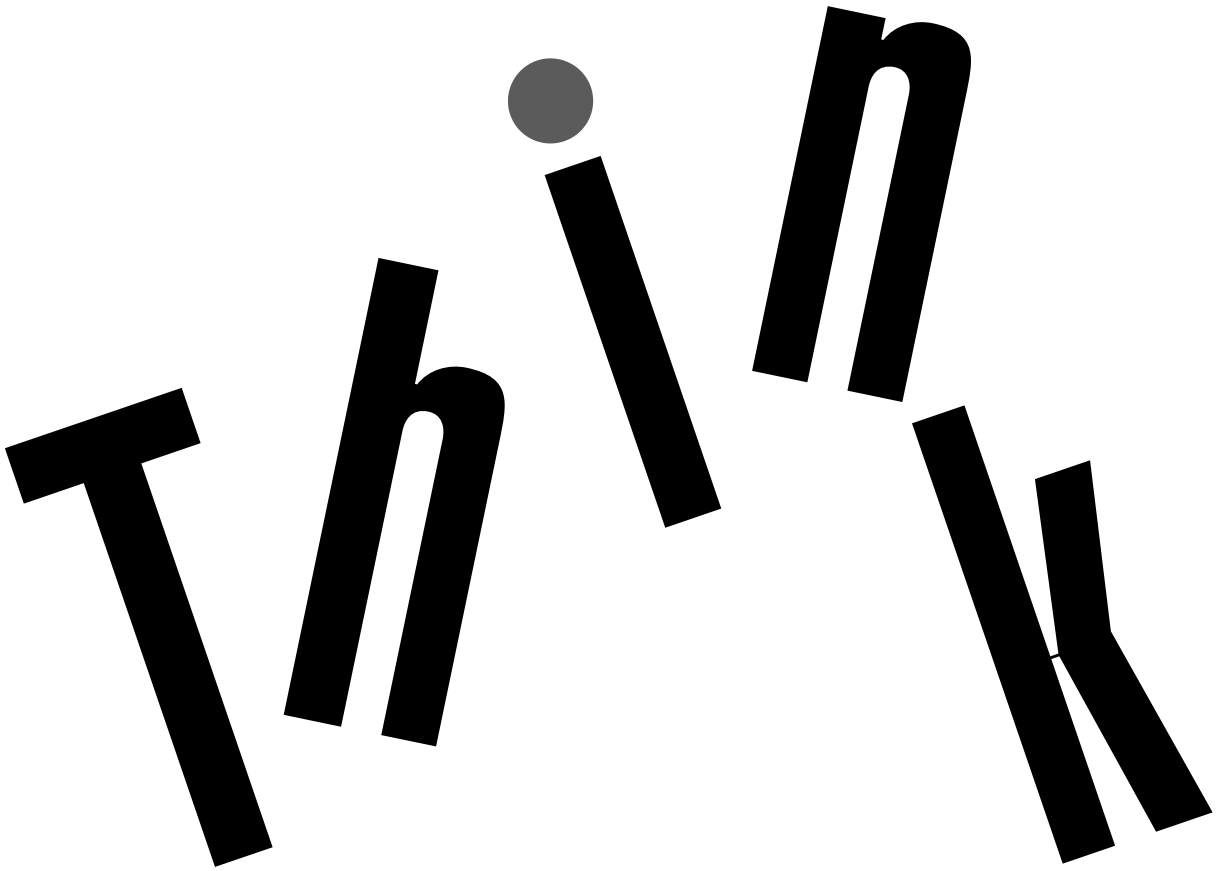
Lenovo

ThinkServer®

ThinkServer RS140 User Guide and Hardware Maintenance Manual



Machine Types: 70F2, 70F3, 70F8, and 70F9

Note: Before using the information and the product it supports, be sure to read and understand the following:

- The *Read Me First* that comes with your product
- “Safety information” on page iii
- Appendix A “Notices” on page 125

電子情報技術産業協会(JEITA) 表示

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

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

Fourth Edition (August 2015)

Contents

Safety information

Note: Before using the product, be sure to read and understand the multilingual safety instructions on the documentation DVD that comes with the product.

قبل استخدام المنتج، تأكد من قراءة إرشادات الأمان متعددة اللغات وفهمها، وتوجد هذه الإرشادات في قرص DVD الوثائقي الذي يأتي مع المنتج.

Antes de usar o produto, leia e entenda as instruções de segurança multilíngues no DVD de documentação que o acompanha.

Преди да използвате този продукт, задължително прочетете и вникнете в многоезичните инструкции за безопасност в DVD диска с документация, който се предоставя с продукта.

Prije upotrebe ovog proizvoda obavezno pročitajte višejezične sigurnosne upute koje se nalaze na DVD-u s dokumentacijom koji dobivate uz proizvod.

Před použitím produktu je třeba si přečíst a porozumět bezpečnostním pokynům uvedeným na disku DVD s dokumentací, který je dodáván s produktem.

Før du bruger produktet, skal du sørge for at læse og forstå de sikkerhedsforskrifter, der findes på flere sprog, på den dokumentations-dvd, der følger med produktet.

Lue tuotteen mukana toimitetulla DVD-tietolevyllä olevat monikieliset turvaohjeet ennen tämän tuotteen käyttöä.

Avant d'utiliser le produit, veillez à bien lire et comprendre les instructions de sécurité multilingues figurant sur le DVD de documentation fourni avec le produit.

Πριν χρησιμοποιήσετε το προϊόν, βεβαιωθείτε ότι έχετε διαβάσει και κατανοήσει τις οδηγίες ασφάλειας, οι οποίες είναι διαθέσιμες σε διάφορες γλώσσες στο DVD τεκμηρίωσης που συνοδεύει το προϊόν.

Vor Verwendung des Produkts sollten Sie unbedingt die mehrsprachigen Sicherheitsanweisungen auf der Dokumentations-DVD lesen, die im Lieferumfang des Produkts enthalten ist.

לפני השימוש במוצר, הקפידו לקרוא ולהבין את הוראות הבטיחות, המופיעות בשפות שונות ב-DVD התיעוד המצורף למוצר.

A termék használata előtt mindenképpen olvassa el és értelmezze a termékhez kapott dokumentációs DVD lemezen található, több nyelven elolvasható biztonsági előírásokat.

Prima di utilizzare il prodotto, accertarsi di leggere e comprendere le informazioni sulla sicurezza multilingue disponibili sul DVD di documentazione fornito con il prodotto.

製品をご使用になる前に、製品に付属の Documentation DVD に収録されているマルチリンガルの「安全に正しくご使用いただくために」を読んで理解してください。

제품을 사용하기 전에 제품과 함께 제공되는 문서 DVD의 다국어 안전 지침을 주의 깊게 읽어보십시오.

Voordat u het product gebruikt, moet u ervoor zorgen dat u de meertalige veiligheidsinstructies op de documentatie-dvd van het product hebt gelezen en begrijpt.

Przed skorzystaniem z produktu należy zapoznać się z wielojęzycznymi instrukcjami bezpieczeństwa znajdującymi się na płycie DVD z dokumentacją dostarczoną wraz z produktem.

Antes de utilizar o produto, leia atentamente as instruções de segurança multilingues que constam no DVD de documentação fornecido com o produto.

Înainte de a utiliza produsul, asigurați-vă că ați citit şi înțeles instrucțiunile de siguranță în mai multe limbi de pe DVD-ul cu documentație care însoțeşte produsul.

Før du bruker produktet, må du lese og forstå den flerspråklige sikkerhetsinformasjonen på DVDen med dokumentasjon som følger med produktet.

Прежде чем использовать этот продукт, внимательно ознакомьтесь с инструкциями по технике безопасности на разных языках, которые можно найти на DVD-диске с документацией в комплекте с продуктом.

在使用本产品之前，请务必先阅读和了解产品附带的文档 DVD 中的多语言安全说明。

Pre nego to upotrebite proizvod obavezno paljivo proitajte i prouite viejeziko uputstvo za bezbednost na dokumentacionom DVD-u koji ste dobili uz proizvod.

Pred pouvanm produktu si pretajte viacjazyn bezpenostn pokyny na disku DVD s dokumentciou dodanom s produktom.

Preden začnete uporabljati izdelek, je pomembno, da preberete in razumete večjezična varnostna navodila na DVD-ju z dokumentacijo, ki ste ga prejeli skupaj z izdelkom.

Antes de utilizar el producto, asegúrese de leer y comprender las instrucciones de seguridad multilingües del DVD de documentación que se proporciona con el producto.

Var noga med att läsa säkerhetsinstruktionerna på dokumentations-DVD-skivan som följer med produkten innan du börjar använda produkten.

使用本產品之前，請務必閱讀並瞭解產品隨附的文件 DVD 上的多國語言版本安全資訊。

Bu ürünü kullanmadan önce, ürünle birlikte gönderilen belge DVD'si üzerindeki çok dil içeren güvenlik yönergelerini okuyup anladýðýnýzdan emin olun.

Перед використанням цього продукту уважно ознайомтеся з інструкціями з техніки безпеки на різних мовах, що можна знайти на DVD-диску з документацією в комплекті з продуктом.

Important: For translated versions of the caution or danger statement, refer to the *Safety, Warranty, and Support Information* document.

Ensure that you read and understand all caution and danger statements in this document before you perform the procedures. Read and understand any additional safety information that is included 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.**
- **Ensure that all power cord connectors are securely and completely plugged into receptacles.**
- **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:	**To disconnect:**
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn devices ON.	

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

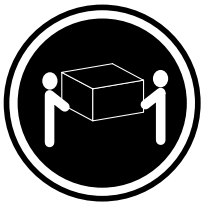
CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **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**

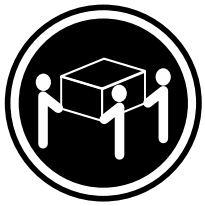
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following: **Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**

Statement 4



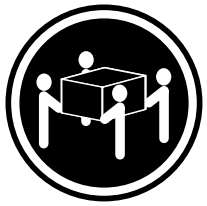
≥ 18 kg (39.7 lb)

< 32 kg (70.5 lb)



≥ 32 kg (70.5 lb)

< 55 kg (121.2 lb)



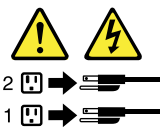
≥ 55 kg (121.2 lb)

< 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 a power source that is easily accessible in case it needs to be disconnected.

Statement 7

CAUTION:
If the device has doors, ensure that you remove or secure the doors before moving or lifting the device to protect against 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:
Disconnect the hot-swap fan cables before removing the fan from the device to protect against personal injury.

Statement 10

CAUTION:
The following label indicates a sharp-edge hazard.

Statement 11

CAUTION:
The following label indicates a potential heat hazard.

Statement 12

DANGER

Overloading a branch circuit is a potential fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch current ratings at the installation site.

Statement 13

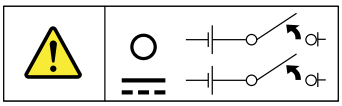
CAUTION:
Ensure that the rack is secured properly to avoid tipping when the server unit is extended on the rails.

Statement 14

CAUTION:
Some accessory or option board outputs exceed Class 2 or limited power source limits. You must install the appropriate interconnecting cabling in accordance with your local electrical code requirements.

Statement 15

CAUTION:
The power-control button on the device may put the device in standby mode instead of turning off the device. In addition, the device might have multiple connections 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 your local electrical code and the latest edition of IEC 60950.**
- **Connect the equipment to a reliably earthed 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 electrical code requirements.**
- **Use 1.3 mm^2 or 16 American Wire Gauge (AWG) copper conductor only, not exceeding 3 meters in length.**
- **Torque the wiring-terminal screws to 1.4 newton-meters or 12 inch-pounds.**
- **Provide a readily available, approved and rated disconnect device in the field wiring.**

Statement 17

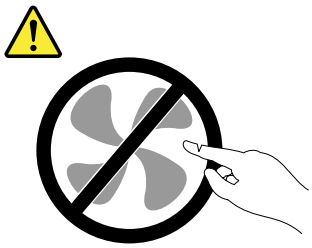
CAUTION:
This product contains a Class 1M laser. Do not view directly with optical instruments.

Statement 18

CAUTION:
Do not place any object on top of rack-mounted products.

Statement 19

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



Statement 20

CAUTION:
A lithium ion battery is provided. To avoid possible explosion, do not burn the battery. Replace the battery only with the Lenovo-approved part. Recycle or discard the battery as instructed by local regulations.

Statement 21

Attention: Choose only D40 or above air-break switch to avoid unexpected power outage.

Products that are not assessed

Typical products that are **not assessed** include but not limited to the following:

- Server and IT-rack components (for example, uninterruptible power supplies and current distribution systems)
- Devices in IT rooms (for example, bulk storage units and network products)
- Industrial low-voltage switchgear

Chapter 1. General information

This chapter provides some general information about your product.

