprocessor from the failing system board. See “Replacing the microprocessor” on page 59.
7. Remove the battery from the failing system board. See “Replacing the system board battery” on page 62.
8. Remove the front fan assembly from the computer. See “Replacing the front fan assembly” on page 55.
9. Note the location of all cable connections on the system board and disconnect all cables. See “Locating parts on the system board” on page 26.
10. Remove the eight screws that secure the system board to the chassis by following the sequence shown in the following illustration.



11. Carefully lift the failing system board out of the chassis.
12. Position the new system board into the chassis so that the screw holes in the new system board are aligned with those in the chassis. Install the eight screws that secure the system board to the chassis in the reverse order that they were removed; that is, install the screw **8** first and install the screw **1** last.
13. Remove the microprocessor socket cover from the new system board.
14. Install the memory modules, PCI cards, battery, microprocessor, and heat sink and fan assembly that you removed from the failing system board to the new system board.
15. Connect all cables to the system board. See “Locating parts on the system board” on page 26.

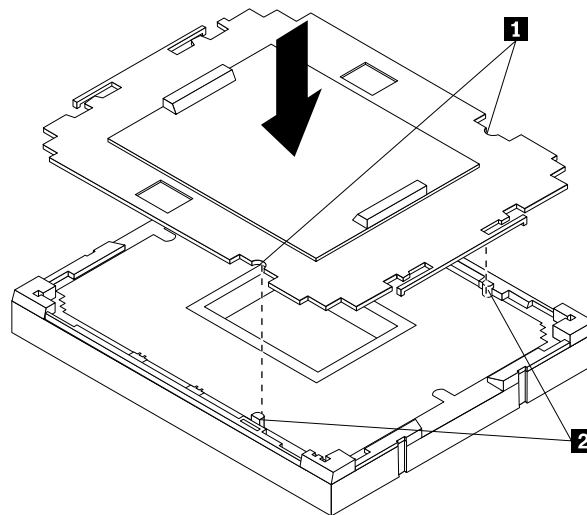
16. Go to “Completing the parts replacement” on page 66.

The failing system board must be returned with microprocessor socket covers to protect the pins during shipping and handling. Install the microprocessor socket covers removed from the new system board on the failing system board.

**Note:** The microprocessor socket cover installation procedure should be performed on both microprocessor sockets on the failing system board.

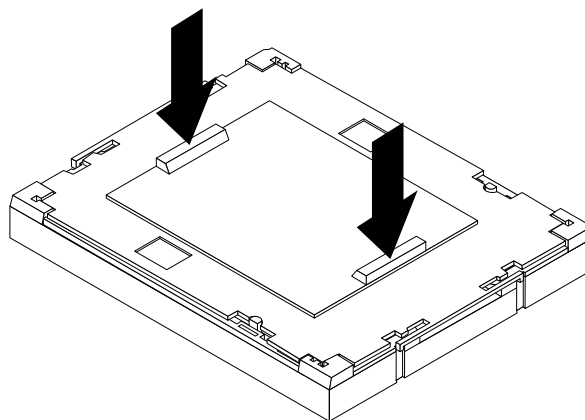
To install a microprocessor socket cover, do the following:

1. Release the lever securing the microprocessor retainer and open the retainer to access the microprocessor.
2. Grasp the microprocessor on the sides and lift it straight up and out of the socket. Do not touch the contacts on the microprocessor socket.
3. Align the notches **1** of the microprocessor socket cover with the alignment keys **2** of the microprocessor socket. Lower the socket cover straight down into the microprocessor socket on the system board.



**Note:** Your microprocessor socket and cover might look slightly different from the illustration.

4. Carefully press the socket cover straight down until it is secured in the socket.



5. Lower the microprocessor retainer and then lower the lever to secure the retainer. Make sure the lever is securely locked into position.

---

## Completing the parts replacement

After completing the installation or replacement for all parts, you need to reinstall the server cover and reconnect cables.

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

1. Make sure that all components have been reassembled correctly and that no tools or loose screws are left inside your server. See “Internal components” on page 27 for the locations of various components in your server.
2. If you have removed the front bezel, reinstall it. See “Removing and reinstalling the front bezel” on page 34.
3. Make sure that the cables are routed correctly before reinstalling the server cover. Keep cables clear of the hinges and sides of the server chassis to avoid interference with reinstalling the server cover.
4. Position the server cover on the chassis so that the rail guides on the bottom of the server cover engage the rails on the chassis. Then, slide the cover to the front of the server until it snaps into position.

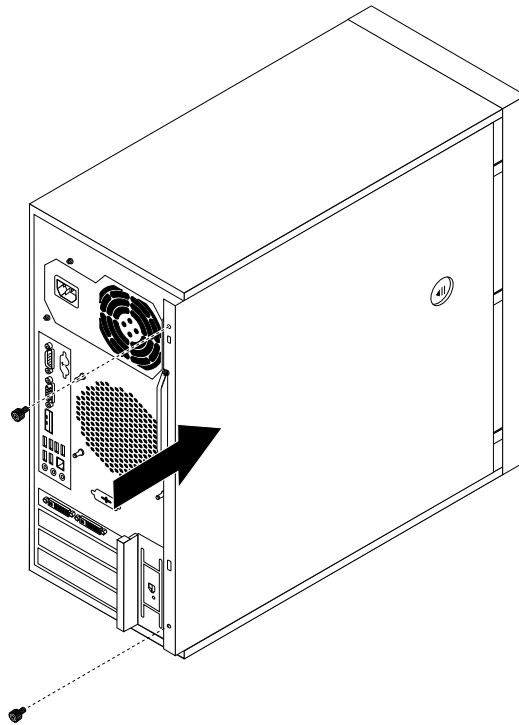


Figure 39. Reinstalling the server cover

5. Install the screws to secure the server cover.
6. Lock the server cover if you have a server cover lock.
7. Reconnect the external cables and power cords to the server. See “Front view” on page 23 and “Rear view” on page 24.
8. Depending on the parts you installed or replaced, you might need to confirm the updated information in the Setup Utility program. Refer to Chapter 7 “Configuring the server” on page 83.

**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.

## Connecting the cables

**Attention:** To prevent damage to equipment, connect the power cords after completing the parts replacement.

If the server cables and connector panel have color-coded connections, match the color of the cable end with the color of the connector. For example, match a blue cable end with a blue panel connector, a red cable end with a red connector, and so on. See “Rear view” on page 24 for an illustration of the I/O connectors on the rear of the server.

## Turning on the server

When the server is connected to an ac power source but is not turned on, the operating system does not run, and all core logic except for the service processor (the integrated management module) is shut down; however, the server can respond to requests to the service processor, such as a remote request to turn on the server.

After the server is connected to an ac power source, you can turn on the server by pressing the power button.

## Turning off the server

When you turn off the server and leave it connected to ac power, the server can respond to requests to the service processor, such as a remote request to turn on the server. While the server remains connected to ac power, one or more fans might continue to run. To remove all power from the server, you must disconnect it from the power source.

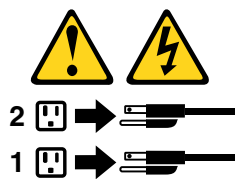
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

### Statement 5



### CAUTION:

**The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.**



The server can be turned off in any of the following ways:

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will turn off automatically.
- You can press the power button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power button for more than four seconds to turn off the server.
- The server can be turned off by the Shutdown on LAN feature.

- The integrated management module (IMM) can turn off the server as an automatic response to a critical system failure.

## Connecting external devices

If you install a supported optional adapter, you can attach external devices to the server.

To attach an external device, do the following:

**Note:** If you are attaching an external device, see the documentation that comes with the device for information about cabling.

1. Read and understand the *Safety Information* on the *ThinkServer Documentation DVD* that comes with your product, and “Guidelines” on page 29. To obtain a copy of the publications, go to:  
<http://www.lenovo.com/support>
2. Turn off the server and all attached devices.
3. Follow the instructions that come with the device to prepare it for installation and to connect it to the server.

## Updating the server configuration

When you start the server for the first time after you install or remove an internal option or external device, you might receive a message saying that the configuration has changed. The Setup Utility program starts automatically so that you can save the new configuration settings.

Some options have device drivers that you must install. For information about installing device drivers, see the documentation that comes with each option.

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.



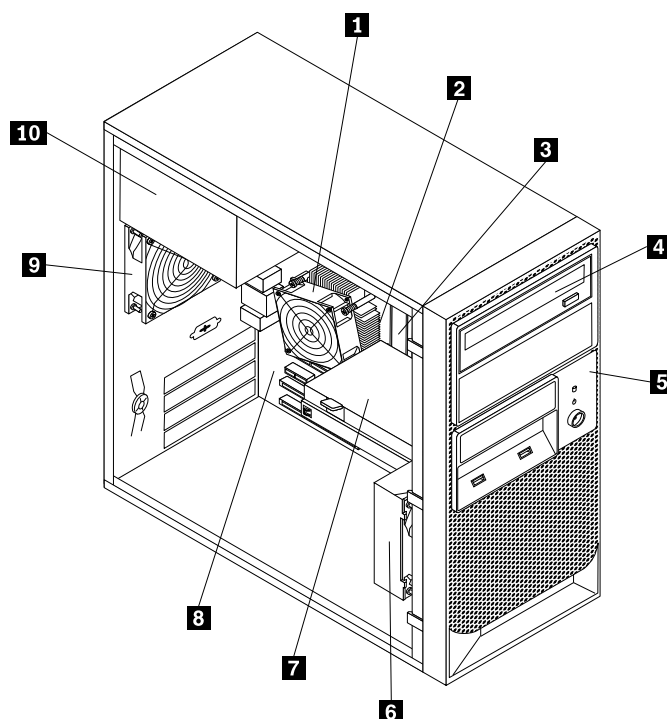
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## Chapter 6. Parts listing

The chapter lists the replaceable components for the ThinkServer TS130 machine types 1098, 1100, 1105, and 1106.

To check for an updated parts listing on the Web, do the following:

1. Go to <http://www.lenovo.com/support>.
2. Click **Download & Drivers** → **ThinkServer** and then follow the instructions on the Web page to download firmware updates for your server.



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### Replaceable server components

Replaceable components are of three types:

- **Self-service customer replaceable unit (CRU):** Replacement of self-service CRUs is your responsibility. If Lenovo installs a self-service CRU at your request, you will be charged for the installation.
- **Optional-service customer replaceable unit:** You may install an optional-service CRU yourself or request Lenovo to install it, at no additional charge, under the type of warranty service that is designated for your server.
- **Field replaceable unit (FRU):** FRUs must be installed only by trained service technicians.

For information about the terms of the warranty and getting service and assistance, see the *Warranty and Support Information* document.

The following table lists the part numbers for the server components.

Table 4. Parts listing, type 1098

Item #	1098 FRUs	FRU#	CRU
1	Thermal kit 95 and 73 W (including heatsink, RM and mounting plate) (models CTO all models)	03X3844	1
2	Microprocessor, E3-1275 quad core / 2 GT 3.40 GHz 95 W (models CTO)	03T7050	N
2	Microprocessor, E3-1245 quad core / 2 GT 3.30 GHz 95 W (models CTO)	03T7051	N
2	Microprocessor, E3-1235 quad core / 2 GT 3.20 GHz 95 W (models CTO)	03T7052	N
2	Microprocessor, E3-1225 quad core / 2 GT 3.10 GHz 95 W (models CTO)	03T7053	N
2	Microprocessor, Core i3-2100 dual core / 1 GT 3.1 GHz 65 W (models CTO 12U 12F 12M 12J 12S 12L 12D 12Y)	03T8011	N
2	Microprocessor, Core i3-2120 dual core / 1 GT 3.3 GHz 65 W (models CTO)	03T8010	N
3	Memory modules, DDR3 ECC PC3-10600 2 GB UDIMM (1333) (models CTO 12U 12F 12M 12J 12S 12L 12D 12Y)	03X3660	1
3	Memory modules, DDR3 ECC PC3-10600 4 GB UDIMM (1333) (models CTO)	03X3661	1
4	Optical drive, DVD-ROM Drive, 16x/48x (SATA) (models CTO 12U 12F 12M 12J 12S 12L 12D 12Y)	71Y5543	1
4	Optical drive, DVD Burner/CD, RW Rambo 8 (SATA) (models CTO)	71Y5545	1
6	4-pin front fan (models CTO all models)	43N9599	1
9	4-pin system fan with fan grill (models CTO all models)	03X3845	1
7	Hard disk drive, non-hot-swap 250 GB SATA Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (models CTO 12U 12F 12M 12J 12S 12L 12D 12Y)	03X3764	1
7	Hard disk drive, non-hot-swap 500 GB SATA, Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (models CTO)	03X3765	1
7	Hard disk drive, non-hot-swap 1 TB SATA, Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (models CTO)	03X3767	1
7	Hard disk drive, non-hot-swap 2 TB SATA, Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (models CTO)	03X3768	1
8	System board, motherboard CPA-SX31200 V1.0, TPM enabled (models CTO 12U 12F 12M 12J 12S 12L 12D 12Y)	03T8003	N
8	System board, motherboard CPA-SX31200 V1.0, TPM disabled, surge protection, (models CTO 12U 12F 12M 12J 12S 12L 12D 12Y)	03X3754	N
10	Power supply, 280 Watt (80 plus bronze) (models CTO 12U 12F 12M 12J 12S 12L 12D 12Y)	45J9431	2
	EMC shield 5.25 (models CTO all models)	41N8080	2
	Rear IO shield, ATX, Q57, FOF, print with 6 USB (models CTO all models)	43N9846	2
	Optical drive blank bezel (models CTO all models)	30X3755	2
	New optional hard disk drive bracket assembly (models CTO all models)	41R6106	2
	Cable, SATA 120 mm (RoHS) (models CTO all models)	41R3328	1
	Cable PATA 1-2 for RDX (models CTO all models)	03X3759	1
	Cable, SATA 250 mm, 1 latching for device (RoHS) (models CTO all models)	54Y9929	1
	Optical drive, 15 u 750 mm single SATA cable V1.0 (models CTO)	03X3696	1
	Intel Pro/1000 PT Dual Port Ethernet card (models CTO)	67Y1430	1
	NVIDIA graphics card, NVS300, 512 MB, DMS59 (models CTO)	03T8152	1