This chapter contains the following items:

Introduction

This documentation for your Lenovo® ThinkServer® product contains information about the server features, specifications, component locations, configuration instructions, hardware replacement procedures, and basic troubleshooting and diagnostics.

Your server comes with a documentation DVD that contains various server documents to help you use and maintain the server. Meanwhile, your server comes with a *ThinkServer EasyStartup* DVD that provides a convenient solution for configuring the server and installing an operating system.

The Lenovo Limited Warranty (LLW) contains the warranty terms that apply to the product you purchased from Lenovo. Read the LLW on the documentation DVD that comes with your server. A printable generic version of the latest LLW also is available in more than 30 languages at http://www.lenovo.com/warranty/llw_02. If you cannot obtain the LLW through the documentation DVD or Lenovo Web site, contact your local Lenovo office or reseller to obtain a printed version of the LLW, free of charge.

For warranty service, consult the worldwide Lenovo Support telephone list. Telephone numbers are subject to change without notice. The most up-to-date telephone list for Lenovo Support is always available on the Web site at http://www.lenovo.com/support/phone. If the telephone number for your country or region is not listed, contact your Lenovo reseller or Lenovo marketing representative.

To obtain the most up-to-date information about the server, go to:
http://www.lenovo.com/thinkserver

Lenovo maintains pages on the World Wide Web, where you can get the latest technical information and download documentation or device drivers and updates. To access the Lenovo Support Web site, go to:
http://www.lenovo.com/support

Record information about your server in the following table. You will need the information if you ever need to have your server serviced.

For where to find the product information label on the chassis, see “Machine type, model, and serial number label” on page 12.

Product name	_____
Machine type and model (MT-M)	_____
Serial number (S/N)	_____
Date of purchase	_____

You can register your server with Lenovo by following the instructions at:
http://www.lenovo.com/register

When you register your server, information is entered into a database, which enables Lenovo to contact you in case of a recall or other severe problem. After you register your server with Lenovo, you will receive quicker service when you call Lenovo for help. In addition, some locations offer extended privileges and services to registered users.

Server documentation

This topic provides general descriptions of the various documentation for your server and instructions on how to obtain all the documentation.

Printed document

The following document is printed out and contained in your server package.

Read Me First

This is a multilingual document you should read first. This document guides you to read the complete warranty, support, and safety information on the documentation DVD that comes with your server before using the product. This document also provides information about how to find the most up-to-date information on the Lenovo Support Web site.

Documentation DVD

The documentation DVD, which comes with your server, contains various documents for your server in Portable Document Format (PDF) and HyperText Markup Language (HTML). The documentation DVD is not bootable. To view the documents on the DVD, you will need a computer with a Web browser and the Adobe Reader program, which is available for download at:
http://www.adobe.com

To start the documentation DVD, insert the DVD into the optical drive. The DVD is AutoPlay enabled and starts automatically in most Microsoft® Windows® environments. If the DVD fails to start or if you are using a Linux® operating system, open the launch.htm file located in the root directory of the DVD.

Note: Lenovo maintains pages on the World Wide Web, where you can get the latest technical information and download documentation or device drivers and updates. Some information in the documents on the documentation DVD might change without notice after the first release of the DVD. You can always obtain all the most up-to-date documentation for your server from the Lenovo Web site at:
http://www.lenovo.com/UserManuals

The following documents are on the documentation DVD that comes with your server:

- *Safety, Warranty, and Support Information*

  This is a multilingual document that includes all the safety statements for your product in more than 30 languages. Be sure to read and understand all the safety statements before using the product. This document also includes the Lenovo warranty statement, Customer Replaceable Units (CRUs) information, and information about how to contact the Lenovo Customer Support Center.

- *Lenovo License Agreement*

  This document includes the terms and conditions of the Lenovo License Agreement.

- *User Guide and Hardware Maintenance Manual*

  This document provides detailed information to help you get familiar with your server and help you use, configure, and maintain your server. Some information in this document, if specified, is intended for service technicians only.

- *MegaRAID SAS Software User Guide*

  This document provides information about Redundant Array of Independent Disks (RAID) and how to use the utility programs to configure, monitor, and maintain your server RAID and related devices. This document is in English only.

  Note: Refer to this document for hardware RAID information if you have a required RAID card installed in the server. See “Installing or removing the RAID card” on page 66.

Chapter 2. Server setup road map

This chapter provides a general road map to guide you through setting up your server.

The server setup procedure varies depending on the configuration of the server when it was delivered. In some cases, the server is fully configured and you need to connect the server to the network and an ac power source, and then you can turn on the server. In other cases, the server needs to have hardware devices installed, requires hardware and firmware configuration, and requires an operating system to be installed.

The general procedure for setting up your server is:

1. Unpack the server package. See “Server package” on page 7.
2. Install any required hardware or server options. See the related topics in Chapter 6 “Installing, removing, or replacing hardware” on page 57.
3. If you have a rail kit, you can install the server into a standard rack cabinet. See the documentation that comes with the rail kit.
4. Connect the Ethernet cables and the power cord to the server. See “Rear view of the server” on page 15 to locate the connectors.
5. Turn on the server to verify operation. See “Turning on the server” on page 37.
6. Review the Unified Extensible Firmware Interface (UEFI) Basic Input Output System (BIOS) settings and customize as needed. See “Using the Setup Utility program” on page 39.
7. Configure RAID and install the operating system and device drivers. See “Using the ThinkServer EasyStartup program” on page 46 and “Configuring RAID” on page 49.
8. Install any additional drivers required for added features. Refer to the instructions that come with the hardware option.
9. Configure Ethernet settings in the operating system by referring to the operating system help. This step is not required if the operating system was installed using the ThinkServer EasyStartup program.
10. Check for firmware updates. See “Updating the firmware” on page 54.
11. Install management applications and any other applications. Refer to the documentation that comes with the applications that you want to install.

Chapter 3. Product overview

This chapter provides information about the server package, features, specifications, software programs, and component locations.

This chapter contains the following items:

Server package

The server package includes the server, the power cord, printed documentation, a documentation DVD, and software media.

Note: Depending on the model, your server might look slightly different from the following illustration.

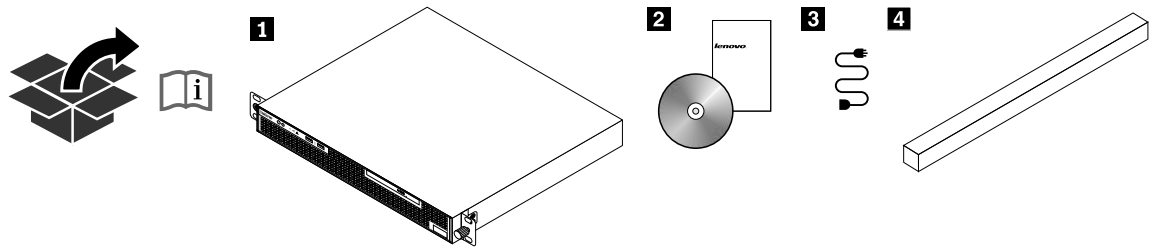


Figure 1. Server package

1 Server

2 Material box (including printed documentation, a documentation DVD, and software media)

3 Power cord

4 Rail kit

Features

This topic provides general information about the server features for various models. Depending on your specific model, some features might vary or unavailable. For information about your specific model, use the Setup Utility program. See “Viewing information in the Setup Utility program” on page 39. You also can refer to the *Products Specifications Reference* document for ThinkServer products at: http://www.lenovo.com/psref/

Microprocessor

Your server comes with one of the following microprocessors (internal cache size varies by model type):

- Intel® Celeron® microprocessor
- Intel Core™ i3 microprocessor
- Intel Pentium® microprocessor
- Intel Xeon® microprocessor

For a list of ThinkServer microprocessor options, go to:
http://lenovoquickpick.com/usa/home/thinkserver/rack-and-tower-server

Memory

Your server has four memory slots. For more information, see “Memory module installation rules” on page 63.

Power supply

Your server comes with a 300-watt automatic voltage-sensing power supply.

Note: If you are using uninterruptible power supplies (UPS), ensure that you use only pure-sine UPSes with your ThinkServer server.

System fan

Your server has three system fans.

Internal drive

Internal drives are devices that your server uses to read and store data. The internal drives supported by your server vary by model.

- Hard disk drive
  - Up to two 3.5-inch Serial Advanced Technology Attachment (SATA) or Serial Attached SCSI (SAS) hard disk drives (SCSI is the acronym for Small Computer System Interface)
  - Up to four 2.5-inch SATA or SAS hard disk drives or SATA solid-state drives

  Note: The term “2.5-inch hard disk drives” hereinafter refers to all the supported types of 2.5-inch hard disk drives, including solid-state drives.
- Optical drive

  One slim SATA optical drive (available on some models)

Expansion slot

One Peripheral Component Interconnect (PCI) Express card slot on the riser card assembly

For detailed information, see “Rear view of the server” on page 15.

Input/Output (I/O) features

- Four USB 2.0 connectors (two on the front panel and two on the rear panel)
- Four USB 3.0 connectors on the rear panel
- One DisplayPort® connector on the rear panel
- One serial connector on the rear panel
- One video graphics array (VGA) connector on the rear panel
- Three RJ-45 Ethernet connectors (one on the rear panel for system management and two on the Ethernet card)

For the location information about the connectors, refer to the related topics in “Locations” on page 12.

Video subsystem

Integrated graphics for a VGA connector and a DisplayPort connector

Ethernet connectivity

There are three RJ-45 Ethernet connectors on the rear panel with 10 megabits per second (Mbps), 100 Mbps, or 1000 Mbps network connectivity. For more information, see “Rear view of the server” on page 15.

Reliability, availability, and serviceability

Reliability, availability, and serviceability (hereinafter 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.

Your server has the following RAS features:

- **Security features**
  - Administrator password and user password to help you protect unauthorized access to the server (see “Using passwords” on page 43)
  - ThinkServer Trusted Platform Module (TPM), which is a security chip, to help enhance server security

    Note: The TPM is only available in some models.
  - Redundant Array of Independent Disks (RAID) configuration for improving data storage reliability and fault tolerance (see “Configuring RAID” on page 49)
  - Remote monitoring or control by an administrator to provide protection or help
- **Basic system management features**
  - Ability to store the power-on self-test (POST) hardware test results
  - BIOS Setup Utility program

    The BIOS Setup Utility program helps you view the server information and configure the server in the pre-operating system environment. See “Using the Setup Utility program” on page 39.
  - Preboot Execution Environment (PXE)

    The Intel PXE technology enables you to start your computers, load an operating system, or deploy executable images from a remote server by using a network interface. The operation can be done independently of local data storage devices (such as hard disk drives) or operating systems.

– RAID

  Your server supports onboard SATA software RAID. If a required RAID card is installed, your server also supports advanced SATA/SAS hardware RAID configurations. For detailed information, see “Configuring RAID” on page 49.

  Note: The onboard RAID is a software RAID instead of a hardware RAID.

– Software programs

  For more information about the software programs, see “Software” on page 11.

– Wake on LAN

  Wake on LAN is an Ethernet computer networking standard that allows a computer to be turned on or woken up by a network message. The message is usually sent by a program running on another computer on the same local area network.

Specifications

This topic lists the physical specifications for your server.

Dimensions

Width without rack handles: 430 mm (16.9 inches)

Depth: 411 mm (16.2 inches)

Height: 43.5 mm (1.71 inches)

Weight

The product weight varies depending on different system configurations.

Range of product weight with package: 11.63 kg (25.64 lb) to 13.16 kg (29.01 lb)

Environment

- Air temperature:

  Operating: 10°C to 35°C (50°F to 95°F)

  Storage: -40°C to 70°C (-40°F to 158°F) in original shipping package
- Altitude: 0 to 3048 m (0 to 10 000 ft) in an unpressurized environment
- Humidity:

  Operating: 10% to 80% (non-condensing)

  Storage without package: 10% to 80% (non-condensing)

  Storage with package: 10% to 90% (non-condensing)

Electrical input

- Universal input:
  - Low range:

    Minimum: 100 V ac

    Maximum: 127 V ac

    Input frequency range: 50 to 60 Hz
  - High range:

    Minimum: 200 V ac

    Maximum: 240 V ac

    Input frequency range: 50 to 60 Hz

Software

This topic provides information about the software programs that you can use to help you set up, use, and maintain the server.

ThinkServer EasyStartup

The ThinkServer EasyStartup program simplifies the process of configuring RAID and installing supported Microsoft Windows and Linux operating systems, VMware hypervisors, and device drivers on your server. This program is provided with your server on a self-starting (bootable) *ThinkServer EasyStartup* DVD. The user guide for the program also is on the DVD and can be accessed directly from the program interface. For detailed information, see “Using the ThinkServer EasyStartup program” on page 46.

ThinkServer EasyUpdate Firmware Updater

The ThinkServer EasyUpdate Firmware Updater program (hereinafter referred to as the Firmware Updater program) enables you to maintain your server firmware up-to-date and helps you avoid unnecessary server outages. The Firmware Updater program is provided on the Lenovo Support Web site. For more information about downloading and using the Firmware Updater program, see “Updating the firmware” on page 54.

Lenovo ThinkServer Power Planner

The Lenovo Thinkserver Power Planner program provides information about the power consumption and electric current calculation based on the different configurations of servers and other devices. The program also helps to plan servers and devices deployment in an efficient way.

For detailed information about using the Lenovo ThinkServer Power Planner program, refer to the help system of the program.

BIOS update utility

The BIOS firmware keeps updating after the shipment of the server. Lenovo maintains pages on the Support Web site and provides the BIOS update utility with instructions for download to help you update the BIOS firmware if needed. For more information, see “Updating or recovering the BIOS” on page 45 and “Updating the firmware” on page 54.

RAID configuration utilities

Your server supports onboard SATA software RAID. If a required RAID card is installed, your server also supports advanced SATA/SAS hardware RAID configurations. For detailed information, see “Configuring RAID” on page 49.

Lenovo ThinkServer Diagnostics

The Lenovo ThinkServer Diagnostics program enables you to diagnose server problems, perform some diagnostic tests, and collect system information. Examples of the system information include basic operating-system information, hardware information, SEL, RAID log, and so on. Depending on the model, your server might come with one of the following diagnostic programs:

- Lenovo ThinkServer Diagnostics Linux Edition
- Lenovo ThinkServer Diagnostics Standalone Edition
- Lenovo ThinkServer Diagnostics Windows Edition

For detailed information about using the Lenovo ThinkServer Diagnostics program, refer to the user guide of the software.

Locations

This topic provides information to help you locate your server components.

Machine type, model, and serial number label

This topic helps you locate the label that contains the machine type, model, and serial number information for your server.

When you contact Lenovo for help, the machine type, model, and serial number information helps support technicians to identify your server and provide faster service.

The machine type, model, and serial number label is attached on the right rack handle of your server as shown.

Note: Depending on the model type, your server might look slightly different from this illustration.

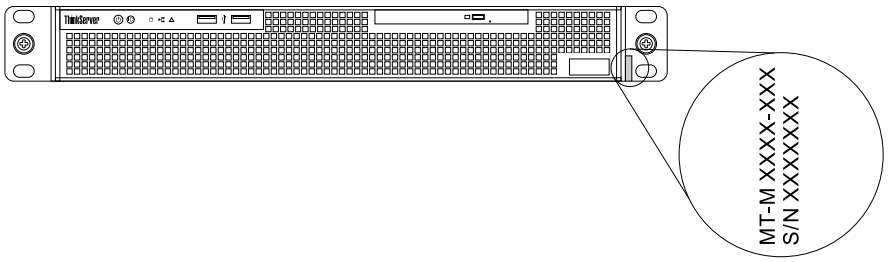


Figure 2. Machine type, model, and serial number label

Front view of the server

The following illustration shows the front view of the server.

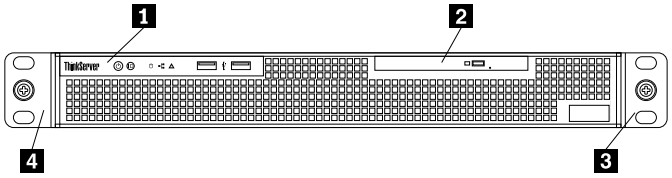


Figure 3. Front view of the server

1 Front panel	2 Slim optical drive (available on some models)
3 Rack handle (right)	4 Rack handle (left)

1 Front panel

For detailed information about the controls, connectors, and status LEDs on the front panel, see “Front panel” on page 13.

2 Slim optical drive

Some server models come with a slim SATA optical drive.

3 Rack handle (right)

4 Rack handle (left)

If your server is installed in a rack cabinet, you can use the rack handles to help you slide the server out of the rack cabinet. You also can use the rack handles and screws to secure the server in the rack cabinet so that the server cannot slide out, especially in vibration-prone areas. For more information, refer to the documentation that comes with your rail kit.

Front panel

The following illustration shows the controls, connectors, and LEDs on the front panel of the server. To locate the front panel, see “Front view of the server” on page 12.

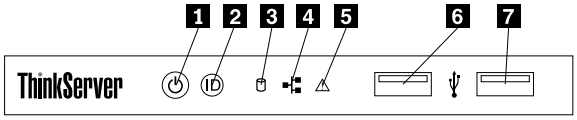


Figure 4. Front panel

1 Power button with power status LED	2 ID button with ID LED
3 Hard-disk-drive status LED	4 Network Interface Controller (NIC) status LED
5 System error LED	6 Front USB 2.0 connector 1
7 Front USB 2.0 connector 2	

1 Power button with power status LED

Press the power button to turn on the server when you finish setting up the server. Hold the power button for several seconds to turn off the server if you cannot turn it off from the operating system. See Chapter 4 “Turning on and turning off the server” on page 37. The power status LED helps you to determine the current power status.

Power status LED	Color	Description
On	Green	The server is on.
Off	None	The server is off.

2 ID button with ID LED

When you press the ID button on the front panel, the ID LEDs on both the front and rear of the server are lit to help you locate the server among other servers.

ID LED	Color	Description
On	Blue	The server is identified.
Off	None	The ID LED is not in use or the server is not identified.

3 Hard-disk-drive status LED

The hard-disk-drive status LED helps you to determine the activity of the hard disk drive.

Hard-disk-drive status LED	Color	Description
Off	None	The hard disk drive is not in use.
Blinking	Green	The hard disk drive is active and data is being transferred.

4 NIC status LED

The NIC status LED indicates the LAN status for the Ethernet connector 1 and Ethernet connector 2 on the rear panel of the server.

NIC status LED	Color	Description
On	Green	The server is connected to a LAN.
Off	None	The server is disconnected from a LAN.
Blinking	Green	The LAN is connected and active.

5 System error LED

The system error LED helps you to determine if there are any system errors.

System error LED	Color	Description
On	Green	The booting process stops because of a POST error.
Off	None	The server is off or the server is on and working correctly.

6 Front USB 2.0 connector 1

7 Front USB 2.0 connector 2

Used to attach a USB-compatible device, such as a USB keyboard, mouse, scanner, or printer. If you have more than eight USB devices, you can purchase a USB hub, which you can use to connect additional USB devices.

Rear view of the server

The following illustration shows the rear view of the server.

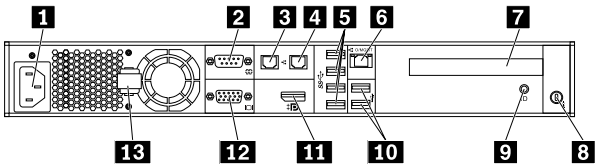


Figure 5. Rear view of the server

1 Power cord connector	2 Serial connector
3 Ethernet connector 1 (RJ-45)	4 Ethernet connector 2 (RJ-45)
5 USB 3.0 connectors (4)	6 Ethernet connector 0 for system management (RJ-45)
7 PCI Express card slot for the card installed on the riser card assembly	8 Security-lock slot
9 ID LED	10 Front USB 2.0 connectors (2)
11 DisplayPort connector	12 VGA DB-15 connector
13 Power cord retainer	

1 Power cord connector

Used to connect the power cord.

2 Serial connector

Used to attach a device that uses a 9-pin serial connector.

3 4 6 Ethernet connectors (RJ-45)

Used to attach an Ethernet cable for a LAN. Each Ethernet connector has two status LEDs to help you identify the Ethernet connectivity, activity, and connection speed.

Notes:

- The Ethernet connector 0 (callout 6) marked with “MGMT” is for system management by default.
- The Ethernet connector 0 does not support the Intel Virtualization Technology.

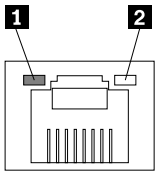


Figure 6. Ethernet status LEDs

Table 1. Ethernet status LED 1

Color	Status	Description
Amber	On	The connection speed is 1000 Mbps.
Green	On	The connection speed is 100 Mbps.
None	Off	The connection speed is 10 Mbps.

Table 2. Ethernet status LED 2

Color	Status	Description
Amber	On	The server is connected to a LAN.
Amber	Off	The server is disconnected from a LAN.
Amber	Blinking	The LAN is connected and active.

5 10 USB connectors

Used to attach a USB-compatible device, such as a USB keyboard, mouse, scanner, or printer. If you have more than eight USB devices, you can purchase a USB hub, which you can use to connect additional USB devices.

7 PCI Express card slot

There are two PCI Express card slots on the riser card assembly. The Ethernet card is installed in the slot 1 on the riser card assembly. The slot 2 is used to install a half-length, full-height PCI Express card, such as a RAID card or a ThinkServer Host Bus Adapter (HBA).

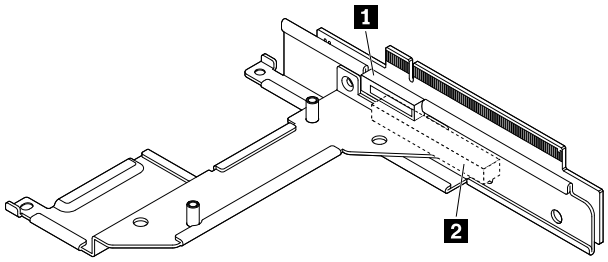


Figure 7. Locating the slots on the riser card assembly

8 Security-lock slot

Used to attach a cable lock to secure your server to a desk, table, or other non-permanent fixture.

9 ID LED

When you press the ID button on the front of the server, the ID LEDs on both the front and rear of the server are lit to help you locate the server among other servers.

ID LED	Color	Description
On	Blue	The server is identified.
Off	None	The ID LED is not in use or the server is not identified.

11 DisplayPort connector

Used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a DisplayPort connector.

12 VGA DB-15 connector

Used to attach a VGA-compatible video device, such as a VGA monitor.

Note: To connect a VGA cable to this connector, the physical thickness of the whole connector on the end of the VGA cable must be less than 17 mm (0.67 inch).

13 Power cord retainer

Used to secure the power cord.

Server lock

You can use a Kensington-style cable lock to secure your server to a desk, table, or other non-permanent fixture. The cable lock attaches to the security-lock slot at the rear of your server and is operated with a key or combination depending on the type selected. The cable lock also locks the server cover. This is the same type of lock used with many notebook computers. You can order such a cable lock directly from Lenovo by searching for **Kensington** at:
http://www.lenovo.com/support

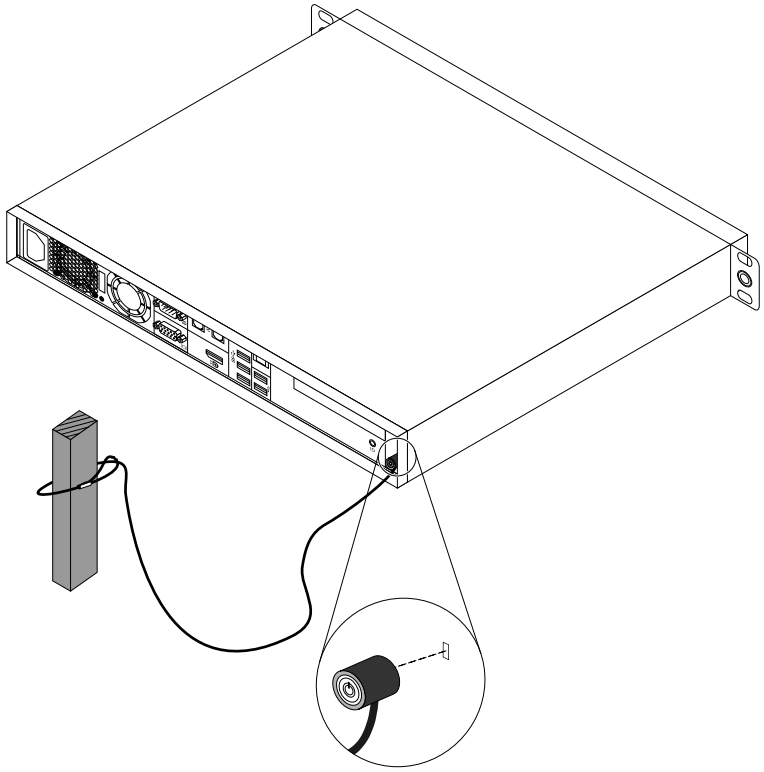


Figure 8. Kensington-style cable lock

Server components

This topic provides information to help you locate the components of your server. For more information about major components, see the related topics in “Locations” on page 12.

To remove the server cover and gain access to the inside of the server, see “Removing the server cover” on page 59.

The chassis configuration varies by model. The following illustrations show the two chassis configurations based on the supported hard disk drives.