Table 4. Parts listing, type 1098 (continued)

Item #	1098 FRUs	FRU#	CRU
	Hard disk drive cage assembly (models CTO all models)	03X3841	1
	Internal speaker assembly, 400mm (models CTO all models)	43N9091	1
	Cable, DMS59 (M) - 2 VGA (F), 203 mm (models CTO)	42Y8181	1
	Cable, DMS59 (M) - 2 DVI (F), 203mm (CTO)	41X6298	1
	Temp sense cable (6pin 460 mm) (models CTO all models)	45J9495	1
	Lenovo RDX 160 GB internal USB drive (models CTO)	03X3662	1
	Lenovo RDX 320 GB internal USB drive (models CTO)	03X3663	1
	Lenovo RDX 500 GB internal USB drive (models CTO)	03X3664	1

Table 5. Parts listing, type 1100

Item #	1100 FRUs	FRU#	CRU
1	Thermal kit 95 and 73 W (including heatsink, RM and mounting plate) (models CTO all models)	03X3844	1
2	Microprocessor, E3-1275 quad core / 2 GT 3.40 GHz 95 W (models CTO)	03T7050	N
2	Microprocessor, E3-1245 quad core / 2 GT 3.30 GHz 95 W (models CTO)	03T7051	N
2	Microprocessor, E3-1235 quad core / 2 GT 3.20 GHz 95 W (models CTO)	03T7052	N
2	Microprocessor, E3-1225 quad core / 2 GT 3.10 GHz 95 W (models CTO 12U 12F 12G 12M 12J 12S 12L 12D 12Y)	03T7053	N
2	Microprocessor, Core i3-2100 dual core / 1 GT 3.1 GHz 65 W (models CTO)	03T8011	N
2	Microprocessor, Core i3-2120 dual core / 1 GT 3.3 GHz 65 W (models CTO)	03T8010	N
3	Memory modules, DDR3 ECC PC3-10600 2 GB UDIMM (1333) (models CTO 12U 12F 12G 12M 12J 12S 12L 12D 12Y)	03X3660	1
3	Memory modules, DDR3 ECC PC3-10600 4 GB UDIMM (1333) (models CTO)	03X3661	1
4	Optical drive, DVD-ROM drive, 16x/48x (SATA) (models CTO 12U 12F 12G 12M 12J 12S 12L 12D 12Y)	71Y5543	1
4	Optical drive, DVD Burner/CD, RW Rambo 8 (SATA) (models CTO)	71Y5545	1
6	4-pin front fan (models CTO all models)	43N9599	1
9	4-pin system fan with fan grill (models CTO all models)	03X3845	1
7	Hard disk drive, non-hot-swap 250 GB SATA Enterprise 7200 rpm, 3 GB/s, XXMB cache, 3.5" drive assembly (models CTO 12U 12F 12G 12M 12J 12S 12L 12D 12Y)	03X3764	1
7	Hard disk drive, non-hot-swap 500 GB SATA, Enterprise 7200 rpm, 3 GB/s, XXMB cache, 3.5" drive assembly (models CTO)	03X3765	1
7	Hard disk drive, non-hot-swap 1 TB SATA, Enterprise 7200 rpm, 3 GB/s, XXMB cache, 3.5" drive assembly (models CTO)	03X3767	1
7	Hard disk drive, non-hot-swap 2 TB SATA, Enterprise 7200 rpm, 3 GB/s, XXMB cache, 3.5" drive assembly (models CTO)	03X3768	1
8	System board, motherboard CPA-SX31200 V1.0, TPM enabled (models CTO 12U 12F 12M 12J 12S 12L 12D 12Y)	03T8003	N
8	System board, motherboard CPA-SX31200 V1.0, TPM disabled, surge protection (models CTO 12U 12F 12G 12M 12J 12S 12L 12D 12Y)	03X3754	N

Table 5. Parts listing, type 1100 (continued)

Item #	1100 FRUs	FRU#	CRU
10	Power supply, 280 Watt (80 plus bronze) (models CTO 12U 12F 12G 12M 12J 12S 12L 12D 12Y)	45J9431	2
	EMC shield 5.25 (models CTO all models)	41N8080	2
	Rear IO shield, ATX, Q57, FOF, print with 6 USB (models CTO all models)	43N9846	2
	Optical drive blank bezel (models CTO all models)	30X3755	2
	New optional hard disk drive bracket assembly (models CTO all models)	41R6106	2
	Cable, SATA 120 mm (RoHS) (models CTO all models)	41R3328	1
	Cable PATA 1-2 for RDX (models CTO all models)	03X3759	1
	Cable, SATA 250 mm, 1 latching for device (RoHS) (models CTO all models)	54Y9929	1
	Optical drive, 15 u 750 mm single SATA cable V1.0 (models CTO all models)	03X3696	1
	Internal speaker assembly, 400 mm (models CTO all models)	43N9091	1
	Intel Pro/1000 PT dual port Ethernet card (models CTO)	67Y1430	1
	NVIDIA graphics card, NVS300, 512 MB, DMS59 (models CTO)	03T8152	1
	Hard disk drive cage assembly (models CTO all models)	03X3841	1
	Cable, DMS59 (M) - 2 VGA (F), 203 mm (models CTO)	42Y8181	1
	Cable, DMS59 (M) - 2 DVI (F), 203 mm (models CTO)	41X6298	1
	Temp sense cable (6pin 460 mm) (models CTO all models)	45J9495	1
	Lenovo RDX 160 GB internal USB drive (models CTO)	03X3662	1
	Lenovo RDX 320 GB internal USB drive (models CTO)	03X3663	1
	Lenovo RDX 500 GB internal USB drive (models CTO)	03X3664	1

Table 6. Parts listing, type 1105

Item #	1105 FRUs	FRU#	CRU
1	Thermal kit 95 and 73 W (including heatsink, RM and mounting plate) (models CTO all models)	03X3844	1
2	Microprocessor, E3-1275 quad core / 2 GT 3.40 GHz 95 W (models CTO 1BU 1BF 1BM 1BJ 1BS 1BL 1BD 1BY)	03T7050	N
2	Microprocessor, E3-1245 quad core / 2 GT 3.30 GHz 95 W (models CTO 1EU 1EF 1EM 1EJ 1ES 1EL 1ED 1EY)	03T7051	N
2	Microprocessor, E3-1235 quad core / 2 GT 3.20 GHz 95 W (models CTO 1AU 1AF 1AM 1AJ 1AS 1AL 1AD 1AY 1DU 1DF 1DM 1DJ 1DS 1DL 1DD 1DY)	03T7052	N
2	Microprocessor, E3-1225 quad core / 2 GT 3.10 GHz 95 W (models CTO 18F 18M 18J 18S 18L 18D 18Y 19U 19F 19M 19J 19S 19L 19D 19Y 1CU 1CF 1CM 1CJ 1CS 1CL 1CD 1CY)	03T7053	N
2	Microprocessor, Core i3-2100 dual core / 1 GT 3.1 GHz 65 W (models CTO 15U 15F 15M 15J 15S 15L 15D 15Y 11G)	03T8011	N
2	Microprocessor, Core i3-2120 dual core / 1 GT 3.3 GHz 65 W (models CTO 16J)	03T8010	N
3	Memory modules, DDR3 ECC PC3-10600 2 GB UDIMM (1333) (models CTO 15U 15F 15M 15J 15S 15L 15D 15Y 16J 18U 18F 18M 18J 18S 18L 18D 18Y 19U 19F 19M 19J 19S 19L 19D 19Y 11G A1G)	03X3660	1

Table 6. Parts listing, type 1105 (continued)

Item #	1105 FRUs	FRU#	CRU
3	Memory modules, DDR3 ECC PC3-10600 4 GB UDIMM (1333) (models CTO 1AU 1AF 1AM 1AJ 1AS 1AL 1AD 1AY 1BU 1BF 1BM 1BJ 1BS 1BL 1BD 1BY 1CU 1CF 1CM 1CJ 1CS 1CL 1CD 1CY 1DU 1DF 1DM 1DJ 1DS 1DL 1DD 1DY 1EU 1EF 1EM 1EJ 1ES 1EL 1ED 1EY )	03X3661	1
4	Optical drive, DVD-ROM drive, 16x/48x (SATA) (models CTO 15U 15F 15M 15J 15S 15L 15D 15Y 16J 18U 18F 18M 18J 18S 18L 18D 18Y 19U 19F 19M 19J 19S 19L 19D 19Y 11G A1G)	71Y5543	1
4	Optical drive, DVD Burner/CD, RW Rambo 8 (SATA) (models CTO)	71Y5545	1
6	4-pin front fan (models CTO all models)	43N9599	1
9	4-pin system fan with fan grill (models CTO all models)	03X3845	1
7	Hard disk drive, non-hot-swap 250 GB SATA Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (CTO 15U 15F 15M 15J 15S 15L 15D 15Y 16J 18U 18F 18M 18J 18S 18L 18D 18Y 19U 19F 19M 19J 19S 19L 19D 19Y 1BU 1BF 1BM 1BJ 1BS 1BL 1BD 1BY 1DU 1DF 1DM 1DJ DS 1DL 1DD 1DY 11G A1G)	03X3764	1
7	Hard disk drive, non-hot-swap 500 GB SATA, Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (models CTO 1AU 1AF 1AG 1AM 1AJ 1AS 1AL 1AD 1AY 1CU 1CF 1CS 1CL 1CD 1CY 1CM 1CJ 1EU 1EF 1EM 1EJ 1ES 1EL 1ED 1EY)	03X3765	1
7	Hard disk drive, non-hot-swap 1 TB SATA, Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (models CTO)	03X3767	1
7	Hard disk drive, non-hot-swap 2 TB SATA, Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (models CTO)	03X3768	1
8	System board, motherboard CPA-SX31200 V1.0, TPM enabled (models CTO 15U 15F 15M 15J 15S 15L 15D 15Y 16J 18U 18F 18M 18J 18S 18L 18D 18Y 19U 19F 19M 19J 19S 19L 19D 19Y 1AU 1AF 1AM 1AJ 1AS 1AL 1AD 1AY 1BU 1BF 1BM 1BJ 1BS 1BL 1BD 1BY 1CU 1CF 1CM 1CJ 1CS 1CL 1CD 1CY 1DU 1DF 1DM 1DJ 1DS 1DL 1DD 1DY 1EU 1EF 1EM 1EJ 1ES 1EL 1ED 1EY 11G A1G)	03T8003	N
8	System board, motherboard CPA-SX31200 V1.0, TPM disabled, surge protection (models CTO 15U 15F 15M 15J 15S 15L 15D 15Y 16J 18U 18F 18M 18J 18S 18L 18D 18Y 19U 19F 19M 19J 19S 19L 19D 19Y 1AU 1AF 1AM 1AJ 1AS 1AL 1AD 1AY 1BU 1BF 1BM 1BJ 1BS 1BL 1BD 1BY 1CU 1CF 1CM 1CJ 1CS 1CL 1CD 1CY 1DU 1DF 1DM 1DJ 1DS 1DL 1DD 1DY 1EU 1EF 1EM 1EJ 1ES 1EL 1ED 1EY 11G A1G)	03X3754	N
10	Power supply, 280 Watt (80 plus bronze) (models CTO 15U 15F 15M 15J 15S 15L 15D 15Y 16J 18U 18F 18M 18J 18S 18L 18D 18Y 19U 19F 19M 19J 19S 19L 19D 19Y 1AU 1AF 1AM 1AJ 1AS 1AL 1AD 1AY 1BU 1BF 1BM 1BJ 1BS 1BL 1BD 1BY 1CU 1CF 1CM 1CJ 1CS 1CL 1CD 1CY 1DU 1DF 1DM 1DJ 1DS 1DL 1DD 1DY 1EU 1EF 1EM 1EJ 1ES 1EL 1ED 1EY 11G A1G)	45J9431	2
	EMC shield 5.25 (models CTO all models)	41N8080	2
	Rear IO shield, ATX, Q57, FOF, print with 6 USB (models CTO all models)	43N9846	2
	Optical drive blank bezel (models CTO all models)	30X3755	2
	New optional hard disk drive bracket assembly (models CTO all models)	41R6106	2
	Cable, SATA 120 mm (RoHS) (models CTO all models)	41R3328	1
	Cable PATA 1-2 for RDX (models CTO all models)	03X3759	1
	Cable, SATA 250 mm, 1 latching for device (RoHS) (models CTO all models)	54Y9929	1
	Optical drive, 15 u 750 mm single SATA cable V1.0 (models CTO)	03X3696	1
	Intel Pro/1000 PT dual port Ethernet card (models CTO)	67Y1430	1

Table 6. Parts listing, type 1105 (continued)

Item #	1105 FRUs	FRU#	CRU
	NVIDIA graphics card, NVS300, 512 MB, DMS59 (models CTO)	03T8152	1
	Hard disk drive cage assembly (models CTO all models)	03X3841	1
	Internal speaker assembly, 400mm (models CTO all models)	43N9091	1
	Cable, DMS59 (M) - 2 VGA (F), 203 mm (models CTO)	42Y8181	1
	Cable, DMS59 (M) - 2 DVI (F), 203 mm (models CTO)	41X6298	1
	Temp sense cable (6pin 460 mm) (models CTO all models)	45J9495	1
	Lenovo RDX 160 GB internal USB drive (models CTO)	03X3662	1
	Lenovo RDX 320 GB internal USB drive (models CTO)	03X3663	1
	Lenovo RDX 500 GB internal USB drive (models CTO)	03X3664	1

Table 7. Parts listing, type 1106

Item #	1106 FRUs	FRU#	CRU
1	Thermal kit 95 and 73 W (including heatsink, RM and mounting plate) (models CTO all models)	03X3844	1
2	Microprocessor, E3-1275 quad core / 2 GT 3.40 GHz 95 W (models CTO)	03T7050	N
2	Microprocessor, E3-1245 quad core / 2 GT 3.30 GHz 95 W (models CTO)	03T7051	N
2	Microprocessor, E3-1235 quad core / 2 GT 3.20 GHz 95 W (models CTO 1HG A1G A1M)	03T7052	N
2	Microprocessor, E3-1225 quad core / 2 GT 3.10 GHz 95 W (models CTO 1GG)	03T7053	N
2	Microprocessor, Core i3-2100 dual core / 1 GT 3.1 GHz 65 W (models CTO)	03T8011	N
2	Microprocessor, Core i3-2120 dual core / 1 GT 3.3 GHz 65 W (models CTO 1EU 1EF 1EM 1EJ 1ES 1EL 1ED 1EY)	03T8010	N
3	Memory modules, DDR3 ECC PC3-10600 2 GB UDIMM (1333) (models CTO 1EU 1EF 1EM 1EJ 1ES 1EL 1ED 1EY)	03X3660	1
3	Memory modules, DDR3 ECC PC3-10600 4 GB UDIMM (1333) (models CTO 1GG 1HG A1G A1M)	03X3661	1
4	Optical drive, DVD-ROM drive, 16x/48x (SATA) (models CTO)	71Y5543	1
4	Optical drive, DVD Burner/CD, RW Rambo 8 (SATA) (models CTO 1GG 1EU 1EF 1EM 1EJ A1G 1ES 1EL 1ED 1EY A1M)	71Y5545	1
6	4-pin front fan (CTO models CTO all models)	43N9599	1
9	4-pin system fan with fan grill (models CTO all models)	03X3845	1
7	Hard disk drive, non-hot-swap 250 GB SATA Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (models CTO 1HG)	03X3764	1
7	Hard disk drive, non-hot-swap 500 GB SATA, Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (models CTO 1GG 1EU 1EF 1EM 1EJ A1G 1ES 1EL 1ED 1EY A1M)	03X3765	1
7	Hard disk drive, non-hot-swap 1 TB SATA, Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (models CTO)	03X3767	1
7	Hard disk drive, non-hot-swap 2 TB SATA, Enterprise 7200 rpm, 3 GB/s, XX MB cache, 3.5" drive assembly (models CTO)	03X3768	1

Table 7. Parts listing, type 1106 (continued)

Item #	1106 FRUs	FRU#	CRU
8	System board, motherboard CPA-SX31200 V1.0, TPM enabled (models CTO 1GG 1HG 1EU 1EF 1EM 1EJ A1G 1ES 1EL 1ED 1EY A1M)	03T8003	N
8	System board, motherboard CPA-SX31200 V1.0, TPM disabled, surge protection (models CTO 1GG 1HG 1EU 1EF 1EM 1EJ A1G 1ES 1EL 1ED 1EY A1M)	03X3754	N
10	Power supply, 280 Watt (80 plus bronze) (models CTO 1GG 1HG 1EU 1EF 1EM 1EJ A1G 1ES 1EL 1ED 1EY)	45J9431	2
	EMC shield 5.25 (models CTO all models)	41N8080	2
	Rear IO shield, ATX, Q57, FOF, print with 6 USB (models CTO all models)	43N9846	2
	Optical drive blank bezel (models CTO all models)	30X3755	2
	New optional hard disk drive bracket assembly (models CTO all models)	41R6106	2
	Cable, SATA 120 mm (RoHS) (models CTO all models)	41R3328	1
	Cable PATA 1-2 for RDX (models CTO all models)	03X3759	1
	Cable, SATA 250 mm, 1 latching for device (RoHS) (models CTO all models)	54Y9929	1
	Optical drive, 15 u 750 mm single SATA cable V1.0 (models CTO)	03X3696	1
	Intel Pro/1000 PT dual port Ethernet card (models CTO)	67Y1430	1
	NVIDIA graphics card, NVS300, 512 MB, DMS59 (models CTO)	03T8152	1
	Hard disk drive cage assembly (models CTO all models)	03X3841	1
	Internal speaker assembly, 400mm (models CTO all models)	43N9091	1
	Cable, DMS59 (M) - 2 VGA (F), 203 mm (models CTO)	42Y8181	1
	Cable, DMS59 (M) - 2 DVI (F), 203 mm (models CTO)	41X6298	1
	Temp sense cable (6pin 460 mm) (models CTO all models)	45J9495	1
	Lenovo RDX 160 GB internal USB drive (models CTO)	03X3662	1
	Lenovo RDX 320 GB internal USB drive (models CTO)	03X3663	1
	Lenovo RDX 500 GB internal USB drive (models CTO)	03X3664	1

## Ship group

A Lenovo ship group for a specific country or region is usually available only in that country or region.

Table 8. Ship group, type 1098

1098 Ship group	FRU#	CRU
EasyStartup DVD (English language version) (models CTO)	03X3653	1
Documentation DVD (models CTO)	03X3654	1
EasyStartup DVD (multiple language version) (models CTO)	03X3655	1
Windows Server 2008 R2 64-bit ship group US (models CTO)	90Y1183	1

Table 9. Ship group, type 1100

1100 Ship group	FRU#	CRU
EasyStartup DVD (English language version) (models CTO)	03X3653	1
Documentation DVD (models CTO)	03X3654	1

Table 9. Ship group, type 1100 (continued)

1100 Ship group	FRU#	CRU
EasyStartup DVD (multiple language version) (models CTO)	03X3655	1
Windows Server 2008 R2 64-bit ship group US (models CTO)	90Y1183	1

Table 10. Ship group, type 1105

1105 Ship group	FRU#	CRU
EasyStartup DVD (English language version) (models CTO)	03X3653	1
Documentation DVD (models CTO)	03X3654	1
EasyStartup DVD (multiple language version) (models CTO)	03X3655	1
Windows Server 2008 R2 64-bit ship group US (models CTO)	90Y1183	1

Table 11. Ship group, type 1106

1106 Ship group	FRU#	CRU
EasyStartup DVD (English language version) (models CTO)	03X3653	1
Documentation DVD (models CTO)	03X3654	1
EasyStartup DVD (multiple language version) (models CTO)	03X3655	1
Windows Server 2008 R2 64-bit ship group US (models CTO)	90Y1183	1

## Power cords

For your safety, Lenovo provides a power cord with a grounded attachment plug to use with this Lenovo product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

Lenovo power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

Lenovo power cords for a specific country or region are usually available only in that country or region.

Table 12. Primary power cords, type 1098

1098 Primary power cords	FRU#	CRU
Line cord - US (models CTO 12U 12F 12D 12S 12L)	41R3184	1
Line cord - China (models CTO)	41R3256	1
Line cord - Japan (models CTO 12J)	24R2633	1



Table 12. Primary power cords, type 1098 (continued)

<b>1098 Primary power cords</b>	<b>FRU#</b>	<b>CRU</b>
Line cord - Brazil (models CTO)	45J9595	1
Line cord - Latin America High Voltage (Argentina, Paraguay, Uruguay) (models CTO 12Y 12L)	41R3176	1
Line cord - Australia/ New Zealand (models CTO 12M)	41R3196	1
Line cord - Korea (models CTO)	41R3260	1
Line cord - Hong Kong, United Kingdom, Singapore, Malaysia, Brunei, Ireland, (models CTO 11G 12G 18G 19G)	41R3224	1
Line cord - Taiwan (models CTO)	41R3278	1
Line cord - Italy (models CTO 12S 12L 12Y)	41R3232	1
Line-cord - Indonesia, Laos, Cambodia, Vietnam, Austria, Belgium, Croatia, Czechoslovakia, Finland, France, Germany, Hungary, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden (models CTO)	41R3208	1
Line cord - Denmark (models CTO)	41R3212	1
Line cord - Switzerland (models CTO)	41R3228	1
Line cord - Israel (models CTO)	41R3236	1
Line cord - South Africa (models CTO 12M)	41R3220	1
Line cord - India (models CTO)	41R3341	1

Table 13. Secondary power cords, type 1098

<b>1098 Secondary power cords</b>	<b>FRU#</b>	<b>CRU</b>
Line cord - US (models CTO 12U 12F 12D 12S 12L)	41R3184	1
Line cord - China (models CTO)	41R3256	1
Line cord - Japan (models CTO 12J)	24R2633	1
Line cord - Brazil (models CTO)	45J9595	1
Line cord - Latin America High Voltage (Argentina, Paraguay, Uruguay) (models CTO 12Y 12L)	41R3176	1
Line cord - Australia/ New Zealand (models CTO 12M)	41R3196	1
Line cord - Korea (models CTO)	41R3260	1
Line cord - Hong Kong, United Kingdom, Singapore, Malaysia, Brunei, Ireland, (models CTO)	41R3224	1
Line cord - Taiwan (models CTO)	41R3278	1
Line cord - Italy (models CTO 12S 12L 12Y)	41R3232	1
Line-cord - Indonesia, Laos, Cambodia, Vietnam, Austria, Belgium, Croatia, Czechoslovakia, Finland, France, Germany, Hungary, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden (models CTO)	41R3208	1
Line cord - Denmark (models CTO)	41R3212	1
Line cord - Switzerland (models CTO)	41R3228	1
Line cord - Israel (models CTO)	41R3236	1
Line cord - South Africa (models CTO 12M)	41R3220	1
Line cord - India (models CTO)	41R3341	1

Table 14. Primary power cords, type 1100

1100 Primary power cords	FRU#	CRU
Line cord - US (models CTO 12U 12F 12D 12S 12L)	41R3184	1
Line cord - China (models CTO)	41R3256	1
Line cord - Japan (models CTO 12J)	24R2633	1
Line cord - Brazil (models CTO)	45J9595	1
Line cord - Latin America High Voltage (Argentina, Paraguay, Uruguay) (models CTO 12Y 12L)	41R3176	1
Line cord - Australia/ New Zealand (models CTO 12M)	41R3196	1
Line cord - Korea (models CTO)	41R3260	1
Line cord - Hong Kong, United Kingdom, Singapore, Malaysia, Brunei, Ireland, (models CTO)	41R3224	1
Line cord - Taiwan (models CTO)	41R3278	1
Line cord - Italy (models CTO 12S 12L 12Y)	41R3232	1
Line-cord - Indonesia, Laos, Cambodia, Vietnam, Austria, Belgium, Croatia, Czechoslovakia, Finland, France, Germany, Hungary, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden (models CTO)	41R3208	1
Line cord - Denmark (models CTO)	41R3212	1
Line cord - Switzerland (models CTO)	41R3228	1
Line cord - Israel (models CTO)	41R3236	1
Line cord - South Africa (models CTO 12M)	41R3220	1
Line cord - India (models CTO)	41R3341	1

Table 15. Secondary power cords, type 1100

1100 Secondary power cords	FRU#	CRU
Line cord - US (models CTO 12U 12F 12D 12S 12L)	41R3184	1
Line cord - China (models CTO)	41R3256	1
Line cord - Japan (models CTO 12J)	24R2633	1
Line cord - Brazil (models CTO)	45J9595	1
Line cord - Latin America High Voltage (Argentina, Paraguay, Uruguay) (models CTO 12Y 12L)	41R3176	1
Line cord - Australia/ New Zealand (models CTO 12M)	41R3196	1
Line cord - Korea (models CTO)	41R3260	1
Line cord - Hong Kong, United Kingdom, Singapore, Malaysia, Brunei, Ireland, (models CTO)	41R3224	1
Line cord - Taiwan (models CTO)	41R3278	1
Line cord - Italy (models CTO 12S 12L 12Y)	41R3232	1
Line-cord - Indonesia, Laos, Cambodia, Vietnam, Austria, Belgium, Croatia, Czechoslovakia, Finland, France, Germany, Hungary, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden (models CTO)	41R3208	1
Line cord - Denmark (models CTO)	41R3212	1
Line cord - Switzerland (models CTO)	41R3228	1
Line cord - Israel (models CTO)	41R3236	1

Table 15. Secondary power cords, type 1100 (continued)

1100 Secondary power cords	FRU#	CRU
Line cord - South Africa (models CTO 12M)	41R3220	1
Line cord - India (models CTO)	41R3341	1

Table 16. Primary power cords, type 1105

1105 Primary power cords	FRU#	CRU
Line cord - US (models CTO 15U 15F 18F 19U 19F 1AU 1AF 1BU 1BF 1CU 1CF 1DU 1DF 1EU 1EF 15D 15S 15L 18D 18S 18L 19D 19S 19L 1AD 1AS 1AL 1BD 1BS 1BL 1CD 1CS 1CL 1DD 1DS 1DL 1ED 1ES 1EL)	41R3184	1
Line cord - China (models CTO)	41R3256	1
Line cord - Japan (models CTO 15J 16J 18J 19J 1AJ 1BJ 1CJ 1DJ 1EJ)	24R2633	1
Line cord - Brazil (models CTO)	45J9595	1
Line cord - Latin America High Voltage (Argentina, Paraguay, Uruguay) (models CTO 15Y 15L 18Y 18L 19Y 19L 1AY 1AL 1BY 1BL 1CY 1CL 1DY 1DL 1EY 1EL)	41R3176	1
Line cord - Australia/ New Zealand (models CTO 15M 18M 19M 1AM 1BM 1CM 1DM 1EM)	41R3196	1
Line cord - Korea (models CTO)	41R3260	1
Line cord - Hong Kong, United Kingdom, Singapore, Malaysia, Brunei, Ireland, (models CTO 11G A1G)	41R3224	1
Line cord - Taiwan (models CTO)	41R3278	1
Line cord - Italy (models CTO 11G A1G 15S 15L 15Y 18S 18L 18Y 19S 19L 19Y 1AS 1AL 1AY 1BS 1BL 1BY 1CS 1CL 1CY 1DS 1DL 1DY 1ES 1EL 1EY)	41R3232	1
Line-cord - Indonesia, Laos, Cambodia, Vietnam, Austria, Belgium, Croatia, Czechoslovakia, Finland, France, Germany, Hungary, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden (models CTO 11G A1G)	41R3208	1
Line cord - Denmark (models CTO 11G A1G)	41R3212	1
Line cord - Switzerland (models CTO 11G A1G)	41R3228	1
Line cord - Israel (CTO 11G A1G)	41R3236	1
Line cord - South Africa (models CTO 15M 18M 19M 1AM 1BM 1CM 1DM 1EM 11G A1G)	41R3220	1
Line cord - India (models CTO)	41R3341	1