- “Components of server models with two 3.5-inch hard-disk-drive bays” on page 19
- “Components of server models with four 2.5-inch hard-disk-drive bays” on page 20

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

Components of server models with two 3.5-inch hard-disk-drive bays

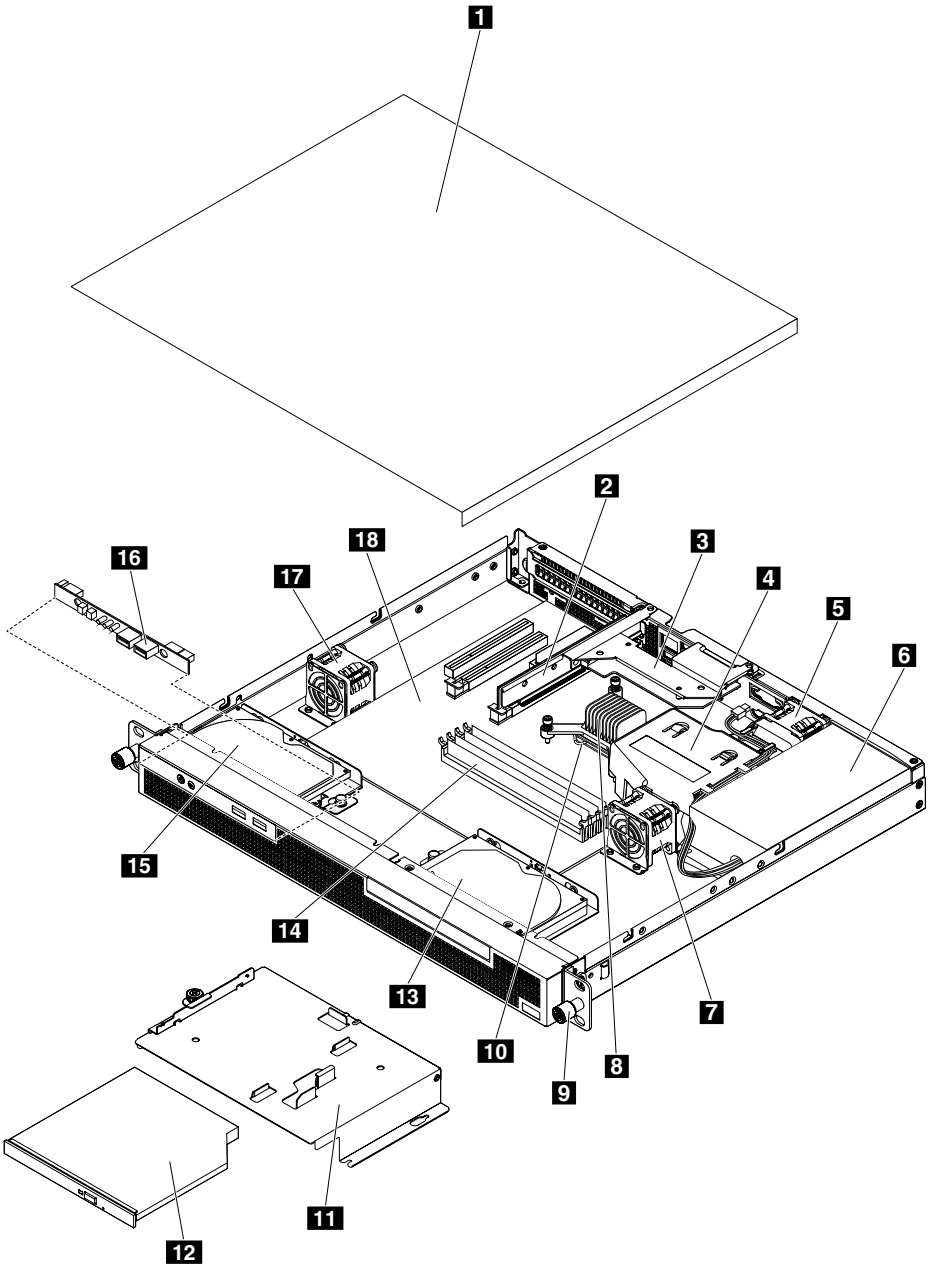


Figure 9. Components of server models with two 3.5-inch hard-disk-drive bays

1 Server cover	2 Riser card assembly
3 Ethernet card	4 Fan duct
5 System fan 1	6 Power supply assembly
7 System fan 3	8 Heat sink
9 Rack handle (right)	10 Microprocessor
11 Slim-optical-drive bracket	12 Slim optical drive

13 Hard disk drive 1	14 Memory modules
15 Hard disk drive 0	16 Front panel board
17 System fan 2	18 System board

Components of server models with four 2.5-inch hard-disk-drive bays

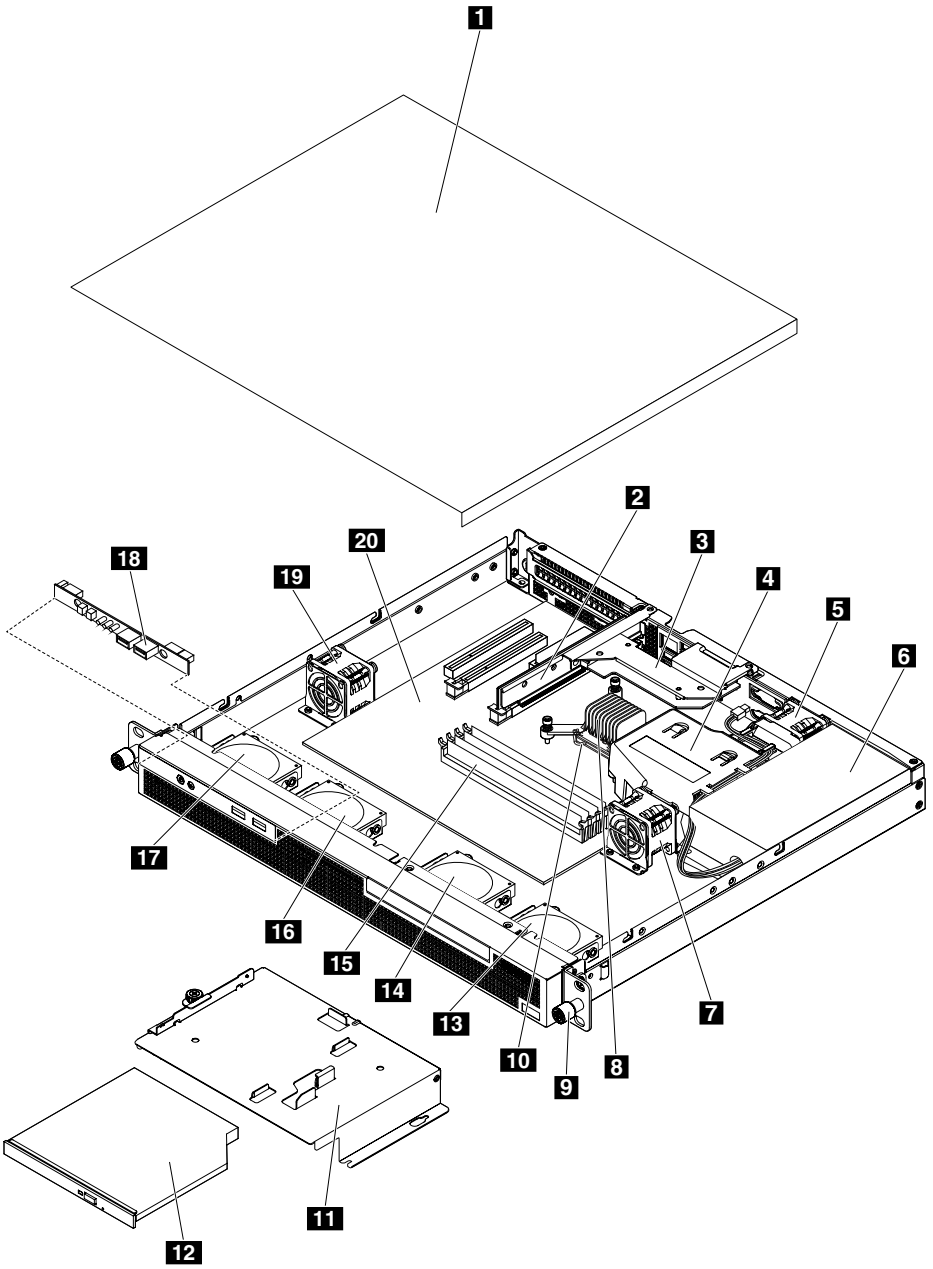


Figure 10. Components of server models with four 2.5-inch hard-disk-drive bays

1 Server cover	2 Riser card assembly
3 Ethernet card	4 Fan duct

5 System fan 1	6 Power supply assembly
7 System fan 3	8 Heat sink
9 Rack handle (right)	10 Microprocessor
11 Slim-optical-drive bracket	12 Slim optical drive
13 2.5-inch hard disk drive 3	14 2.5-inch hard disk drive 2
15 Memory modules	16 2.5-inch hard disk drive 1
17 2.5-inch hard disk drive 0	18 Front panel board
19 System fan 2	20 System board

CRU identification

CRUs are parts that can be upgraded or replaced by the customer. If a CRU is determined to be defective during the warranty period, a replacement CRU will be provided to the customer. Customers are responsible for installing the self-service CRUs for this product. Customers also can install optional-service CRUs, which might require some technical skills or tools, or request that a technician install the optional-service CRU under the terms of the applicable warranty service type for your country or region.

Non-CRUs must be replaced only by trained service technicians.

The following table lists the major FRUs in your server and the CRU identification information. For a complete listing of FRU information, such as FRU part numbers and supported server models, go to: http:/www.lenovo.com/serviceparts-lookup

Notes:

- Before servicing a Lenovo product, ensure that you read and understand “Safety information” on page iii.
- Use only parts provided by Lenovo.

FRU description	Self-service CRU	Optional-service CRU
Coin-cell battery	Yes	No
Ethernet card	Yes	No
Fan duct	Yes	No
Front panel board	No	No
Hard disk drive	No	No
Heat sink	Yes	No
Memory module	Yes	No
Microprocessor	No	Yes
PCI card (available on some models)	Yes	No
Power supply assembly	No	Yes
Rack handles	Yes	No
Riser card assembly	No	Yes
Slim optical drive (available on some models)	Yes	No
System board	No	No
System fan	No	No

FRU description	Self-service CRU	Optional-service CRU
ThinkServer RAID 500 Upgrade Key for Advanced RAID (available on some models)	Yes	No
ThinkServer RAID 700 Battery (available on some models)	Yes	No

RAID card

Some server models come with a RAID card installed in the longer slot of the riser card assembly to provide advanced SATA/SAS hardware RAID functions. You also can purchase a supported RAID card from Lenovo and install it into the server. See “Installing or removing the RAID card” on page 66.

Note: The option kit for a RAID card is designed for different types of servers and might contain additional cables that are not required for your server.

Your server supports the following RAID cards:

- ThinkServer RAID 500 Adapter (also known as ThinkServer 9240-8i RAID 0/1 Adapter)
- ThinkServer RAID 700 Adapter (also known as ThinkServer 9260-8i SAS RAID Adapter)

ThinkServer RAID 500 Adapter (also known as ThinkServer 9240-8i RAID 0/1 Adapter)

The following illustration shows the connectors on the ThinkServer RAID 500 Adapter.

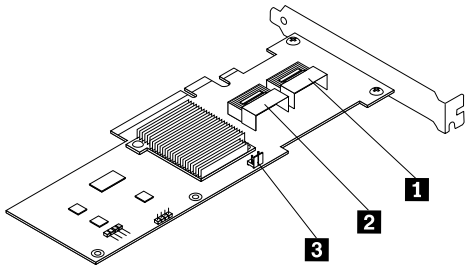


Figure 11. ThinkServer RAID 500 Adapter

1 Port 0	2 Port 1
3 TR 500 key connector	

1 Port 0

Used to connect a mini-SAS signal cable.

2 Port 1

Used to connect a mini-SAS signal cable.

3 TR 500 key connector

Used to connect a ThinkServer RAID 500 Upgrade Key for Advanced RAID. See “Installing or removing the ThinkServer RAID 500 Upgrade Key for Advanced RAID” on page 70.

ThinkServer RAID 700 Adapter (also known as ThinkServer 9260-8i SAS RAID Adapter)

The following illustration shows the connectors on the ThinkServer RAID 700 Adapter.

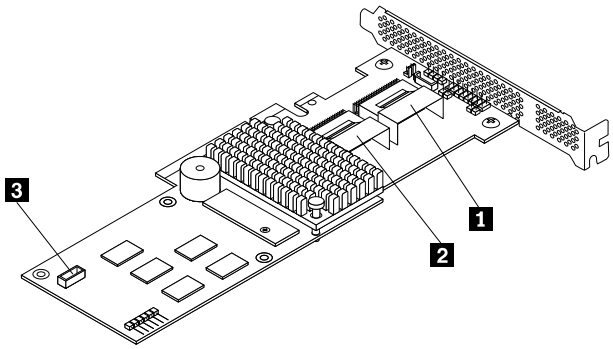


Figure 12. ThinkServer RAID 700 Adapter

1 Ports 7-4	2 Ports 3-0
3 ThinkServer RAID 700 Battery connector	

1 Ports 7-4

Used to connect a mini-SAS signal cable.

2 Ports 3-0

Used to connect a mini-SAS signal cable.

3 ThinkServer RAID 700 Battery connector

Used to connect a ThinkServer RAID 700 Battery. See “Installing or removing the ThinkServer RAID 700 Battery” on page 72.

Connecting the cables

Note: Your server supports both SATA and SAS hard disk drives. For server models with SAS hard disk drives, a RAID card must be installed. For server models with SATA hard disk drives, you can connect the SATA hard disk drives to a RAID card or the SATA connectors on the system board.

This topic provides instructions on the following cable connections:

Connecting the 2.5-inch hard disk drives and slim optical drive with a RAID card

Note: If you are connecting the 2.5-inch hard disk drives with a ThinkServer 9207-8i 6G HBA, the procedure is similar.

To connect the 2.5-inch hard disk drives and slim optical drive with a RAID card:

1. Connect the mini-SAS connector of the mini-SAS to 2.5-inch SAS combo cable to the RAID card.

   Note: For the RAID 500 Adapter, connect the mini-SAS connector to Port 0. For the RAID 700 Adapter, connect the mini-SAS connector to Ports 3-0. See “RAID card” on page 22.

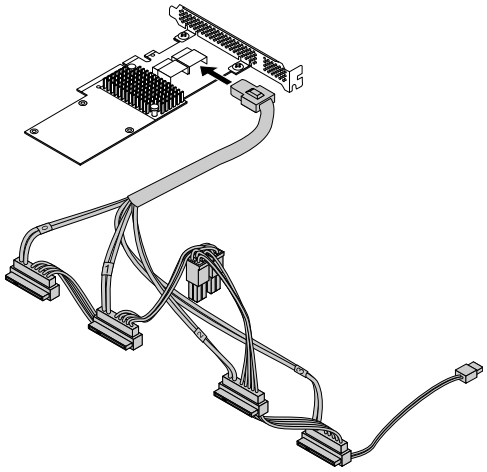


Figure 13. Connecting the mini-SAS connector to the RAID card

2. Connect one end of the SAS-hard-disk-drive-LED cable to the hard-disk-drive-activity-LED connector on the RAID card, if supported.
3. Install the RAID card to the riser card assembly. See “Installing the RAID card” on page 66.
4. Connect the other end of the SAS-hard-disk-drive-LED cable to the hard-disk-drive-LED connector on the system board. See “System board components” on page 33.

5. Do the following to connect the hard disk drives:
   a. 1 2: Connect the SATA combo connectors 0 and 1 of the mini-SAS to 2.5-inch SAS combo cable to the hard disk drives 0 and 1 respectively.
   b. 3: Connect the power connector 1 of the mini-SAS to 2.5-inch SAS combo cable to the 4-pin power connector which is near the memory modules on the system board.
   c. 4 5: Connect the SATA combo connectors 2 and 3 of the mini-SAS to 2.5-inch SAS combo cable to the hard disk drives 2 and 3 respectively.
   d. 6: Connect the power connector 2 of the mini-SAS to 2.5-inch SAS combo cable to the other available 4-pin power connector on the system board.

   For more information, see “System board components” on page 33.

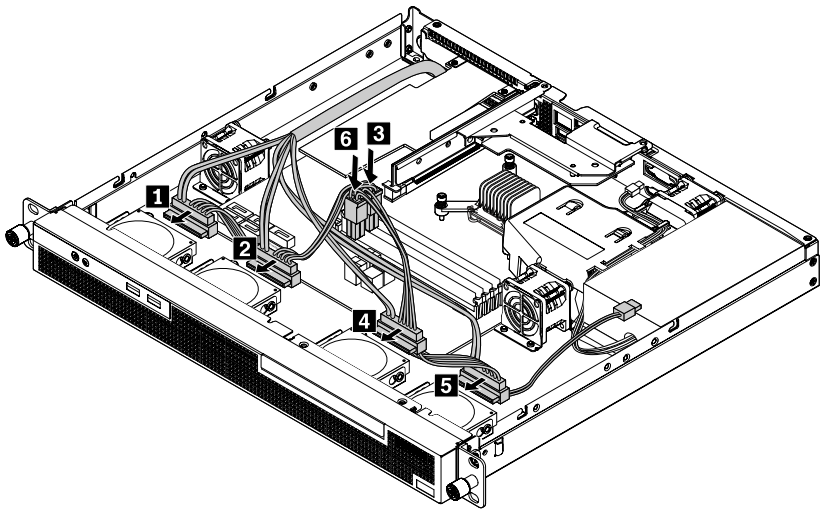


Figure 14. Connecting the 2.5-inch hard disk drives

6. If you have a slim optical drive, install the slim-optical-drive bracket, and then install the slim optical drive. See “Removing and reinstalling the slim-optical-drive bracket” on page 86 and “Installing the slim optical drive” on page 75.

7. Do the following to connect the slim optical drive:
   a. **1**: Connect one end of the available SATA cable to the SATA 4 connector on the system board. See “System board components” on page 33.
   b. **2**: Connect the other end of the SATA cable to the rear of the slim optical drive.
   c. **3**: Connect the slim-optical-drive power connector of the mini-SAS to 2.5-inch SAS combo cable to the power connector at the rear of the slim optical drive.

   Note: Ensure that the SATA cable and the power cable for the slim optical drive are routed under the power supply cable and the mini-SAS to 2.5-inch SAS combo power cable.

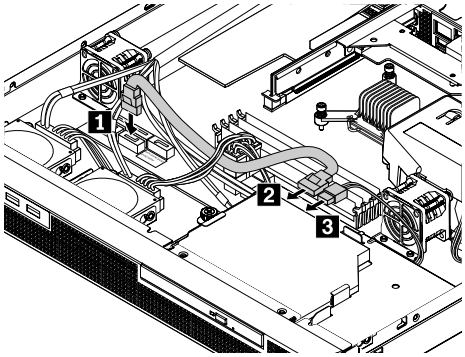


Figure 15. Connecting the slim optical drive

8. Route the cables using the cable ties in the chassis. See “Reinstalling the server cover and reconnecting cables” on page 110.

Connecting the 2.5-inch hard disk drives and slim optical drive without a RAID card

To connect the 2.5-inch hard disk drives and slim optical drive without a RAID card:

1. Do the following to connect the hard disk drives:
   a. 1 2: Connect the SATA combo connectors 0 and 1 of the combo SAS cable to the hard disk drives 0 and 1 respectively.
   b. 3: Connect the power connector 1 of the combo SAS cable to the 4-pin power connector which is near the memory modules on the system board.
   c. 4 5: Connect the SATA combo connectors 2 and 3 of the combo SAS cable to the hard disk drives 2 and 3 respectively.
   d. 6: Connect the power connector 2 of the combo SAS cable to the other available 4-pin power connector on the system board.

   For more information, see “System board components” on page 33.

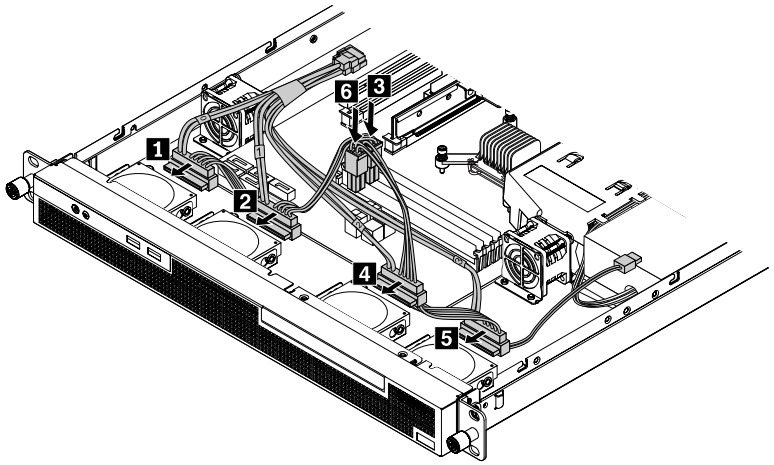


Figure 16. Connecting the 2.5-inch hard disk drives

2. Connect the SATA connectors 0 to 3 of the combo SAS cable to the corresponding SATA connectors 0 to 3 respectively on the system board. See “System board components” on page 33.

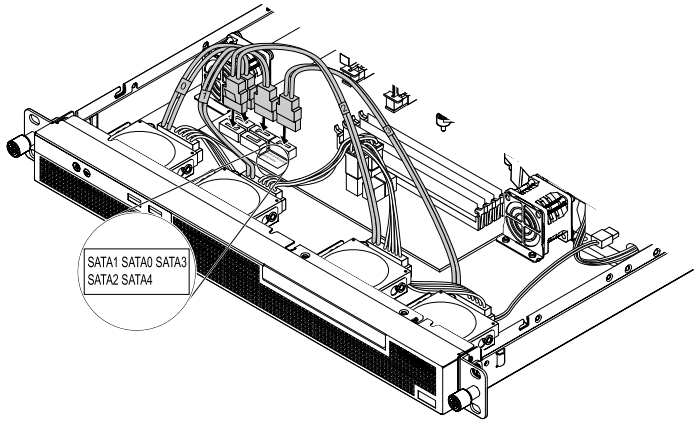


Figure 17. Connecting the 2.5-inch hard disk drive SATA cables

3. If you have a slim optical drive, install the slim slim-optical-drive bracket and then install the slim optical drive. See “Removing and reinstalling the slim-optical-drive bracket” on page 86 and “Installing the slim optical drive” on page 75.
4. Do the following to connect the slim optical drive:
   a. 1: Connect one end of the available SATA cable to the SATA 4 connector on the system board. See “System board components” on page 33.
   b. 2: Connect the other end of the SATA cable to the rear of the slim optical drive.
   c. 3: Connect the slim-optical-drive power connector of a combo SAS cable to the power connector at the rear of the slim optical drive.

   Note: Ensure that the SATA cable and the power cable for the slim optical drive are routed under the power supply cable and the combo SAS power cable.

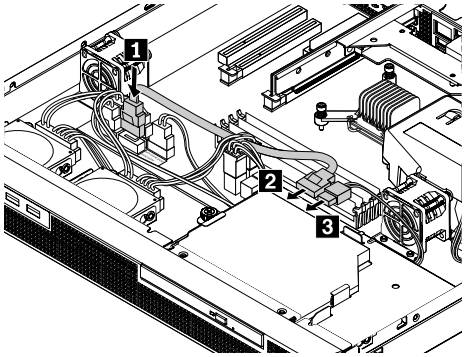


Figure 18. Connecting the slim optical drive

5. Route the cables using the cable ties in the chassis. See “Reinstalling the server cover and reconnecting cables” on page 110.

Connecting the 3.5-inch hard disk drives and slim optical drive with a RAID card

Note: If you are connecting the 3.5-inch hard disk drives with a ThinkServer 9207-8i 6G HBA, the procedure is similar.

To connect the 3.5-inch hard disk drives and the slim optical drive with a RAID card:

1. Connect the mini-SAS connector of the mini-SAS to 3.5-inch SAS combo cable to the RAID card.

   Note: For the RAID 500 Adapter, connect the mini-SAS connector to Port 0. For the RAID 700 Adapter, connect the mini-SAS connector to Ports 3-0. See “RAID card” on page 22.

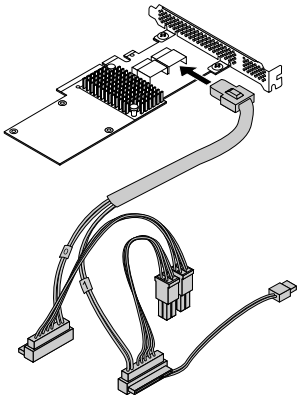


Figure 19. Connecting the mini-SAS connector to the RAID card

2. Connect the SAS-hard-disk-drive-LED cable to the hard-disk-drive-activity-LED connector on the RAID card, if supported.
3. Install the RAID card to the riser card assembly. See “Installing the RAID card” on page 66.
4. Connect the other end of the SAS-hard-disk-drive-LED cable to the hard-disk-drive-LED connector on the system board. See “System board components” on page 33.
5. Do the following to connect the hard disk drives:
   a. **1**: Connect the SATA combo connector 0 of the mini-SAS to 3.5-inch SAS combo cable to the hard disk drive 0.
   b. **2**: Connect the power connector of the mini-SAS to 3.5-inch SAS combo cable to the 4-pin power connector which is near the memory modules on the system board.
   c. **3**: Connect the SATA combo connector 1 of the mini-SAS to 3.5-inch SAS combo cable to the hard disk drive 1.
   d. **4**: Connect the other power connector of the mini-SAS to 3.5-inch SAS combo cable to the other available 4-pin power connector on the system board.