Table 17. Secondary power cords, type 1105

1105 Secondary power cords	FRU#	CRU
Line cord - US (models CTO 15U 15F 18F 19U 19F 1AU 1AF 1BU 1BF 1CU 1CF 1DU 1DF 1EU 1EF 15D 15S 15L 18D 18S 18L 19D 19S 19L 1AD 1AS 1AL 1BD 1BS 1BL 1CD 1CS 1CL 1DD 1DS 1DL 1ED 1ES 1EL)	41R3184	1
Line cord - China (models CTO)	41R3256	1
Line cord - Japan (models CTO 15J 16J 18J 19J 1AJ 1BJ 1CJ 1DJ 1EJ)	24R2633	1
Line cord - Brazil (models CTO)	45J9595	1
Line cord - Latin America High Voltage (Argentina, Paraguay, Uruguay) (models CTO 15Y 15L 18Y 18L 19Y 19L 1AY 1AL 1BY 1BL 1CY 1CL 1DY 1DL 1EY 1EL)	41R3176	1
Line cord - Australia/ New Zealand (models CTO 15M 18M 19M 1AM 1BM 1CM 1DM 1EM)	41R3196	1
Line cord - Korea (models CTO)	41R3260	1

Table 17. Secondary power cords, type 1105 (continued)

1105 Secondary power cords	FRU#	CRU
Line cord - Hong Kong, United Kingdom, Singapore, Malaysia, Brunei, Ireland, (CTO 11G A1G)	41R3224	1
Line cord - Taiwan (models CTO)	41R3278	1
Line cord - Italy (models CTO 11G A1G 15S 15L 15Y 18S 18L 18Y 19S 19L 19Y 1AS 1AL 1AY 1BS 1BL 1BY 1CS 1CL 1CY 1DS 1DL 1DY 1ES 1EL 1EY)	41R3232	1
Line-cord - Indonesia, Laos, Cambodia, Vietnam, Austria, Belgium, Croatia, Czechoslovakia, Finland, France, Germany, Hungary, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden (models CTO 11G A1G)	41R3208	1
Line cord - Denmark (models CTO 11G A1G)	41R3212	1
Line cord - Switzerland (models CTO 11G A1G)	41R3228	1
Line cord - Israel (models CTO 11G A1G)	41R3236	1
Line cord - South Africa (models CTO 15M 18M 19M 1AM 1BM 1CM 1DM 1EM 11G A1G)	41R3220	1
Line cord - India (models CTO)	41R3341	1

Table 18. Primary power cords, type 1106

1106 Primary power cords	FRU#	CRU
Line cord - US (models CTO 1EU 1EF 1ED 1ES 1EL)	41R3184	1
Line cord - China (models CTO)	41R3256	1
Line cord - Japan (models CTO 1EJ)	24R2633	1
Line cord - Brazil (models CTO)	45J9595	1
Line cord - Latin America High Voltage (Argentina, Paraguay, Uruguay) (models CTO 1EY 1EL)	41R3176	1
Line cord - Australia/ New Zealand (models CTO 1EM A1M)	41R3196	1
Line cord - Korea (models CTO)	41R3260	1
Line cord - Hong Kong, United Kingdom, Singapore, Malaysia, Brunei, Ireland, (models CTO 1GG 1HG A1G)	41R3224	1
Line cord - Taiwan (models CTO)	41R3278	1
Line cord - Italy (models CTO 1GG 1HG A1G 1ES 1EL 1EY)	41R3232	1
Line-cord - Indonesia, Laos, Cambodia, Vietnam, Austria, Belgium, Croatia, Czechoslovakia, Finland, France, Germany, Hungary, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden (models CTO)	41R3208	1
Line cord - Denmark (models CTO 1GG 1HG A1G)	41R3212	1
Line cord - Switzerland (models CTO 1GG 1HG A1G)	41R3228	1
Line cord - Israel (models CTO 1GG 1HG A1G)	41R3236	1
Line cord - South Africa (models CTO 1EM 1GG 1HG A1G A1M)	41R3220	1
Line cord - India (models CTO)	41R3341	1

Table 19. Secondary power cords, type 1106

1106 Secondary power cords	FRU#	CRU
Line cord - US (models CTO 1EU 1EF 1ED 1ES 1EL)	41R3184	1
Line cord - China (models CTO)	41R3256	1

Table 19. Secondary power cords, type 1106 (continued)

<b>1106 Secondary power cords</b>	<b>FRU#</b>	<b>CRU</b>
Line cord - Japan (models CTO 1EJ)	24R2633	1
Line cord - Brazil (models CTO)	45J9595	1
Line cord - Latin America High Voltage (Argentina, Paraguay, Uruguay) (models CTO 1EY 1EL)	41R3176	1
Line cord - Australia/ New Zealand (models CTO 1EM A1M)	41R3196	1
Line cord - Korea (models CTO)	41R3260	1
Line cord - Hong Kong, United Kingdom, Singapore, Malaysia, Brunei, Ireland, (CTO 1GG 1HG A1G)	41R3224	1
Line cord - Taiwan (models CTO)	41R3278	1
Line cord - Italy (models CTO 1GG 1HG A1G 1ES 1EL 1EY)	41R3232	1
Line-cord - Indonesia, Laos, Cambodia, Vietnam, Austria, Belgium, Croatia, Czechoslovakia, Finland, France, Germany, Hungary, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden (models CTO)	41R3208	1
Line cord - Denmark (models CTO 1GG 1HG A1G)	41R3212	1
Line cord - Switzerland (models CTO 1GG 1HG A1G)	41R3228	1
Line cord - Israel (models CTO 1GG 1HG A1G)	41R3236	1
Line cord - South Africa (models CTO 1EM 1GG 1HG A1G A1M)	41R3220	1
Line cord - India (models CTO)	41R3341	1



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## Chapter 7. Configuring the server

The following configuration programs come with the server:

- **Setup Utility**  
The Setup Utility program is part of the server firmware. You can use the Setup Utility program to view your server configuration, change the startup device sequence, set the date and time, and set passwords. For information about using this program, see “Using the Setup Utility program” on page 83.
- **ThinkServer EasyStartup**  
For information about the ThinkServer EasyStartup program, see “Using the ThinkServer EasyStartup program” on page 102.
- **EasyUpdate Firmware Updater**  
For information about the EasyUpdate Firmware Updater program, see “Using the EasyUpdate Firmware Updater program” on page 101.

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### 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” on page 96.

When the POST detects that the hard disk drive has been removed from your computer or the memory module size has decreased, an error message will be displayed when you start the computer and you will be prompted to do one of the following:

- Press F1 to enter the Setup Utility program. After you enter the Setup Utility program, press F10 to save the settings and exit the Setup Utility program. The error message will not be displayed again.
- Press F2 to bypass the error message and log in to the operating system.

### Introduction of the BIOS items

The following tables list all the main menus and items in the Setup Utility program.

#### Notes:

- Some items might vary due to BIOS updates.
- Some items are displayed on the menu only if the server supports the corresponding features.
- The default settings are already optimized for you. Use the default value for any item you are not familiar with. Do not change the value of unfamiliar items or items that are not mentioned in this topic to avoid unexpected problems. If you consider changing the server configuration, proceed with extreme caution. Setting the configuration incorrectly might cause unexpected results.

- Lenovo provides the BIOS update utility on the Lenovo Web site. You can download the BIOS image and follow the instructions on the Web site to update the BIOS. See “Updating system programs” on page 102. After updating the BIOS, all the BIOS settings become the default settings of the updated BIOS version. You need to check and reconfigure the BIOS settings for your specific needs.
- If you have changed any hardware in the server, you might need to reflash the BIOS and the RDX.

Table 20. Items under the Setup Utility program menu

Item	Description
Main	Set the basic BIOS parameters. See Table 21 “Items under the <b>Main</b> menu” on page 84.
Devices	Set the device parameters. See Table 24 “Items under the <b>Devices</b> menu” on page 85.
Advanced	Set the advanced BIOS parameters. See Table 31 “Items under the <b>Advanced</b> menu” on page 88.
Power	Set the power parameters. See Table 35 “Items under the <b>Power</b> menu” on page 91.
Security	Set the security parameters. See Table 37 “Items under the <b>Security</b> menu” on page 92.
Startup	From the currently detected boot devices, select the first boot device for system initialization. See Table 42 “Items under the <b>Startup</b> menu” on page 95.
Exit	Exit the Setup Utility program. See Table 43 “Items under the <b>Exit</b> menu” on page 96.

Table 21. Items under the **Main** menu

Item	Option or description
System Summary	Enter the submenu to view all the options. See Table 22 “Submenus under the <b>System Summary</b> menu” on page 85.
System Time & Date	Enter the submenu to view all the options. See Table 23 “Submenus under the <b>System Time &amp; Date</b> menu” on page 85.
System Brand ID	Product Name
Machine Type and Model	Version
System Serial Number	Serial Number
Asset Tag	Asset Tag Number
System UUID	UUID
Ethernet MAC Address	XX-XX-XX-XX-XX-XX / Not Available
BIOS Revision Level	BIOS Version
BIOS Date (MM/DD/YYYY)	
Language	[English] / Français / Chinese
<b>Notes:</b>	
<ul style="list-style-type: none"> <li>• [ ] indicates the default setting.</li> <li>• The default BIOS language is English. You can change it to French or Chinese on the <b>Main</b> menu.</li> </ul>	



Table 22. Submenus under the **System Summary** menu

Item	Option or description
CPU Type	Show the CPU brand and CPU type.
CPU Speed	Show the CPU speed.
CPU Core Count	
Installed Memory	Show the total size of memory installed on the system board.
Memory Bus Speed	
Active Video	IGD/PEG/PCI
Onboard Audio	[Enabled] / Disabled
Onboard Ethernet	[Enabled] / Disabled
Fan 1	Operating / Not Operating
Fan 2	Operating / Not Operating
SATA Drive 0	None / Device type: Device model number
SATA Drive 1	None / Device type: Device model number
SATA Drive 2	None / Device type: Device model number
SATA Drive 3	None / Device type: Device model number
<b>Note:</b> [ ] indicates the default setting.	

Table 23. Submenus under the **System Time & Date** menu

Item	Option	Description
System Time	HH:MM:SS	Set the system time.
System Date (MM / DD / YYYY)	MM / DD / YYYY	Set the system date.

Table 24. Items under the **Devices** menu

Item	Description
Serial Port Setup	Enter the submenu to view all the options. See Table 25 “Submenus under the <b>Serial Port Setup</b> menu” on page 86.
USB Setup	Enter the submenu to view all the options. See Table 26 “Submenus under the <b>USB Setup</b> menu” on page 86.
ATA Drive Setup	Enter the submenu to view all the options. See Table 27 “Submenus under the <b>ATA Drive Setup</b> menu” on page 86.
Video Setup	Enter the submenu to view all the options. See Table 28 “Submenus under the <b>Video Setup</b> menu” on page 87.
Audio Setup	Enter the submenu to view all the options. See Table 29 “Submenus under the <b>Audio Setup</b> menu” on page 87.
Network Setup	Enter the submenu to view all the options. See Table 30 “Submenus under the <b>Network Setup</b> menu” on page 88.
<b>Note:</b> Do not change the value of any unfamiliar items under the <b>Devices</b> menu.	

Table 25. Submenus under the **Serial Port Setup** menu

Item	Option	Description
Serial Port1 Address	Disabled, [3F8/IRQ4], 2F8/IRQ3, 3E8/IRQ4, 2E8/IRQ3	Disable or select settings for Serial Port 1.
<b>Note:</b> [ ] indicates the default setting.		

Table 26. Submenus under the **USB Setup** menu

Item	Option	Description
USB Support	[Enabled] / Disabled	Enable or disable USB functions. If it is disabled, no USB device can be used.
USB Legacy Support	[Enabled] / Disabled	Enable or disable the USB legacy support. When the USB legacy support is disabled, the USB keyboard and mouse will not function unless the device driver is installed.
Front USB Ports	[Enabled] / Disabled	Enable or disable front USB ports.
Rear USB Ports	[Enabled] / Disabled	Enable or disable rear USB ports.
USB Port 1	[Enabled] / Disabled	Enable or disable USB port 1.
USB Port 2	[Enabled] / Disabled	Enable or disable USB port 2.
USB Port 3	[Enabled] / Disabled	Enable or disable USB port 3.
USB Port 4	[Enabled] / Disabled	Enable or disable USB port 4.
USB Port 5	[Enabled] / Disabled	Enable or disable USB port 5.
USB Port 6	[Enabled] / Disabled	Enable or disable USB port 6.
USB Port 7	[Enabled] / Disabled	Enable or disable USB port 7.
USB Port 8	[Enabled] / Disabled	Enable or disable USB port 8.
<b>Note:</b> [ ] indicates the default setting.		

Table 27. Submenus under the **ATA Drive Setup** menu

Item	Option	Description
External SATA Port	[Enabled] / Disabled	Enable or disable the external SATA port.
SATA Controller	[Enabled] / Disabled	Enable or disable the SATA controller.
Configure SATA as	IDE / [AHCI] / RAID	Select this option to configure your system ATA drive. <b>Note:</b> Device driver support is required for AHCI and RAID. Depending on how the hard disk image was installed, changing this setting may prevent the system from booting.
Native Mode Operation	[Enabled] / Disabled	Enable or disable native mode for ATA.

Table 27. Submenus under the **ATA Drive Setup** menu (continued)

Item	Option	Description
Hard Disk Pre-delay	[Disabled] / 3 Seconds / 6 Seconds / 9 Seconds / 12 Seconds / 15 Seconds / 21 Seconds / 30 Seconds	Force the BIOS to delay the initialization of hard disk drives for up to 30 seconds. The delay provides your hard disk drives more time to spin up before the BIOS initializes them.
<b>Note:</b> [ ] indicates the default setting.		

Table 28. Submenus under the **Video Setup** menu

Item	Option	Description
Select Active Video	IGD / PEG / PCI / [Auto]	Select the primary video device that will be used for graphic output. If you select <b>Auto</b> , the system will prioritize video devices in the following sequence: PEG (PCI-e Graphics Device), PCI (PCI Graphics Device), and IGD (Internal Graphics Device). <b>Notes:</b> When you select <b>IGD</b> , the following items will be hidden: <ul style="list-style-type: none"> <li>• Pre-Allocated Memory Size</li> <li>• Total Graphics Memory</li> <li>• Multi-Monitor Support</li> </ul>
Pre-Allocated Memory Size	32 MB / 64 MB / [128 MB]	Memory allocated to IGD.
Total Graphics Memory	128MB / 256 MB / [Maximum]	Total memory allocated to graphics devices. <b>Note:</b> This function works only when you are using the Windows XP operating system on your server.
Multi-Monitor Support	Enabled / [Disabled]	Enable or disable the multi-monitor support function.
<b>Note:</b> [ ] indicates the default setting.		

Table 29. Submenus under the **Audio Setup** menu

Item	Option	Description
Onboard Audio Controller	[Enabled] / Disabled	Enable or disable the onboard audio controller.
<b>Note:</b> [ ] indicates the default setting.		

Table 30. Submenus under the **Network Setup** menu

Item	Option	Description
Onboard Ethernet Controller	[Enabled] / Disabled	Enable or disable the onboard Ethernet controller. <b>Note:</b> If you select <b>Disabled</b> , the Intel AMT related functions will be disabled.
Boot Agent	[PXE] / SMC / Disabled	Load the onboard PXE (Preboot Execution Environment) or SMC (Secure Managed Client). This feature enables the server to boot from a server image.
<b>Note:</b> [ ] indicates the default setting.		

Table 31. Items under the **Advanced** menu

Item	Description
CPU Setup	Enter the submenu to view all the options. See Table 32 “Submenus under the <b>CPU Setup</b> menu” on page 88.
Intel® Manageability	Enter the submenu to view all the options. See Table 33 “Submenus under the <b>Intel® Manageability</b> menu” on page 90.
<b>Note:</b> The above options might vary depending on the type of the microprocessor.	

Table 32. Submenus under the **CPU Setup** menu

Item	Option	Description
Intel® SpeedStep™ Technology	[Enabled] / Disabled	Enable or disable the Intel SpeedStep technology. This technology enables the system to dynamically adjust processor voltage and core frequency, which can result in decreased average power consumption and decreased average heat production.
Core Multi-Processing	[Enabled] / Disabled	Enable or disable the multi-core processing function.
Hyper Threading Technology	[Enabled] / Disabled	Enable or disable the Hyper Threading technology. This technology enables multiple logical processors within the same processor core to share execution resources and cache hierarchy.
Execute-Disable Bit	[Enabled] / Disabled	Enable or disable the Execute-Disable Bit function. This technology can prevent certain classes of malicious buffer overflow attacks if your server operating systems support this technology.

Table 32. Submenus under the **CPU Setup** menu (continued)

Item	Option	Description
Intel® Virtualization Technology	Enabled / [Disabled]	Enable or disable the Intel Virtualization technology. This technology can provide additional capacity for hardware computing. If you set this feature to <b>Enabled</b> , you have to turn off the server and disconnect the power cord from electrical outlet, and then reconnect the power cord and turn on the server to have this feature take effect.
VT-d	Enabled / [Disabled]	Enable or disable VT-d. VT-d support on Intel platforms provides the capability to ensure improved isolation of I/O resources for greater reliability, security, and availability.
TxT	Enabled / [Disabled]	Enable or disable TxT (Trusted Execution Technology). This technology provides hardware-based mechanisms that help protect against software-based attacks and protect the confidentiality and integrity of data stored or created on client computers. This setting might impact system performance. <b>Note:</b> If TxT is set to <b>Enabled</b> , the TCG security feature will be set to <b>Active</b> automatically.
C State Support	C1 / C1C3 / [C1C3C6]	Select supported CPU power management status to minimize the idle power consumption of the processor. <ul style="list-style-type: none"><li>• C1: C1 only</li><li>• C1C3: C1 and C3</li><li>• C1C3C6: C1, C3, and C6</li></ul>
Turbo Mode	[Enabled] / Disabled	Enable or disable the Turbo mode. This function enables the processor to assess its own thermals, current, and power to come up with a dynamic upper limit on its frequency benefit.
CPU ID		
Microcode Revision (MM / DD / YYYY)	(MM / DD / YYYY)	
<p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>1. [ ] indicates the default setting.</li> <li>2. The above options might vary depending on the type of the microprocessor.</li> </ol>		

Table 33. Submenus under the **Intel® Manageability** menu

Item	Option	Description
Intel® Manageability Control	[Enabled] / Disabled	Enable or disable Intel Manageability Control. When this function is disabled: <ul style="list-style-type: none"> <li>If the system is provisioned, MEBx (Management Engine BIOS Extension) will be unprovisioned firstly.</li> </ul> <p><b>Note:</b> When you are prompted to unprovision MEBx, press <b>YES</b>.</p> <ul style="list-style-type: none"> <li>The manageability functions will be disabled. You can go into MEBx or the BIOS to re-enable this function.</li> </ul>
Intel® Manageability Reset	Enabled / [Disabled]	Enable or disable the Intel Manageability Reset function. When this function is enabled, Intel Manageability settings will be reset to defaults. The MEBx password will also be reset.
Press <Ctrl-P> to enter MEBx	[Enabled] / Disabled	Enable or disable the Press <Ctrl-P> to enter MEBx function. This function provides platform-level configuration options for you to configure the Management Engine (ME) platform.
SOL Configuration		Enter the submenu to view all the options. See Table 34 “Submenus under the <b>SOL Configuration</b> menu” on page 90.

**Notes:**

- [ ] indicates the default setting.
- The above options might vary depending on the type of the microprocessor.

Table 34. Submenus under the **SOL Configuration** menu

Item	Option	Description
SOL Configuration	Console types: <ul style="list-style-type: none"> <li>VT100</li> <li>VT100 , 8 bit</li> <li>PC-ANSI, 7bit</li> <li>PC-ANSI</li> <li>[VT100+]</li> <li>VT-UTF8</li> <li>ASCII</li> </ul>	Select a console type.

**Notes:**

- [ ] indicates the default setting.
- The above options might vary depending on the type of the microprocessor.

Table 35. Items under the **Power** menu

Item	Option	Description
After Power Loss	Power Off / Power On / [Last State]	<p>This field shows whether the system will stay on after ac power is removed and then restored.</p> <ul style="list-style-type: none"> <li>• Select <b>Power On</b> if you are using a power strip to turn the system on.</li> <li>• Select <b>Power Off</b> if you want the system to remain off after the power is restored.</li> <li>• Select <b>Last State</b> to have the system return to the previous state.</li> </ul>
Enhanced Power Saving Mode	[Disabled] / Enabled	<p>Enable or disable Enhanced Power Saving Mode. When this function is enabled, the system will enter Enhanced Power Saving Mode when it is powered off. The total power consumption will be lower when it is turned off.</p> <p><b>Note:</b> When Enhanced Power Saving Mode is enabled, only the Wake Up on Alarm function is supported. The Intel Manageability Management function cannot be used.</p>
Smart Performance Choice	[Better Acoustic Performance] / Better Thermal Performance	Enable the system to enter the lower acoustic level or better thermal level.
Automatic Power On		Enter the submenus to view all the options. See Table 36 “Submenus under the <b>Automatic Power On</b> menu” on page 91.
<b>Note:</b> [ ] indicates the default setting.		

Table 36. Submenus under the **Automatic Power On** menu

Item	Option	Description
Wake on LAN	Primary / [Automatic] / Disabled	<p>Enable or disable the Wake on LAN function and control which startup sequence to use after a Wake on LAN event.</p> <p><b>Note:</b> This item controls the wake-up event from onboard LAN and PCI LAN.</p>
Wake from PCI Modem	[Primary] / Automatic / Disabled	Enable or disable the Wake from PCI Modem function and control which startup sequence to use after a PCI modem wake-up event.

Table 36. Submenus under the **Automatic Power On** menu (continued)

Item	Option	Description
Wake from Serial Port Ring	[Primary] / Automatic / Disabled	Enable or disable the Wake from Serial Port Ring function and controls which startup sequence to use after a serial port wake-up event.
Wake from PCI Device	[Primary] / Automatic / Disabled	Enable or disable the Wake from PCI Device function and control which startup sequence to use after a PCI device wake-up event.
Wake Up on Alarm	Single Event / Daily Event / Weekly Event / [Disabled]	Enable or disable the Wake up on Alarm function. This function enables you to turn on your system on a day of the month, a day of the week, or daily. <b>Note:</b> Values in these fields might be overridden by the operating system.
Startup Sequence	[Primary] / Automatic	Select the startup sequence after a Wake Up on Alarm event.
Alarm Time (HH:MM:SS)	[00]:00:00	Specify the time when the system is to wake up.
Alarm Date (MM/DD/YYYY)	[01] / 01 / 1999	Specify the date when the system is to wake up.
Alarm Day of Week	[Sunday] / Monday / Tuesday / Wednesday / Thursday / Friday / Saturday	Select the day of the week when the system is to wake up.
<b>Note:</b> [ ] indicates the default setting.		

Table 37. Items under the **Security** menu

Item	Option	Description
Hardware Password Manager	[Enabled] / Disabled	
Current setting	Registered / Disabled / [Enabled]	
Administrator Password	Not Installed / Installed	
Power-On Password	Not Installed / Installed	
Set Administrator Password	Enter	Configure this item to set, change, or delete the Administrator Password. To set a password, use characters a-z and 0-9. Passwords are not case sensitive. <b>Note:</b> To delete the Administrator Password, clear the corresponding fields for each password.
Set Power-On Password	Enter	Configure this item to set, change, or delete the Administrator Password. To set a password, use characters a-z and 0-9. Passwords are not case sensitive. <b>Note:</b> To delete the Power-On Password, clear the corresponding fields for each password.



Table 37. Items under the **Security** menu (continued)

Item	Option	Description
Require Admin Password when Flashing	Yes / [No]	If <b>No</b> is selected, the Administrator Password will not be required when updating the system software.
Require POP on Restart	Yes / [No]	If <b>No</b> is selected, the Power-On Password will only be required when the system is started with a cold boot.
Hard Disk Password		Enter the submenus to view all the options. See Table 38 “Submenus under the <b>Hard Disk Password</b> menu” on page 93.
Fingerprint Setup		Enter the submenus to view all the options. See Table 39 “Submenus under the <b>Fingerprint Setup</b> menu” on page 94.
TCG Feature Setup		Enter the submenus to view all the options. See Table 40 “Submenus under the <b>TCG Feature Setup</b> submenu” on page 94.
System Event Log		Enter the submenus to view all the options. See Table 41 “Submenus under the <b>System Event Log</b> menu” on page 94.
Configuration Change Detection	Enabled / [Disabled]	Enable or disable Configuration Change Detection.
<b>Note:</b> [ ] indicates the default setting.		

Table 38. Submenus under the **Hard Disk Password** menu

Item	Option	Description
SATA Drive 0 Password	[Disabled] / User / User + Master	The Hard Disk Password prevents unauthorized users from accessing the data on the hard disk drive. In addition to the User Password, an optional Master Password can be used to recover the hard disk drive if the User Password is lost. <b>Note:</b> If multiple hard disk drives are present, it is recommended to set the same password for all the hard disk drives.
SATA Drive 1 Password	[Disabled] / User / User + Master	The Hard Disk Password prevents unauthorized users from accessing the data on the hard disk drive. In addition to the User Password, an optional Master Password can be used to recover the hard disk drive if the User Password is lost. <b>Note:</b> If multiple hard disk drives are present, it is recommended to set the same password for all the hard disk drives.

Table 38. Submenus under the **Hard Disk Password** menu (continued)

Item	Option	Description
Require HDP on Restart	Yes / [No]	If <b>No</b> is selected, the Hard Disk Password will only be required when the system is started with a cold boot. <b>Note:</b> It is highly recommended to set this value to <b>Yes</b> to achieve the highest level of security.
<b>Note:</b> [ ] indicates the default setting.		

Table 39. Submenus under the **Fingerprint Setup** menu

Item	Option	Description
Preboot Authentication	[Enabled] / Disabled	Enable or disable the fingerprint reader function for BIOS password input.
Erase Fingerprint Data	Yes / [No]	Select whether to clear fingerprint data stored in a fingerprint reader.
<b>Note:</b> [ ] indicates the default setting.		

Table 40. Submenus under the **TCG Feature Setup** submenu

Item	Option	Description
TCG Security Feature	Active / [Inactive] / Disabled	Change the TCG Security Feature settings. <ul style="list-style-type: none"> <li>• <b>Active:</b> The feature is fully functional.</li> <li>• <b>Inactive:</b> The feature is visible, but is not functional.</li> <li>• <b>Disabled:</b> The feature is hidden and not functional.</li> </ul> <b>Note:</b> When you set it as <b>Inactive</b> or <b>Disabled</b> , the TxT will be set to <b>Disabled</b> automatically.
Clear TCG Security Feature	Yes / [No]	Select whether to clear TCG Security Feature settings.
<b>Note:</b> [ ] indicates the default setting.		

Table 41. Submenus under the **System Event Log** menu

Item	Description
View System Event Log	View the system event log.
Clear System Event Log	Clear the system event log.