   For more information, see “System board components” on page 33.

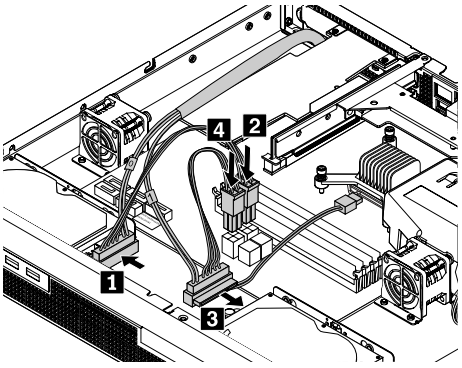


Figure 20. Connecting the mini-SAS to 3.5-inch SAS combo cable to the hard disk drives

6. If you have a slim optical drive, install the slim-optical-drive bracket, and then install the slim optical drive. See “Removing and reinstalling the slim-optical-drive bracket” on page 86 and “Installing the slim optical drive” on page 75.
7. Do the following to connect the slim optical drive:
   a. 1: Connect one end of the available SATA cable to the SATA 4 connector on the system board. See “System board components” on page 33.
   b. 2: Connect the other end of the SATA cable to the rear of the slim optical drive.
   c. 3: Connect the slim-optical-drive power connector of the mini-SAS to 3.5-inch SAS combo cable to the power connector at the rear of the slim optical drive.

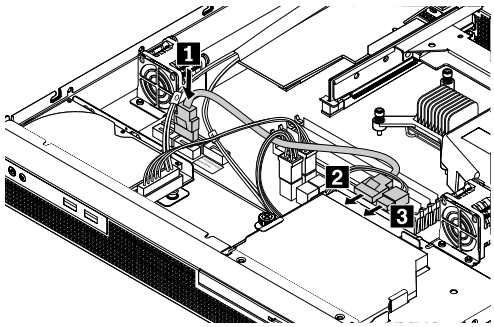


Figure 21. Connecting the slim optical drive

Note: Ensure that the SATA cable and the power cable for the slim optical drive are routed under the power supply cable and the mini-SAS to SAS combo power cable.

8. Route the cables using the cable ties in the chassis. See “Reinstalling the server cover and reconnecting cables” on page 110.

Connecting the 3.5-inch hard disk drives and slim optical drive without a RAID card

To connect the 3.5-inch hard disk drives and slim optical drive without a RAID card:

1. Do the following to connect the hard disk drives:
   a. 1: Connect the SATA combo connector of the combo SAS cable to the hard disk drive 0.
   b. 2: Connect the SATA connector of the combo SAS cable to the SATA 0 connector on the system board.
   c. 3: Connect the power connector of the combo SAS cable to the 4-pin power connector which is near the memory modules on the system board.
   d. 4: Connect the SATA combo connector of the other combo SAS cable to the hard disk drive 1.
   e. 5: Connect the SATA connector of this combo SAS cable to the SATA 1 connector on the system board.
   f. 6: Connect the power connector of this combo SAS cable to the other available 4-pin power connector on the system board.

   For more information, see “System board components” on page 33.

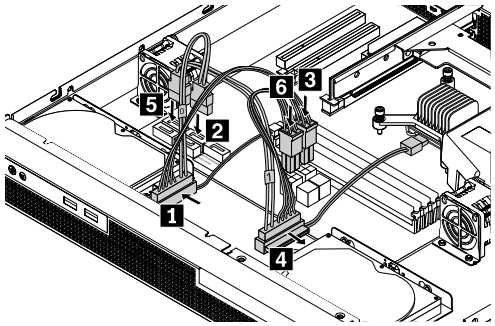


Figure 22. Connecting the 3.5-inch hard disk drives to the system board

2. If you have a slim optical drive, install the slim-optical-drive bracket, and then install the slim optical drive. See “Removing and reinstalling the slim-optical-drive bracket” on page 86 and “Installing the slim optical drive” on page 75.

3. Do the following to connect the slim optical drive:
   a. **1**: Connect one end of the available SATA cable to the SATA 4 connector on the system board.
   b. **2**: Connect the other end of the SATA cable to the rear of the slim optical drive.
   c. **3**: Connect the slim-optical-drive power connector of a combo SAS cable to the power connector at the rear of the slim optical drive.

   For more information, see “System board components” on page 33.

   Note: Ensure that the SATA cable and the power cable for the slim optical drive are routed under the power supply cable and the combo SAS power cable.

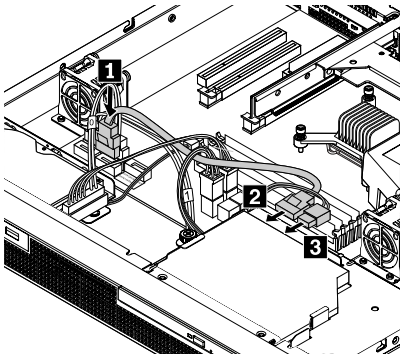


Figure 23. Connecting the slim optical drive

4. Route the cables using the cable ties in the chassis. See “Reinstalling the server cover and reconnecting cables” on page 110.

System board components

The following illustration shows the component locations on the system board.

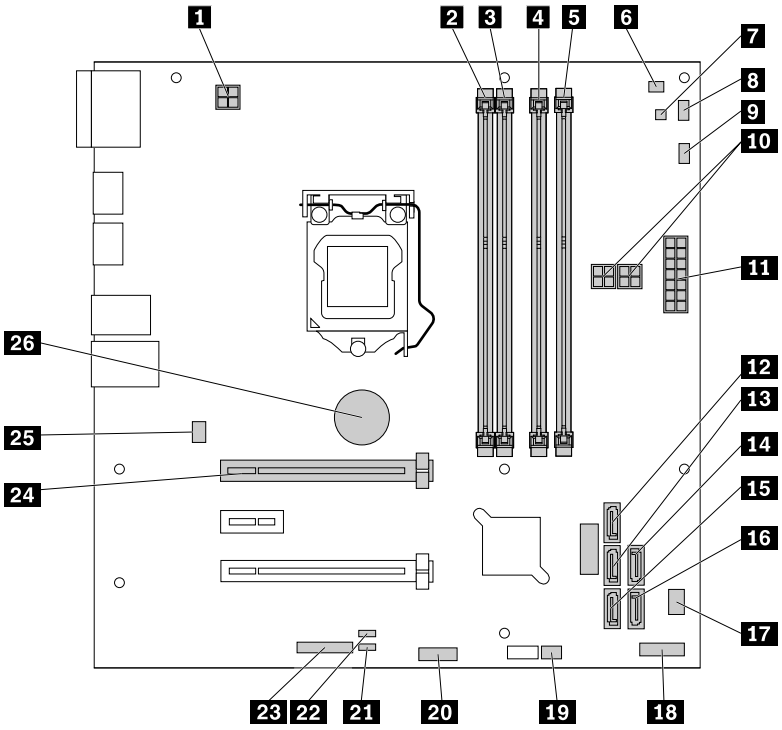


Figure 24. System board components

1 4-pin power connector	2 DIMM1
3 DIMM2	4 DIMM3
5 DIMM4	6 Thermal sensor connector
7 ID LED power connector	8 System-error-LED-cable connector
9 System fan 3 connector	10 4-pin power connectors (2)
11 14-pin power connector	12 SATA connector 3
13 SATA connector 0	14 SATA connector 4
15 SATA connector 1	16 SATA connector 2
17 System fan 2 connector	18 Front panel connector
19 Hard-disk-drive-LED connector	20 Internal USB 2.0 connector
21 Clear CMOS (Complementary Metal Oxide Semiconductor) /Recovery jumper	22 Manageability Engine (ME) disable jumper
23 Trusted Cryptography Module (TCM) connector	24 Riser card assembly slot
25 System fan 1 connector	26 Coin-cell battery

1 4-pin power connector

Used to connect the auxiliary power connector of the power supply.

2 3 4 5 Memory slots

There are four memory slots on the system board. For detailed information, see “Memory module installation rules” on page 63.

6 Thermal sensor connector

Used to connect the thermal sensor cable.

7 ID LED power connector

Used to provide power to the ID LED on the front panel.

8 System-error-LED-cable connector

Used to connect the System-error-LED cable.

9 17 25 System fan connectors

There are three system fans installed in your server. Each system fan connector is used to connect a corresponding system fan.

10 4-pin power connectors (2)

Used to provide power to your hard disk drives.

11 14-pin power connector

Used to connect the power connector of the power supply to provide main power to your server.

12 13 15 16 SATA connectors 0-3

Used to connect SATA signal cables for the hard disk drives.

14 SATA connector 4

Used to connect the signal cable of the slim optical drive if your server has a slim optical drive installed.

18 Front panel connector

Used to connect the front panel cable.

19 Hard-disk-drive-LED connector

Used to connect the hard-disk-drive-LED cable.

20 Internal USB 2.0 connector

Used to connect the two USB connectors on the front panel.

21 Clear CMOS (Complementary Metal Oxide Semiconductor) /Recovery jumper

Used to clear CMOS and turn the BIOS settings into the factory default settings.

22 ME disable jumper

Used to enable or disable the ME.

23 Trusted Cryptography Module (TCM) connector

Used to install the TCM.

24 Riser card assembly slot

Used to install the riser card assembly.

26 Coin-cell battery

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

Chapter 4. Turning on and turning off the server

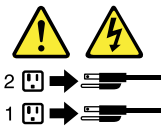
This chapter provides information about turning on and turning off the server.

Turning 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

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 one of the following ways:

- 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. For instructions on how to shut down your specific operating system, refer to the related documentation or help system for the operating system.
- Press the power button on the front of the chassis 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 might be turned off as an automatic response to a critical system failure.

Note: For information about your specific operating system, refer to the related documentation or help system for the operating system.

Chapter 5. Configuring the server

This chapter provides the following information to help you configure the server:

Using the Setup Utility program

This topic provides information about using the Setup Utility program.

The Setup Utility program is part of the server firmware. You can use the Setup Utility program to view and change the configuration settings of your server, 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

This topic provides instructions on how to start the Setup Utility program.

To start the Setup Utility program, do the following:

1. Connect the server to an ac power source and press the power button on the front panel to turn on the server. See “Turning on the server” on page 37.
2. Press the F1 key as soon as you see the logo screen. Then, wait for several seconds, and the Setup Utility program opens. If you have set a password, you need to type the correct password to enter the Setup Utility program. For password information, see “Using passwords” on page 43.

Viewing information in the Setup Utility program

The Setup Utility program menu lists various items about the system configuration. Select a desired item to view information or change settings.

When working with the Setup Utility program, you must use the keyboard. The keys used to perform various tasks are displayed on the right bottom pane of each screen. You also can press the F1 key for general help about the keys. For most items, the corresponding help message is displayed on the right top pane of the screen when the item is selected. If the item has submenus, you can display the submenus by pressing Enter.

You can view the following information about your specific server model from the Setup Utility program:

- The **Main** menu lists information about the BIOS version, microprocessor type and core frequency, memory size, installed SATA devices, and system date and time.
- The **Advanced** menu lists information about the installed microprocessor and its supported technologies.

Setup Utility program interface

This topic provides information about the menus and items in the Setup Utility program.

Depending on the version of your system BIOS, some menu or item information might differ slightly from the information in this topic.

Notes:

- The default settings already are optimized for you. Use the default value for any item you are not familiar with. Do not change the value of unfamiliar items to avoid unexpected problems. If you consider changing the server configuration, proceed with extreme caution. Setting the configuration incorrectly might cause unexpected results. If you cannot turn on the server because of incorrect BIOS settings, use the Clear CMOS jumper to restore the BIOS settings to the factory default settings. See “System board components” on page 33.
- If you have changed any hardware in the server, you might need to reflash the BIOS.

The following menus are listed on the **BIOS Setup Utility** screen:

- **Main**: See “Main menu” on page 40.
- **Devices**: See “Devices menu” on page 40.
- **Advanced**: See “Advanced menu” on page 40.
- **Power**: See “Power menu” on page 41.
- **Security**: See “Security menu” on page 41.
- **Startup**: See “Startup menu” on page 42.
- **Exit**: “Exit menu” on page 42.

Main menu

After entering the Setup Utility program, you can see the **Main** menu, which lists basic information about the BIOS, total memory size, and system date and time.

To set the system date and time on the **Main** menu, see “Setting the system date and time” on page 43.

Devices menu

You can view or change various devices settings on the **Devices** menu in the Setup Utility program. On each submenu, press Enter to view the information or show selectable options and select a desired option by using the up and down arrow keys. Some items are displayed on the menu only if the server supports the corresponding features.

Notes:

- **Enabled** means that the function is configured.
- **Disabled** means that the function is not configured.

The **Devices** menu contains the following submenus. For more information, enter the corresponding submenu and refer to the instructions on the screen.