Table 42. Items under the **Startup** menu

Item	Option	Description
Primary Boot Sequence		This sequence is used when the system starts normally. Press the Up and Down arrow keys to select a device.
Automatic Boot Sequence		This sequence is used when a communication device wakes the system up. Press the Up and Down arrow keys to select a device.
Error Boot Sequence		This sequence is used when the BIOS determines that an error has occurred. Press the Up and Down arrow keys to select a device.
Boot Mode	[Auto] / UEFI / Legacy	Choose boot policy: <ul style="list-style-type: none"> <li>• <b>Auto:</b> The system will prioritize boot options in bootable devices by running UEFI boot options first and then processing Legacy boot options.</li> <li>• <b>UEFI:</b> The system will boot from UEFI bootable devices only.</li> <li>• <b>Legacy:</b> The system will boot from Legacy bootable devices only.</li> </ul>
Quick Boot	[Enabled] / Disabled	Select <b>Enabled</b> to obtain the fastest boot time. Select <b>Disabled</b> to test for a stuck key during the POST and you may hear a beep after POST completes.
Boot Up Num-Lock Status	[On] / Off	This field indicates the state of the NumLock feature of the keyboard after startup. <ul style="list-style-type: none"> <li>• If NumLock is <b>On</b>, the keys on the keyboard will act as numeric keys.</li> <li>• If NumLock is <b>Off</b>, the keys on the keyboard will act as cursor keys.</li> </ul>
Keyboardless Operation	Enabled / [Disabled]	Enable or disable the keyboardless operation. This function enables the system to function without a keyboard. It is commonly used when the system has been set up as a network server. <p><b>Note:</b> If it is enabled, systems without keyboards will not display keyboard errors during the POST.</p>
Option Keys Display	[Enabled] / Disabled	Enable or disable the Option Keys Display function. When this function is enabled, the system software option key (such as the F1 key) prompts will be displayed. <p><b>Note:</b> Disabling the prompts will not affect the function of a specific key.</p>

Table 42. Items under the **Startup** menu (continued)

Item	Option	Description
Option Keys Display Style	[Normal] / Legacy	Control the prompts displayed on the POST logo screen. <ul style="list-style-type: none"> <li>• <b>Normal:</b> During the POST, this message will be displayed: To interrupt normal startup, press Enter.</li> <li>• <b>Legacy:</b> During the POST, this message will be displayed: Press F1 to enter Setup and press F12 to display Boot Menu.</li> </ul>
Startup Device Menu Prompt	[Enabled] / Disabled	Enable or disable the Startup Device Menu Prompt. This function enables the Startup Device Menu to be displayed by pressing F12 after the server is turned on. The Startup Device Menu enables the sequence of startup devices to be temporarily changed.
<b>Note:</b> [ ] indicates the default setting.		

Table 43. Items under the **Exit** menu

Item	Description
Save Changes and Exit	Exit the Setup Utility program after saving the changes.
Discard Changes and Exit	Exit the Setup Utility program without saving any changes.
Load Optimal Defaults	Restore/Load default values for all the setup options.

## 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” on page 83. Then, follow the instructions on the screen.

You can use either the keyboard or the mouse to navigate through BIOS menu choices. 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 a password to use your computer. However, using passwords improves computing security. If you decide to set a password, 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.

### Notes:

- After you set a Hard Disk Password, your data on the hard disk drive is protected even if the hard disk drive is removed from one computer and installed in another.
- If the Hard Disk Password is forgotten, there is no way to reset the password or recover data from 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 83.
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 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 “Particulate contamination” on page 112.

## 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 all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 33.
3. Locate the Clear CMOS /Recovery jumper on the system board. See “Locating parts on the system board” on page 26.
4. Remove all parts and disconnect all cables that might prevent your access to the Clear CMOS /Recovery jumper.

**Note:** If your server has a secondary hard disk drive installed, remove the secondary hard disk drive to access the Clear CMOS /Recovery jumper. See “Installing or replacing the secondary hard disk drive” on page 46.

5. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
6. Reinstall all parts and reconnect all cables that have been removed.
7. Reinstall the server cover and reconnect the server power cord. See “Completing the parts replacement” on page 66.
8. Turn on the server and leave it on for approximately 10 seconds. Then, turn off the server by holding the power switch for approximately five seconds.
9. Repeat step 1 through step 4.
10. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
11. Reinstall all parts and reconnect all cables that have been removed.
12. Reinstall the server cover and connect the power cords. See “Completing the parts replacement” on page 66.

## Enabling or disabling a device

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

<b>USB Setup</b>	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.
<b>SATA Controller</b>	When this feature is set to <b>Disabled</b> , all devices connected to the SATA connectors (such as hard disk drives or the optical drive) are disabled and cannot be accessed.
<b>External SATA Port</b>	When this option is set to <b>Disabled</b> , 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 83.
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 Drive Setup** to enable or disable an internal or external SATA device.
4. Select the desired settings and press Enter.
5. Press F10 to save changes and exit the Setup Utility program. See “Exiting from the Setup Utility program” on page 99.

## Selecting a startup device

If your computer does not start up from a device such as the disc 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 and hard disk drives 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 opens, 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 83.
2. From the Setup Utility program main menu, select **Startup**.
3. Select the devices for the Primary Startup Sequence, the Automatic Startup Sequence, and the Error Startup Sequence. Read the information displayed on the right side of the screen.
4. Press F10 to save changes and exit the Setup Utility program. See “Exiting from the Setup Utility program” on page 99.

## 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. 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.

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## Configuring RAID

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

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

### RAID level

Your server must have the minimum number of SATA hard disk drives installed for the supported level of RAID to function:

- 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 “Installing or replacing the secondary hard disk drive” on page 46.

## 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 83.
2. Select **Devices → ATA Drive Setup**.
3. Select **Configure SATA as** and press Enter.
4. Select **RAID Mode** and press Enter.
5. Press F10 to save changes 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 system 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. If desired, return to step 2 to create additional RAID volumes.
10. When finished, select **Exit** and press Enter.

## 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 system 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 100 for RAID volume creation.
- Use the up and down arrow keys to select **Exit** and press Enter.

## Resetting disks to non-RAID

This section describes how to reset your hard disk drives to non-RAID.

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

1. Press Ctrl+I when prompted to enter the Intel Matrix Storage Manager option ROM configuration utility during system startup.
2. Use the up and down arrow keys to select **Reset Disks to Non-RAID** and press Enter.
3. Use the arrow keys and the space key to mark individual physical hard disk drives to be reset, and then press Enter to complete the selection.
4. When prompted, press Y to confirm the reset action.
5. After resetting the hard disk drives to non-RAID, you can:
  - See “Deleting RAID volumes” on page 100 for RAID volume deletion.
  - See “Creating RAID volumes” on page 100 for RAID volume creation.
  - Use the up and down arrow keys to select **Exit** and press Enter.

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## Updating the firmware

The firmware in the server is periodically updated and is available for download on the Lenovo Support Web site. Go to <http://www.lenovo.com/support> to check for the latest level of firmware, such as the BIOS ROM file and RAID FW files.

When you replace a device in the server, you might have to either update the server with the latest version of the firmware that is stored in memory on the device or restore the pre-existing firmware from a diskette or CD image.

- The BIOS ROM file is stored in flash on the system board.
- The onboard SATA software RAID firmware is integrated into the BIOS ROM on the system board.

The Ethernet firmware is downloadable at <http://www.lenovo.com/support>.

## Using the EasyUpdate Firmware Updater program

ThinkServer EasyUpdate Firmware Updater is a software application that enables you to maintain your system firmware up-to-date and helps you avoid unnecessary outages. Firmware Updater updates the server system and adapter firmware.

To update your system, do the following:

1. Go to <http://www.lenovo.com/support>.
2. Click **Download & Drivers** → **ThinkServer** and then follow the instructions on the Web page to download the ISO image for the EasyUpdate Firmware Updater program.
3. Burn the ISO image to a disc.
4. Set the optical drive as the first boot device and insert the disc into the optical drive. The server will proceed directly to the User Interface Application’s introductory screen.
5. Read the messages and instructions displayed on the introductory screen. Then, click **Next** to proceed to the list of firmware updates available on the optical media.

6. Click **Apply** to begin the updates (click **Cancel** if you want to abort the updates and exit). All updates will run to completion, with each updater's native user interface kept visible to the user. When the User Interface Application regains control, you will see the results screen.

Before distributing the firmware update to other servers, ensure that your server can restart successfully without encountering hardware problems.

**Notes:**

1. If you have changed any hardware (except the hard disk drives) in the server, you must reflash the BIOS and the RDX.
2. After updating the BIOS, all the BIOS settings become the default settings of the updated BIOS version. You need to check and reconfigure the BIOS settings for your specific needs.

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## Using the ThinkServer EasyStartup program

The *ThinkServer EasyStartup* DVD simplifies the process of configuring your RAID controllers and installing an operating system. The program works in conjunction with your Windows operating-system installation disc to automate the process of installing the operating systems and associated device drivers.

If you did not receive a *ThinkServer EasyStartup* DVD with your server, you can download an image from the Lenovo Support Web site at <http://www.lenovo.com/support>.

The EasyStartup program has the following features:

- Self-booting DVD
- Easy-to-use, language-selectable interface
- Integrated help system
- Automatic hardware detection
- RAID configuration utility
- Device drivers provided based on the server model and detected devices
- Selectable partition size and file system
- Support for multiple operating systems
- Installing the operating system and device drivers in an unattended mode to save time
- Creating a reuseable response file that can be used with similarly configured Lenovo servers to make future installations even faster

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## Updating system programs

This topic provides information about updating the POST and BIOS, and how to recover from a POST and 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, and the Setup Utility program. The POST is a set of tests and procedures that are performed each time you turn on your computer. The 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 or change the configuration settings of your computer. See "Using the Setup Utility program" on page 83 for detailed information.

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 the POST, the BIOS, and the Setup

Utility program by starting your computer with a system-program-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 and 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 disc or an update program that can be run from the operating system.

## Updating (flashing) the BIOS from a disc

This section provides instructions on how to update (flash) the BIOS from a disc.

**Note:** You can download a self-starting bootable disc image (known as an ISO image) with the system program updates to create a system-program-update disc. Go to: <http://www.lenovo.com/support>

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

1. Turn off your computer.
2. Repeatedly press and release the F12 key when turning on the computer. When the **Startup Device Menu** opens, release the F12 key.
3. On the **Startup Device Menu**, select the desired optical drive as the startup device. Then, insert the disc into this optical drive and press Enter. The update begins.
4. When prompted to change the serial number, it is suggested that you do not make this change by pressing N. However, if you do want to change the serial number, press Y, then type in the serial number and press Enter.
5. When prompted to change the machine type and model, it is suggested that you do not make this change by pressing N. However, if you do want to change the machine type and model, press Y, then type in the machine type and model and press Enter.
6. Follow the instructions on the screen to complete the update. After the update is completed, remove the disc from the optical drive.

## Updating (flashing) the BIOS from your operating system

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

To update (flash) the 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** from the **Refine results** drop-down list box to easily locate all the BIOS related links.
  - d. Click the BIOS update link.
3. Click the TXT file that contains the instructions for updating (flashing) the BIOS from your operating system.
4. Print these instructions. This is very important because these instructions will not be displayed on the screen after the download begins.
5. Follow the printed instructions to download, extract, and install the update.

## Recovering from a POST and BIOS update failure

If the power to your computer is interrupted while the POST and BIOS are being updated, your computer might not restart correctly. If this happens, perform the following procedure to recover from the POST and BIOS update failure. This procedure is commonly called Boot-block Recovery.

1. Remove all media from the drives and turn off all attached devices and the computer. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the computer.
2. Remove the computer cover. See “Removing the server cover” on page 33.
3. Locate the Clear CMOS /Recovery jumper on the system board. See “Locating parts on the system board” on page 26.
4. Remove any cables that impede access to the Clear CMOS /Recovery jumper.
5. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
6. Reconnect any cables that were disconnected and reinstall the PCI card if removed.
7. Reinstall the computer cover and reconnect the power cords for the computer and monitor to electrical outlets. See “Completing the parts replacement” on page 66.
8. Turn on the computer and then insert the POST and BIOS update (flash update) disc into the optical drive. The recovery session begins. The recovery session will take two to three minutes. During this time, you will hear a series of beeps.
9. 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.
10. Repeat step 1 through step 4.
11. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
12. Reconnect any cables that were disconnected and reinstall the PCI card if removed.
13. Reinstall the computer cover and reconnect any cables that were disconnected.
14. Turn on the computer to restart the operating system.

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## Appendix A. Information resources

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

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### Safety and Warranty

The *Safety Information* and the *Warranty and Support Information* at <http://www.lenovo.com/support> contain information on safety, setup, warranty, and notices. Read and understand all safety information before using this product.

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### 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.

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### Lenovo Support Web site

Technical support information is available at:  
<http://www.lenovo.com/support>

This portal is updated with the latest information about the following subjects:

<b>Downloads and Drivers</b>	Download drivers, flash BIOS, and update your software.
<b>Warranty</b>	Check your warranty status and upgrade your warranty.
<b>Technical Support</b>	Click <b>Need Help?</b> for self-help tips to help diagnose a problem.
<b>ThinkVantage</b>	Learn more about ThinkVantage software to improve productivity and reduce cost.
<b>Lenovo Forums</b>	Search the community knowledge base for your computer to share and discover information with other users.
<b>User Guides &amp; Manuals</b>	Read or print any publications related to your product.



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## Appendix B. Help and service

This appendix contains information about obtaining help and service.

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### Using the documentation

If you experience a problem with your computer, see Chapter 3 “Diagnostics and troubleshooting” on page 13. For information on additional resources to help you troubleshoot your computer problem, see Appendix A “Information resources” on page 105.

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

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

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### 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 *Warranty and Support Information* that comes with your computer for information about your warranty type and duration. 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 *Warranty and Support Information* 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 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.

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## 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>



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## Appendix C. Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service.

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1009 Think Place - Building One  
Morrisville, NC 27560  
U.S.A.  
Attention: Lenovo Director of Licensing*

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

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

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## Trademarks

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

- Lenovo
- The Lenovo logo
- ThinkServer

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

Intel and Intel SpeedStep are trademarks of Intel Corporation in the United States, other countries, or both.

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

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## Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

Lenovo makes no representations or warranties with respect to non-Lenovo products. Support (if any) for the non-Lenovo products is provided by the third party, not Lenovo.

Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

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## Polyvinyl Chloride (PVC) cable and cord notice

**WARNING:** Handling the cord on this product or cords associated with accessories sold with this product will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. ***Wash hands after handling.***

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## Recycling information

Lenovo encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. Lenovo offers a variety of programs and services to assist equipment owners in recycling their IT products. For information on recycling Lenovo products, go to:

<http://www.lenovo.com/lenovo/environment/recycling>

環境配慮に関して

本機器またはモニターの回収リサイクルについて

企業のお客様が、本機器が使用済みとなり廃棄される場合は、資源有効利用促進法の規定により、産業廃棄物として、地域を管轄する県知事あるいは、政令市長の許可を持った産業廃棄物処理業者に適正処理を委託する必要があります。また、弊社では資源有効利用促進法に基づき使用済みパソコンの回収および再利用・再資源化を行う「PC回収リサイクル・サービス」を提供しています。詳細は、

[http://www.lenovo.com/social\\_responsibility/us/en/sustainability/ptb\\_japan.html](http://www.lenovo.com/social_responsibility/us/en/sustainability/ptb_japan.html)をご参照ください。

また、同法により、家庭で使用済みとなったパソコンのメーカー等による回収再資源化が2003年10月1日よりスタートしました。詳細は、[http://www.lenovo.com/social\\_responsibility/us/en/sustainability/ptb\\_japan.html](http://www.lenovo.com/social_responsibility/us/en/sustainability/ptb_japan.html)をご参照ください。

重金属を含む内部部品の廃棄処理について

本機器のプリント基板等には微量の重金属（鉛など）が使用されています。使用後は適切な処理を行うため、上記「本機器またはモニターの回収リサイクルについて」に従って廃棄してください。

### Collecting and recycling a disused Lenovo computer or monitor

If you are a company employee and need to dispose of a Lenovo computer or monitor that is the property of the company, you must do so in accordance with the Law for Promotion of Effective Utilization of Resources. Computers and monitors are categorized as industrial waste and should be properly disposed of by an industrial waste disposal contractor certified by a local government. In accordance with the Law for Promotion of Effective Utilization of Resources, Lenovo Japan provides, through its PC Collecting and Recycling Services, for the collecting, reuse, and recycling of disused computers and monitors. For details, visit the Lenovo Web site at [http://www.lenovo.com/social\\_responsibility/us/en/sustainability/ptb\\_japan.html](http://www.lenovo.com/social_responsibility/us/en/sustainability/ptb_japan.html). Pursuant to the Law for Promotion of Effective Utilization of Resources, the collecting and recycling of home-used computers and monitors by the manufacturer was begun on October 1, 2003. This service is provided free of charge for home-used computers sold after October 1, 2003. For details, visit the Lenovo Web site at [http://www.lenovo.com/social\\_responsibility/us/en/sustainability/ptb\\_japan.html](http://www.lenovo.com/social_responsibility/us/en/sustainability/ptb_japan.html).

### Disposing of Lenovo computer components

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

## **Battery return program**

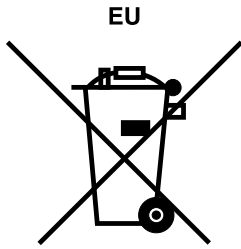
This product may contain a lithium or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal or batteries outside the United States, go to <http://www.lenovo.com/lenovo/environment/recycling> or contact your local waste disposal facility.

**For Taiwan:** Please recycle batteries.



廢電池請回收

## For the European Union:



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

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

Les batteries ou emballages pour batteries sont étiquetés conformément aux directives européennes 2006/66/EC, norme relative aux batteries et accumulateurs en usage et aux batteries et accumulateurs usés. Les directives déterminent la marche à suivre en vigueur dans l'Union Européenne pour le retour et le recyclage des batteries et accumulateurs usés. Cette étiquette est appliquée sur diverses batteries pour indiquer que la batterie ne doit pas être mise au rebut mais plutôt récupérée en fin de cycle de vie selon cette norme.

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

## Requirement for batteries containing perchlorate

The following statement applies to users in the state of California, U.S.A.

California Perchlorate Information:

Products containing CR (manganese dioxide) lithium coin cell batteries may contain perchlorate.

Perchlorate Material - special handling may apply, See <http://www.dtsc.ca.gov/hazardouswaste/perchlorate>

The foregoing notice is provided in accordance with California Code of Regulations Title 22, Division 4.5 Chapter 33. Best Management Practices for Perchlorate Materials. This product/part may include a lithium manganese dioxide battery which contains a perchlorate substance.

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## Particulate contamination

**Attention:** Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server that is described in this document. Risks that are posed by the presence of excessive particulate

levels or concentrations of harmful gases include damage that might cause the server to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If Lenovo determines that the levels of particulates or gases in your environment have caused damage to the server, Lenovo may condition provision of repair or replacement of servers or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 44. Limits for particulates and gases

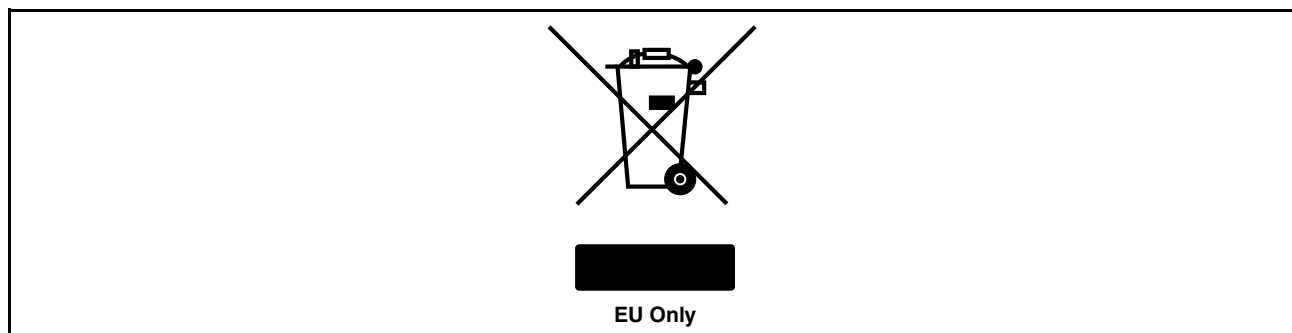
Contaminant	Limits
Particulate	<ul style="list-style-type: none"> <li>The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2<sup>1</sup>.</li> <li>Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282.</li> <li>The deliquescent relative humidity of the particulate contamination must be more than 60%<sup>2</sup>.</li> <li>The room must be free of conductive contamination such as zinc whiskers.</li> </ul>
Gaseous	<ul style="list-style-type: none"> <li>Copper: Class G1 as per ANSI/ISA 71.04-1985<sup>3</sup></li> <li>Silver: Corrosion rate of less than 300 Å in 30 days</li> </ul>

<sup>1</sup> ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

<sup>2</sup> The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

<sup>3</sup> ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

## Important information for the European Directive 2002/96/EC



The Waste Electrical and Electronic Equipment (WEEE) mark applies only to countries within the European Union (EU) and Norway. Appliances are labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive. Users of electrical and electronic equipment (EEE) with the WEEE marking per Annex IV of the WEEE Directive must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, recovery of WEEE and minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. For additional WEEE information go to: <http://www.lenovo.com/lenovo/environment>

Le marquage des déchets d'équipements électriques et électroniques (DEEE) s'applique uniquement aux pays de l'Union européenne (EU) et à la Norvège. Les appareils sont marqués conformément à la Directive 2002/96/CE du Conseil Européen relative aux déchets d'équipements électriques et électroniques (DEEE). Cette directive, applicable à l'ensemble des pays de l'Union européenne, concerne la collecte et le recyclage des appareils usagés. Ce marquage est apposé sur différents produits pour indiquer que ces derniers ne doivent pas être jetés, mais récupérés en fin de vie, conformément à cette directive. Les utilisateurs d'équipements électriques et électroniques portant le marquage DEEE, conformément à l'Annexe IV de la Directive DEEE, ne doivent pas mettre au rebut ces équipements comme des déchets municipaux non triés, mais ils doivent utiliser la structure de collecte mise à disposition des clients pour le retour, le recyclage et la récupération des déchets d'équipements électriques et électroniques, afin de réduire tout effet potentiel des équipements électriques et électroniques sur l'environnement et la santé en raison de la présence possible de substances dangereuses dans ces équipements. Pour plus d'informations sur les équipements électriques et électroniques, consultez le site <http://www.lenovo.com/lenovo/environment>.

Die WEEE-Kennzeichnung gilt nur in Ländern der Europäischen Union und in Norwegen. Geräte werden gemäß der Richtlinie 2002/96/EC der Europäischen Union über Elektro- und Elektronikaltgeräte (WEEE) gekennzeichnet. Die Richtlinie regelt die Rückgabe und Wiederverwertung von Altgeräten innerhalb der Europäischen Union. Mit dieser Kennzeichnung versehene Altgeräte dürfen gemäß dieser Richtlinie nicht weggeworfen werden, sondern müssen zurückgegeben werden. Anwender von Elektro- und Elektronikgeräten mit der WEEE-Kennzeichnung dürfen diese gemäß Annex IV der WEEE-Richtlinie nach ihrem Gebrauch nicht als allgemeinen Hausmüll entsorgen. Stattdessen müssen diese Geräte im verfügbaren Sammelsystem zurückgegeben werden und damit einem Recycling- oder Wiederherstellungsprozess zugeführt werden, bei dem mögliche Auswirkungen der Geräte auf die Umwelt und den menschlichen Organismus aufgrund gefährlicher Substanzen minimiert werden. Weitere Informationen zur Entsorgung von Elektro- und Elektronikaltgeräten finden Sie unter der Adresse: <http://www.lenovo.com/lenovo/environment>.

La marca de Residuos de equipos eléctricos y electrónicos (WEEE) se aplica sólo a los países pertenecientes a la Unión Europea (UE) y a Noruega. Los aparatos se etiquetan conforme a la Directiva Europea 2002/96/EC relativa a los residuos de equipos eléctricos y electrónicos (WEEE). La directiva determina el marco para devolver y reciclar los aparatos usados según sea aplicable en toda la Unión Europea. Esta etiqueta se aplica a varios productos para indicar que el producto no se va a desechar, sino que va ser reclamado por esta Directiva, una vez termine su ciclo de vida. Los usuarios de los equipos eléctricos y electrónicos (EEE) con la marca WEEE por el Anexo IV de la Directiva WEEE no deben tratar los EEE como desperdicios municipales no clasificados, una vez terminado su ciclo de vida, sino que deben utilizar el marco de recogida disponible para devolver, reciclar y recuperar los WEEE y minimizar los posibles efectos de los EEE en el medio ambiente y en la salud debidos a la presencia de sustancias peligrosas. Para obtener información adicional acerca de WEEE consulte el sitio: <http://www.lenovo.com/lenovo/environment>.

Il marchio WEEE (Waste Electrical and Electronic Equipment) viene applicato soltanto ai paesi all'interno dell'unione europea (EU) e norvegia. Le apparecchiature vengono etichettate in accordo con la direttiva europea 2002/96/EC riguardante lo smaltimento di apparecchiatura elettrica ed elettronica (WEEE). Le direttive determinano la procedura di restituzione e di riciclaggio delle apparecchiature usate in conformità con le normative dell'unione europea. Questa classificazione viene applicata a vari prodotti per indicare che il prodotto stesso non deve essere gettato ma riscattato al termine dell'utilizzo per questa direttiva. Gli utenti di apparecchiature elettriche o elettroniche (EEE) marchiate WEEE secondo Annex IV della direttiva WEEE non devono disporre di fine utilizzo EEE come rifiuto, municipale non classificato, ma deve essere utilizzata la procedura di classificazione disponibile per il riscatto, riciclo, recupero del WEEE e minimizzare qualsiasi potenziale effetto della EEE sull'ambiente e sulla salute umana dovuto alla presenza di sostanze pericolose. Per ulteriori informazioni sulla WEEE visitare il sito: <http://www.lenovo.com/lenovo/environment>.

A marca REEE (Resíduos de Equipamentos Eléctricos e Electrónicos) aplica-se apenas aos Estados Membros da União Europeia e à Noruega. Os aparelhos eléctricos deverão ser identificados em conformidade com a Directiva Europeia 2002/96/CE relativa a REEE (Resíduos de Equipamentos Eléctricos e Electrónicos). A Directiva determina o enquadramento normativo relativamente à devolução e reciclagem de aparelhos eléctricos utilizados, conforme aplicável no espaço da União Europeia. Esta etiqueta

deverá ser aposta em diversos produtos para indicar que os mesmos não poderão ser deitados fora, mas sim recuperados no final da respectiva vida útil, de acordo com a referida Directiva. Os utilizadores de equipamentos eléctricos e electrónicos (EEE) com a marca REEE em conformidade com o Anexo IV da Directiva REEE não poderão deitar fora os EEE no final da respectiva vida útil como lixo municipal não separado, devendo sim utilizar a estrutura de recolha que lhes tenha sido disponibilizada para efeitos de devolução, reciclagem e recuperação de REEE, por forma a minimizar potenciais efeitos dos EEE sobre o ambiente e saúde pública resultantes da presença de substâncias perigosas. Para obter informações adicionais acerca da REEE consulte o sítio da web: <http://www.lenovo.com/lenovo/environment>.