- **Serial Port Setup**: View and set serial connector configuration parameters.
- **USB Setup**: View and set USB configuration parameters.
- **ATA Drive Setup**: View and set SATA hard-disk-drive configuration parameters.
- **Video Setup**: View and set the primary video adapter type.
- **Network Setup**: Enable or disable the onboard Ethernet controller and other network functions.

Advanced menu

You can view or change various server component settings on the **Advanced** menu in the Setup Utility program. The **Advanced** menu contains various configuration submenus and items. On each submenu, press Enter to show selectable options and select a desired option by using the up and down arrow keys or type desired values from the keyboard. Some items are displayed on the menu only if the server supports the corresponding features.

Notes:

- **Enabled** means that the function is configured.
- **Disabled** means that the function is not configured.

The **Advanced** menu contains the following submenus. For more information, enter the corresponding submenu and refer to the instructions on the screen.

- **CPU Setup**: View and set CPU configuration parameters.
- **Intel® Manageability**: View and set Intel vPRO features.

Power menu

You can view or change various server power management settings on the **Power** menu in the Setup Utility program. The **Power** menu contains various configuration submenus and items. For each submenu and item, press Enter to show selectable options and select a desired option by using the up and down arrow keys or type desired values from the keyboard. Some items are displayed on the menu only if the server supports the corresponding features.

The **Power** menu contains the following items:

- **After Power Loss**: View and configure the system performance after ac power source is removed and restored.
- **Enhanced Power Saving Mode**: Enable or disable Enhanced Power Saving Mode.

The **Power** menu contains the following submenus:

- **Intelligent Cooling Engine (ICE)**: Enable the system to enter the lower acoustic level or better thermal level.
- **Automatic Power On**: Enable or disable the Automatic Power On function.

Security menu

You can set passwords and configure the TPM function on the **Security** menu in the Setup Utility program. For each menu item, press Enter to show selectable options and select a desired option by using the up and down arrow keys or type desired values from the keyboard. Some items are displayed on the menu only if the server supports the corresponding features.

Notes:

- **Enabled** means that the function is configured.
- **Disabled** means that the function is not configured.

The **Security** menu contains the following main items:

- **Administrator Password**: View the status of an administrator password.
- **Power-On Password**: View the status of a user password.
- **Set Administrator Password**: Set an administrator password to protect against unauthorized access to your server. See “Using passwords” on page 43.
- **Set Power-On Password**: Set a user password to protect against unauthorized access to your server. See “Using passwords” on page 43.

The **Security** menu contains the following submenus:

- **TCG Feature Setup**: Configure the TPM function. See “Configuring the TPM function” on page 44.
- **System Event Log**: View and clear the system event log.

- **Secure Boot**: View and set secure boot configuration parameters.

Startup menu

The **Startup** menu in the Setup Utility program provides an interface to help you view or change the server startup options, including the startup sequence and boot priority for various devices. After the server restarts, changes in the startup options take effect.

The startup sequence specifies the order in which the server checks devices to find a boot record. The server starts from the first boot record that it finds. For example, you can define a startup sequence that checks a disc in the optical drive, then checks the hard disk drive, and then checks a network device. For information about setting the startup sequence or selecting a startup device, see "Selecting a startup device" on page 44.

The **Startup** menu contains various configuration submenus and items. For each submenu and item, press **Enter** to show selectable options and select a desired option by using the up and down arrow keys or type desired values from the keyboard. Some items are displayed on the menu only if the server supports the corresponding features.

The **Startup** menu contains the following submenus:

- **Primary Boot Sequence**: This sequence is used when the system is powered up normally.
- **Automatic Boot Sequence**: This sequence is used when a communication device wakes up the system.
- **Error Boot Sequence**: This sequence is used when an error occurs.

The **Startup** menu contains the following items:

- **CSM**: If you select **Enabled**, you can install a non-UEFI operating system. If you select **Disabled**, you can install a UEFI operating system.
- **Boot Mode**: Choose the boot policy.
- **Boot Priority**: Set the boot priority of operating systems.
- **Options Keys Display**: If you select **Enabled**, the option keys will be displayed on the logo screen. If you select **Disabled**, the option keys will not be displayed on the logo screen.
- **Options Keys Display Style**: This item controls the option keys display style when you select **Enabled** for the **Option Keys Display** item.
  - If you select **Legacy**, the message "Press F1 to enter Setup, F12 to display Boot Menu" will be displayed on the logo screen.
  - If you select **Normal**, the message "To interrupt normal startup, press Enter" will be displayed on the logo screen.

Exit menu

After you finish viewing or changing settings in the Setup Utility program, you can choose a desired action from the **Exit** menu to save changes, discard changes, or load default values, and exit the program. Press Enter to select the item on the **Exit** menu, and then select **Yes** when prompted to confirm the action. For information about exiting the Setup Utility program, see "Exiting the Setup Utility program" on page 45.

The **Exit** menu contains the following items:

- **Save Changes and Exit**: Save changes and exit the Setup Utility program.
- **Discard Changes and Exit**: Discard changes, load previous values, and then exit the Setup Utility program.
- **Load Optimal Defaults**: Restore the user default values for all the items.
- **OS Optimized Defaults**: Select **Enabled** to meet the Microsoft Windows 8 certification requirement. The settings for the CSM support, boot mode, boot priority, secure boot, and security RollBack prevention will be affected.

Setting the system date and time

This topic provides instructions on how to set the system date and time in the Setup Utility program.

To set the system date and time in the Setup Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 39.
2. On the **Main** menu, select **System Time & Date**.
3. Use the Tab key to switch between data elements and type the numbers from the keyboard to set the system date and time.
4. Press F10 to save settings and exit the Setup Utility program.

Using passwords

By using the Setup Utility program, you can set a password to prevent unauthorized access to your server.

You do not have to set a password to use your server. However, using a password improves computing security. If you decide to set a password, read the following topics.

Setup Utility program password types

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

- **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.

- **Power-On password**

  When a power-on password is set, the server cannot be used until a valid password is typed in.

Note: If both the administrator password and power-on password are set, you can type either password to use the server. However, you must use your administrator password to change any configuration settings.

Password considerations

For security reasons, it is recommended that you use a strong password that cannot be easily compromised.

Notes:

1. The Setup Utility program passwords are not case sensitive.
2. The server supports Setup Utility program passwords that consist of up to 20 characters.

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
- Not be your name or your user name
- Not be a common word or a common name
- Be significantly different from your previous passwords

Besides the alphabetic characters (a-z) and numeric characters (0-9), the server also supports characters typed using special keys on the keyboard for a password. Refer to the help message on the screen when setting a password to determine the valid special characters.

Setting, changing, or deleting a password

This topic provides instructions on how to set, change, or delete a password in the Setup Utility program.

To set, change, or delete a password in the Setup Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 39.
2. On the **Security** menu, select **Set Administrator Password** to set an administrator password or select **Set Power-On Password** to set a user password.
3. See “Password considerations” on page 43. Then, follow the instructions on the screen to set or change a password.
4. If you want to delete a password, type your current password. Press Enter when you are prompted to type a new password. Then, press Enter to confirm the new password. The previous password will be cleared.

   Note: For security reasons, it is recommended that you always set a password for your server.
5. Press F10 to save settings and exit the Setup Utility program.

If you have forgotten the password, you can use the Clear CMOS jumper on the system board to erase the password. See “System board components” on page 33. Then, set a new password for the server.

Configuring the TPM function

The TPM works as a hardware security solution to help you to encrypt data and protect the server.

To enable the TPM function in the Setup Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 39.
2. On the **Security** menu, select **TCG Feature Setup**, and then press Enter.
3. Select **TCG Security Features**. Then, set the **TPM Support** to **Active**.
4. Press F10 to save settings and exit the Setup Utility program. The server will restart in order to enable the TPM function.

Selecting a startup device

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

Note: Not all discs, hard disk drives, or other removable devices are bootable.

- To select a temporary startup device, do the following:

  Note: Selecting a startup device using the following method does not permanently change the startup sequence.

1. Turn on or restart your server.
2. When you see the logo screen, press F12 to display the boot menu. The boot device selection window opens.
3. In the boot device selection window, use the up and down arrow keys on the keyboard to switch between the selections. Press Enter to select the device of your choice. Then, the server will start up from the selected device.

- 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 39.
  2. On the **Startup** menu, follow the instructions on the screen to set the startup device depending on your needs. You also can set the boot priority for various devices. See “Startup menu” on page 42.
  3. Press F10 to save settings and exit the Setup Utility program. The server will follow the startup device sequence you have set each time you turn on the server.

Exiting the Setup Utility program

After you finish viewing or changing settings, press Esc to return to the Setup Utility program main interface. If you are on a nested submenu, press Esc repeatedly until you reach the main interface. Then, you can do one of the following:

- If you want to save the new settings and exit the Setup Utility program, press F10 or select **Exit → Save Changes and Exit**. Otherwise, your changes will not be saved.
- If you do not want to save the new settings, select **Exit → Discard Changes and Exit**.
- If you want to return to the default settings, press F9 or select **Exit → Load Optimal Defaults**.

For more information about the **Exit** menu in the Setup Utility program, see “Exit menu” on page 42.

Updating or recovering the BIOS

This topic provides instructions on how to update the BIOS and how to recover from a POST and BIOS update failure.

System programs are the basic layer of software built into your server. System programs include the POST, the UEFI BIOS, and the Setup Utility program. The POST is a set of tests and procedures that are performed each time you turn on your server. The UEFI BIOS is a layer of software that translates instructions from other layers of software into electrical signals that the server hardware can execute. You can use the Setup Utility program to view or change the configuration settings of your server. See “Using the Setup Utility program” on page 39.

Lenovo might make changes and enhancements to the BIOS. When updates are released, they are available for download on the Lenovo Web site at http://www.lenovo.com/drivers. You can update the server firmware by downloading an update package and following the instructions on the Web page.

You also can use the Firmware Updater program to help you keep the server firmware up-to-date. See “Updating the firmware” on page 54.

Updating (flashing) the BIOS

This topic provides instructions on how to update (flash) the BIOS.

Notes:

- Update the BIOS on your server only if the newer BIOS version specifically solves a problem you have. We do not recommend BIOS updates for servers that do not need them. You can view the updated information for the new BIOS version in the installation instructions for the BIOS update utility program.

- Downgrading the BIOS to an earlier version is not recommended and might not be supported. An earlier BIOS version might not contain the support for the latest system configurations.
- If the power to your server is interrupted while the POST and BIOS are being updated, your server might not restart correctly. Ensure that you perform the BIOS update procedure in an environment with a steady power supply. Besides, ensure that your server can restart successfully without encountering hardware problems.
- If you have updated the BIOS firmware, 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.

To update (flash) the BIOS, do the following:

1. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to locate the BIOS update package.
2. Download the BIOS update package and the TXT file that contains installation instructions.
3. Print the TXT file and follow the instructions to update (flash) the BIOS.
4. Check and reconfigure the BIOS settings for your specific needs based on your note or refer to “Using the Setup Utility program” on page 39 after the BIOS update process is completed.

Using the ThinkServer EasyStartup program

This topic guides you to use the ThinkServer EasyStartup program to set up and configure your server.

The ThinkServer EasyStartup program simplifies the process of configuring RAID and installing supported Windows and Linux operating systems, VMware hypervisors, and device drivers on your server. The program works with your operating system installation disc to automate the process of installing the operating system and associated device drivers. This program is provided with your server on a self-starting (bootable) *ThinkServer EasyStartup* DVD. The user guide for the program is also on the DVD and can be accessed directly from the program interface.

If you do not have a *ThinkServer EasyStartup* DVD, you also can download an ISO image from the Lenovo Support Web site and make a disc by yourself.

To download the ThinkServer EasyStartup program image and burn it into a disc, do the following:

1. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to locate the ThinkServer EasyStartup program.
2. Download the ISO image for the ThinkServer EasyStartup program and the readme file. The readme file contains important information about the ThinkServer EasyStartup program.
3. Print the readme file and read it carefully.
4. Use an optical drive and any DVD burning software to create a bootable disc with the ISO image.

Features of the ThinkServer EasyStartup program

This topic lists the features of the ThinkServer EasyStartup program.

The ThinkServer EasyStartup program has the following features:

- Contained in a self-starting (bootable) DVD
- Easy-to-use, language-selectable interface
- Integrated help system and user guide
- Automatic hardware detection
- RAID configuration utility

- Device drivers provided based on the server model and detected devices
- Ability to download device drivers from the *ThinkServer EasyStartup* DVD according to the operating system or add-on device
- Selectable partition size and file system type
- Support for multiple operating systems
- Ability to install the operating system and device drivers in an unattended mode to save time
- Ability to create a reusable response file that can be used with similarly configured Lenovo servers to make future installations even faster

Starting the ThinkServer EasyStartup program

This topic provides instructions on how to start the ThinkServer EasyStartup program. After you start the program and enter the main interface, click **User Guide** for detailed information about how to use this program to help you configure the server and install an operating system.