Het WEEE-merkteken (Waste Electrical and Electronic Equipment) geldt alleen voor landen binnen de Europese Unie (EU) en Noorwegen. Apparaten worden van een merkteken voorzien overeenkomstig Europese Richtlijn 2002/96/EC inzake afgedankte elektrische en elektronische apparatuur (waste electrical and electronic equipment, WEEE). Deze richtlijn bepaalt het raamwerk voor het retourneren en recyclen van gebruikte apparatuur, zoals van toepassing binnen de Europese Unie. Dit merkteken wordt aangebracht op diverse producten om aan te geven dat het product in kwestie niet dient te worden weggegooid, maar dat het aan het eind van de levenscyclus krachtens deze Richtlijn dient te worden geretourneerd. Gebruikers van elektrische en elektronische apparaten (EEE) welke zijn voorzien van het WEEE-merkteken zijn gehouden aan Annex IV van de WEEE Richtlijn en mogen gebruikte EEE niet weggooien als ongesorteerd afval, maar dienen gebruik te maken van het inzamelproces voor het teruggeven, recyclen en terugwinnen van WEEE dat voor hen beschikbaar is, en dienen de mogelijke effecten die EEE ten gevolge van de aanwezigheid van schadelijke stoffen kunnen hebben op het milieu en de volksgezondheid, tot een minimum te beperken. Voor meer informatie over WEEE gaat u naar: <http://www.lenovo.com/lenovo/environment>.

WEEE-mærkningerne (Waste Electrical and Electronic Equipment) gælder kun for lande i EU samt Norge. Udstyr mærkes i henhold til EU's direktiv 2002/96/EF om affald af elektrisk og elektronisk udstyr (WEEE). Direktivet fastlægger de rammer, der gælder for returnering og genbrug af brugt udstyr i EU. Mærkatene påsættes forskellige produkter for at angive, at produktet ikke må smides væk, når det er udtjent, men skal genvindes i henhold til dette direktiv. Brugere af elektrisk og elektronisk udstyr (EEE), der er mærket med WEEE-mærket som angivet i Bilag IV til WEEE-direktivet, må ikke bortskaffe brugt EEE som usorteret husholdningsaffald, men skal bruge den indsamlingsordning, der er etableret, så WEEE kan returneres, genbruges eller genvindes. Formålet er at minimere den eventuelle påvirkning af miljøet og menneskers sundhed som følge af tilstedeværelsen af skadelige stoffer. Der er flere oplysninger om affald af elektrisk og elektronisk udstyr på adressen <http://www.lenovo.com/lenovo/environment>.

Sähkö- ja elektroniikkalaiteromu (Waste electrical and electronic equipment, WEEE) -merkintä koskee vain Euroopan unionin (EU) jäsenmaita ja Norjaa. Sähkö- ja elektroniikkalaitteet merkitään Euroopan parlamentin ja neuvoston direktiivin 2002/96/EY mukaisesti. Kyseinen direktiivi määrittää Euroopan Unionin alueella käytössä olevat palautus- ja kierrätyskäytännöt. WEEE-merkintä laitteessa osoittaa, että direktiivin ohjeiden mukaan tuotetta ei tulisi hävittää sen elinkaaren päässä, vaan se tulee toimittaa uusiokäyttöön. Käyttäjien, joiden sähkö- ja elektroniikkalaitteissa on tämä sähkö- ja elektroniikkalaiteromun direktiivin liitteen IV mukainen merkintä, tulee kierrättää kyseiset laitteet käytettävissä olevien resurssien mukaan ja varmistaa, että niistä tai niissä käytetyistä materiaaleista ei aiheudu haittaa ympäristölle tai ihmisten terveydelle. Sähkö- ja elektroniikkalaitteita ei saa hävittää sekajätteen mukana. Lisätietoja sähkö- ja elektroniikkalaiteromun uusiokäytöstä on WWW-sivustossa <http://www.lenovo.com/lenovo/environment>.

WEEE-merket (Waste Electrical and Electronic Equipment) gjelder bare for land i Den europeiske union (EU) og Norge. Utstyr merkes i henhold til EU-direktiv 2002/96/EF om avfall fra elektrisk og elektronisk utstyr (WEEE). Direktivet fastsetter rammene for retur og resirkulering av brukt utstyr innenfor EU. Dette merket benyttes på forskjellige produkter for å angi at produktet ikke må kastes, men må behandles i henhold til dette direktivet ved slutten av produktets levetid. Brukere av elektrisk og elektronisk utstyr (EEE) som er merket med WEEE-merket ifølge vedlegg IV i WEEE-direktivet, må ikke kaste utstyret som usortert husholdningsavfall, men må bruke de tilgjengelige innsamlingsystemene for retur, resirkulering og gjenvinning av kassert elektrisk og elektronisk utstyr for å redusere en eventuell skadelig virkning av elektrisk og elektronisk utstyr på miljø og helse, som skyldes skadelige stoffer. Du finner mer informasjon om WEEE på denne adressen: <http://www.lenovo.com/lenovo/environment>.

Značka odpadní elektrická a elektronická zařízení (OEEZ; Waste Electrical and Electronic Equipment - WEEE) se týká pouze zemí Evropské Unie (EU) a Norska. Zařízení jsou označena v souladu s evropskou směrnicí 2002/96/EC, která se týká likvidace starých elektrických a elektronických zařízení (OEEZ). Směrnice určuje pravidla pro vracení a recyklaci použitých zařízení, která jsou platná v Evropské Unii. Tímto štítkem se označují různá zařízení. Označuje, že produkt nesmí být vyhozen do běžného odpadu, ale po skončení životnosti vrácen podle této směrnice. Uživatelé takovýchto zařízení označených značkou OEEZ podle dodatku IV směrnice OEEZ nesmí na konci životnosti vyhodit zařízení jako netříděný odpad, ale musí použít dostupnou sběrnou síť, aby bylo zařízení recyklováno a aby byly minimalizovány možné dopady zařízení na prostředí a zdraví lidí (zařízení může obsahovat nebezpečné látky). Další informace o značce OEEZ (WEEE) naleznete na webové stránce: <http://www.lenovo.com/lenovo/environment>.

廃電気電子機器指令 (WEEE) マークは EU 諸国とノルウェーにのみ適用されます。この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC (WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。WEEE 指令の付則 (Annex) IV 規則によりマークされた電気/電子機器 (EEE) の使用者は、使用済みの電気・電子機器を地方自治体の無分別ゴミとして廃棄することは許されず、機器に含まれる有害物質が環境や人体へ与える悪影響を最小に抑えるためにお客様が利用可能な廃電気・電子機器の返却、リサイクル、あるいは再生のための回収方法を利用しなければなりません。WEEE の詳細については、次のWebサイトを参照してください。  
[Http://www.lenovo.com/lenovo/environment](http://www.lenovo.com/lenovo/environment)

To sýma WEEE (Waste Electrical and Electronic Equipment) chřisimopioieítai móno se chýres ths Eurwpaikís Énwshs kai sth Norbhgía. Stis suskeués topothetóuntai etikétes pou afhoróun thn apórrifh hlektrikón kai hlektronikón exarhtimátwn súmfwna me thn Eurwpaiké Odhgía 2002/96/EC. H Odhgía auté kathorízei to pláisio gia thn epistrophé kai thn anakúklwsh chřisimopoihtémwn suskeuón pou ischúei se ólh thn Eurwpaiké Énwsh. H etikéta topotheteítai se diáfóra proiónta gia na upodeízei óti metá to mónimó tērmatismó ths chříshs tou to proión, súmfwna me thn Odhgía, préptei na anakuklwthéi kai óchi na aporrifhthéi. Oi chřístes hlektrikón kai hlektrikón exarhtimátwn (electrical and electronic equipment - EEE) pou féroun to sýma WEEE súmfwna me to Parárhthma IV ths en lóghw Odhgías, ðen préptei na aporríptoun ta exarhtímata allá na chřisimopoióun to diathésimó pláisio sulloghís gia thn epistrophé, anakúklwsh kai anakhtish twv exarhtimátwn me skoptó thn elaxistopoiósh ðunhtikón epirrówn sto peribállon kai thn anhrópinh ygeía exaiptías ths parousías epikínðwnwn ousiów sta exarhtímata autá. Gia perissóteres plhrofories schetiká me tis katállhles enérgeies sulloghís kai katērgasías hlektronikón suskeuón kai exarhtimátwn, episkefhtéite thn istoselíða: <http://www.lenovo.com/lenovo/environment>.

A WEEE (leselejtezett elektromos és elektronikus berendezések) jelzés csak az EU tagállamaira és Norvégiára vonatkozik. A berendezések a leselejtezett elektromos és elektronikus berendezésekre (WEEE) vonatkozó 2002/96/EC számú EU direktívának való megfelelést tanúsító címkével vannak ellátva. A direktíva a használt berendezések visszavételének és újrahasznosításának keretrendszerét határozza meg az Európai Unión belül. A különböző termékeken látható címke azt jelenti, hogy a terméket az élettartamának végén nem szabad kidobni, hanem a direktívának megfelelően kell visszanyerni. A WEEE jelzésű elektromos és elektronikai felszerelések (EEE) felhasználóinak, a WEEE direktíva IV. függelékének megfelelően nem szabad vegyes házi szemétként kidobniuk az eszközöket (EEE), hanem a vásárlók számára rendelkezésre álló, meglévő begyűjtési keretrendszer felhasználva kell gondoskodniuk az elektromos hulladék (WEEE) visszajuttatásáról és újrahasznosításáról, valamint minimalizálniuk kell az eszközök (EEE) lehetséges hatásait a környezetre és az emberi egészségre, a veszélyek megelőzése érdekében.  
További WEEE információk: <http://www.lenovo.com/lenovo/environment>.

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## Restriction of Hazardous Substances Directive (RoHS)

This topic provides statements about the Restriction of Hazardous Substances Directive (RoHS).



## China RoHS

### 有毒有害物质或元素名称及含量标识

Toxic / Hazardous Substances and Elements Table

部件名称 (Parts)	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
机架 chassis	○	○	○	○	○	○
外部盖板 external covers	○	○	○	○	○	○
机械组合件 mechanical assemblies	○	○	○	○	○	○
空气传动设备 air moving devices	X	○	○	○	○	○
冷却组合件 cooling assembly	X	○	○	○	○	○
内存模块 memory modules	X	○	○	○	○	○
处理器模块 processor modules	X	○	○	○	○	○
键盘 keyboard	X	○	○	○	○	○
调制解调器 modem	X	○	○	○	○	○
监视器 monitor	X	X	○	○	○	○
鼠标 mouse	X	○	○	○	○	○
电缆组合件 cable assemblies	X	○	○	○	○	○
电源 power supply	X	○	○	○	○	○
存储设备 storage device	X	○	○	○	○	○
电池匣组合件 battery pack assembly	X	○	○	○	○	○
电池 batteries	X	○	○	○	○	○
有 mech 的电路卡 circuit cards with mechs	X	○	○	○	○	○
无 mech 的电路卡 circuit cards w/o mechs	X	○	○	○	○	○
激光器 laser	X	○	○	○	○	○

○: 指示部件的所有均质材料中有毒和危险物质的含量均低于 SJ/T 11363-2006 中所描述的浓度限制要求。

○: indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in SJ/T 11363-2006.

X: 指示至少有一种部件均质材料中的有毒和危险物质的含量超过 SJ/T 11363-2006 中所描述的浓度限制要求。

X: indicates that the content of the toxic and hazardous substance in at least one homogeneous material of the part exceeds the concentration limit requirement as described in SJ/T 11363-2006.

**环保使用期限 (EPUP) 的免责条款:** EPUP 规定的具体期限仅为符合中华人民共和国的相应的法律规定, 并非代表 Lenovo 向客户提供保证或负有任何义务。EPUP 中假定客户按照操作手册在正常情况下使用本产品。对于本产品中配备的某些组合件 (例如, 装有电池的组件) 的 EPUP, 其效力可能低于本产品的 EPUP。

Environmental Protection Use Period (EPUP) Disclaimer: The number provided as the EPUP is provided solely to comply with applicable laws of the People's Republic of China. It does not create any warranties or liabilities on behalf of Lenovo to customer. The EPUP assumes that the product will be used under normal conditions in accordance with the Lenovo operating manual. Certain assemblies inside this product (for example, assemblies that contain a battery) may have an EPUP which is lower than the EPUP on this product.

## Turkish statement of compliance

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

## **Türkiye EEE Yönetmeliğine Uygunluk Beyanı**

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

EEE Yönetmeliğine Uygundur.

## **Ukraine RoHS**

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

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## **German Ordinance for Work gloss statement**

The product is not suitable for use with visual display work place devices according to clause 2 of the German Ordinance for Work with Visual Display Units.

Das Produkt ist nicht für den Einsatz an Bildschirmarbeitsplätzen im Sinne § 2 der Bildschirmarbeitsverordnung geeignet.

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## **Electronic emission notices**

This topic includes electronic emission notices.

## **Federal Communications Commission (FCC) Statement**

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

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

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

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

## **Industry Canada Class B emission compliance statement**

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

## **European Union - Compliance to the Electromagnetic Compatibility Directive**

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the installation of option cards from other manufacturers.

This product has been tested and found to comply with the limits for Class B Information Technology Equipment according to European Standard EN 55022. The limits for Class B equipment were derived for typical residential environments to provide reasonable protection against interference with licensed communication devices.



### German Class B compliance statement

#### Deutschsprachiger EU Hinweis:

##### **Hinweis für Geräte der Klasse B EU-Richtlinie zur Elektromagnetischen Verträglichkeit**

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse B ein.

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

#### Deutschland:

##### **Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmitteln**

Dieses Produkt entspricht dem „Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln“ EMVG (früher „Gesetz über die elektromagnetische Verträglichkeit von Geräten“). Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) in der Bundesrepublik Deutschland.

##### **Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EG Richtlinie 2004/108/EC (früher 89/336/EWG), für Geräte der Klasse B.**

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraf 5 des EMVG ist die Lenovo (Deutschland) GmbH, Gropiusplatz 10, D-70563 Stuttgart.

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:

**Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse B.**

### Korea Class B compliance statement

<b>B급 기기(가정용 방송통신기자재)</b>
이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다

## Japan VCCI Class B compliance statement

この装置は、クラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。

取扱説明書に従って正しい取り扱いをして下さい。

VCCI-B

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

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

## Lenovo product service information for Taiwan

台灣 Lenovo 產品服務資訊如下：  
荷蘭商聯想股份有限公司台灣分公司  
台北市信義區信義路五段七號十九樓之一  
服務電話：0800-000-702

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