To start the ThinkServer EasyStartup program, do the following:

1. Insert the *ThinkServer EasyStartup* DVD into the optical drive, set the optical drive as the first startup device, and start your server from the DVD in the optical drive. See “Selecting a startup device” on page 44.
2. Wait for the ThinkServer EasyStartup program to load. Then, you will be prompted for the following selections:
   - The language in which you want to view the program
   - The language of the keyboard layout you will be using with the program

   Note: The supported languages and keyboard layouts for the ThinkServer EasyStartup program are German, English, Spanish, French, Italian, Dutch, Turkish, Japanese, and Russian.
3. After selecting the language and keyboard layout, click **OK**. Then, you will see one or more messages about configuring storage devices. Click **Next** until you are presented with the Lenovo License Agreement. Read the Lenovo License Agreement carefully. In order to continue, you must agree those terms by clicking **Agree**. Then, the Date and time window opens.
4. Set the current date and time and click **OK**. The Start option window opens.
5. The Start option window provides the following selections:
   - Continue to the main interface.
   - Install the operating system using a pre-existing response file.
   - Configure RAID using a pre-existing response file.

   Read the explanations on the screen and select a desired option. Then, follow the instructions on the screen. If this is the first time you are using the ThinkServer EasyStartup program, select the option to continue to the main interface and view the compatibility notes and user guide.

Notes:

1. Functionality and supported operating systems vary depending on the version of the ThinkServer EasyStartup program. From the main interface of the program, click **Compatibility notes** to view the information about the RAID controllers, operating systems, and server configurations supported by the specific version of the program and click **User Guide** to view the various functions and learn how to use the program.
2. Before using the ThinkServer EasyStartup program to install an operating system, ensure that any external storage devices and fiber channels are configured correctly.

The ThinkServer EasyStartup program main interface provides the following menus on the left pane of the screen:

- **Home**

  This menu is the welcome page that contains some general descriptions about the program and the Lenovo copyright and trademark statements.

- **Compatibility notes**

  This menu provides information about the RAID controllers, operating systems, and server configurations supported by the version of the program you are using.

- **User Guide**

  This menu provides information about the features of the program and instructions on how to use the program.

- **Hardware list**

  This menu displays a list of hardware devices detected by the program.

- **Configure RAID**

  This menu guides you to configure RAID or view the current RAID configuration and make changes if needed.

- **Install operating system**

  This menu displays a series of choices and prompts to collect information required for operating system installation, prepares the hard disk drive for installation, and then initiates the installation process using your operating system installation disc.

- **Download drivers**

  This menu helps you download the required device drivers from the *ThinkServer EasyStartup* DVD to a removable storage device so that you can easily get the drivers for server configuration when you need them.

  Note: The most up-to-date device drivers for various server models are always available for download on the Lenovo Support Web site at:
  http://www.lenovo.com/drivers

- **About**

  This menu provides the version information and legal notices.

Using the ThinkServer EasyStartup program on a Windows operating system

You can run the *ThinkServer EasyStartup* DVD on a Windows operating system with the Internet Explorer® 6.0 Web browser or a later version installed. Enter the operating system and insert the *ThinkServer EasyStartup* DVD into an internal or external optical drive. The DVD starts automatically in most environments. If the DVD fails to start, open the launch.exe file located in the root directory of the DVD.

Note: You should read and accept the Lenovo License Agreement when prompted.

You can do the following when using the ThinkServer EasyStartup program on a Windows operating system. For detailed information, refer to the help system.

- View a general introduction to your ThinkServer server model and the specific server configuration information.
- View general guidance on how to use the *ThinkServer EasyStartup* DVD.
- Download the required device drivers to a removable storage device so that you can easily get the drivers for server configuration when you need them, especially when you finish installing an operating

system without using the *ThinkServer EasyStartup* DVD and need appropriate device drivers to configure your server.

- Install the required device drivers directly on the server on which you are running the *ThinkServer EasyStartup* DVD.
- View information about all server models supported by the ThinkServer EasyStartup program and information about the device drivers for each server model, including the driver versions and driver locations in the root directory of the *ThinkServer EasyStartup* DVD.

  Note: The most up-to-date device drivers for various server models are always available for download on the Lenovo Support Web site at:
  http://www.lenovo.com/drivers

Configuring RAID

This topic provides information about RAID and the utility programs that are available for you to configure RAID.

This topic contains the following items:

About RAID

RAID, an acronym for Redundant Array of Independent Disks, is a technology that provides increased storage functions and reliability through redundancy. This is achieved by combining multiple hard disk drives into a logical unit, where data is distributed across the drives in one of several ways called RAID levels.

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

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

The following list describes some of the most commonly used RAID levels:

- **RAID 0**: block-level striping without parity or mirroring

  Simple stripe sets are normally referred to as RAID 0. RAID 0 uses striping to provide high data throughput, especially for large files in an environment that does not require fault tolerance. RAID 0 has no redundancy and it provides improved performance and additional storage without fault tolerance. Any drive failure destroys the array and the likelihood of failure increases with more drives in the array. RAID 0 does not implement error checking, so any error is uncorrectable. More drives in the array means higher bandwidth, but greater risk of data loss.

  RAID 0 requires a minimum number of two hard disk drives.

- **RAID 1**: mirroring without parity or striping

  RAID 1 uses mirroring so that data written to one drive is simultaneously written to another drive. This is good for small databases or other applications that require small capacity but complete data redundancy. RAID 1 provides fault tolerance from disk errors or failures and continues to operate as long as at least one drive in the mirrored set is functioning. With appropriate operating system support, there can be increased read performance and only a minimal write performance reduction.

  RAID 1 requires a minimum number of two hard disk drives.

- **RAID 5**: block-level striping with distributed parity

  RAID 5 uses disk striping and parity data across all drives (distributed parity) to provide high data throughput, especially for small random access. RAID 5 distributes parity along with the data and requires all drives but one to be present to operate; drive failure requires replacement, but the array is not destroyed by a single drive failure. Upon drive failure, any subsequent read operations can be calculated from the distributed parity so that the drive failure is masked from the end user. The array will have data loss in the event of a second drive failure and is vulnerable until the data that was on the failing drive is rebuilt onto a replacement drive. A single drive failure in the set will result in reduced performance of the entire set until the failing drive has been replaced and rebuilt.

  RAID 5 requires a minimum number of three hard disk drives.

- **RAID 6**: block-level striping with distributed parity

  RAID 6 uses distributed parity, with two independent parity blocks per stripe, and disk striping. A RAID 6 virtual drive can survive the loss of any two drives without losing data. A RAID 6 drive group is similar to a RAID 5 drive group. Blocks of data and parity information are written across all drives. The parity information is used to recover the data if one or two drives fail in the drive group.

  RAID 6 requires a minimum number of three hard disk drives.

- **RAID 10**: a combination of RAID 0 and RAID 1

  RAID 10 consists of striped data across mirrored spans. A RAID 10 drive group is a spanned drive group that creates a striped set from a series of mirrored drives. RAID 10 allows a maximum of eight spans. You must use an even number of drives in each RAID virtual drive in the span. The RAID 1 virtual drives must have the same stripe size. RAID 10 provides high data throughput and complete data redundancy but uses a larger number of spans.

  RAID 10 requires a minimum number of four hard disk drives and also requires an even number of drives, for example, six hard disk drives or eight hard disk drives.

- **RAID 50**: a combination of RAID 0 and RAID 5

  RAID 50 uses distributed parity and disk striping. A RAID 50 drive group is a spanned drive group in which data is striped across multiple RAID 5 drive groups. RAID 50 works best with data that requires high reliability, high request rates, high data transfers, and medium-to-large capacity.

  Note: Having virtual drives of different RAID levels, such as RAID 0 and RAID 5, in the same drive group is not allowed. For example, if an existing RAID 5 virtual drive is created out of partial space in an array, the next virtual drive in the array has to be RAID 5 only.

  RAID 50 requires a minimum number of six hard disk drives.

- **RAID 60**: a combination of RAID 0 and RAID 6

  RAID 60 uses distributed parity, with two independent parity blocks per stripe in each RAID set, and disk striping. A RAID 60 virtual drive can survive the loss of two drives in each of the RAID 6 sets without losing data. RAID 60 works best with data that requires high reliability, high request rates, high data transfers, and medium-to-large capacity.

  RAID 60 requires a minimum number of six hard disk drives.

For detailed information about RAID, refer to “Introduction to RAID” in the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server.

RAID for your server

This topic provides information about the RAID supported by your server.

Note: Before configuring RAID for your server, ensure that you use hard disk drives that are of the same type (SATA or SAS) and have the same capacity within a single RAID array.

Your server supports the following two types of RAID configurations:

- **Onboard SATA software RAID configuration using the Intel Rapid Storage Technology enterprise program**

  The onboard SATA software RAID controller is integrated on the Intel C226 chip on the system board. If your server has SATA hard disk drives that are connected to the system board, you can use the Intel Rapid Storage Technology enterprise program to configure RAID. By default, your server supports onboard SATA software RAID levels 0, 1, 5, and 10. The onboard RAID is a software RAID instead of a hardware RAID.

  For detailed information, see “Configuring the system BIOS to enable onboard SATA RAID functionality” on page 51.

- **Advanced SATA/SAS hardware RAID configuration using the WebBIOS Configuration Utility program; and RAID management using the MegaRAID Storage Manager program and the MegaCLI Configuration Utility program (requires a RAID card)**

  Some server models come with a required RAID card to provide advanced SATA/SAS hardware RAID functions to the server. You also can purchase the RAID card from Lenovo and install it into server models that support the RAID card to get advanced SATA/SAS hardware RAID functions. See “RAID card” on page 22 and “Installing or removing the RAID card” on page 66 for more information.

  Note: For server models with SAS hard disk drives, a RAID card must be installed.

  The RAID card provides the WebBIOS Configuration Utility program to help you configure RAID independently of the operating system. You also can install the MegaRAID Storage Manager program and the MegaCLI Configuration Utility program to help you manage the RAID array and RAID controller in an operating system environment. The supported RAID levels are RAID 0, 1, and 10 by default. For the ThinkServer RAID 500 Adapter, to activate RAID 5 level, you need to install a RAID 5 key on the RAID card. See “Installing or removing the ThinkServer RAID 500 Upgrade Key for Advanced RAID” on page 70.

  For detailed information, see “Configuring the advanced SATA or SAS hardware RAID” on page 53.

Note: The ThinkServer EasyStartup program simplifies the process of configuring supported RAID and installing supported operating systems and device drivers.

Before configuring RAID for your server, observe the following precautions:

1. Use hard disk drives that have the same capacity within a single RAID array.
2. Use hard disk drives that are of the same type (SATA or SAS) within a single RAID array.
3. Depending on the operating system, the primary RAID might be limited to 2 TB total drive capacity.

Configuring the system BIOS to enable onboard SATA RAID functionality

This section describes how to configure the system BIOS to enable onboard 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 39.
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 Rapid Storage Technology enterprise 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 Rapid Storage Technology enterprise 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 Rapid Storage Technology enterprise 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 Rapid Storage Technology enterprise 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 52 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 Rapid Storage Technology enterprise 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 52 for RAID volume deletion.

- See “Creating RAID volumes” on page 52 for RAID volume creation.
- Use the up and down arrow keys to select **Exit** and press Enter.

Configuring the advanced SATA or SAS hardware RAID

Some server models come with a required RAID card to provide advanced SATA/SAS hardware RAID functions to the server. You also can purchase the RAID card from Lenovo and install it into server models that support the RAID card to get advanced SATA/SAS hardware RAID functions. See “RAID card” on page 22 and “Installing or removing the RAID card” on page 66 for more information.

Note: For server models with SAS hard disk drives, a RAID card must be installed.

The RAID card provides the WebBIOS Configuration Utility program to help you configure RAID independently of the operating system. You also can install the MegaRAID Storage Manager program and the MegaCLI Configuration Utility program to help you manage the RAID array and RAID controller in an operating system environment. The supported RAID levels are RAID 0, 1, and 10 by default. For the ThinkServer RAID 500 Adapter, to activate RAID 5 level, you need to install a RAID 5 key on the RAID card. See “Installing or removing the ThinkServer RAID 500 Upgrade Key for Advanced RAID” on page 70.

The installation packages for the MegaRAID Storage Manager program and the MegaCLI Configuration Utility program are on the *ThinkServer EasyStartup* DVD. After you enter the operating system, insert the *ThinkServer EasyStartup* DVD into the optical drive. The installation packages for the programs are located in the Utilities and Others folder in the root directory of the DVD.

Note: The *ThinkServer EasyStartup* DVD is designed for different types of servers and the Utilities and Others folder might contain additional installation packages that are not required to be installed into your server.

For instructions on how to configure and manage the advanced SATA or SAS hardware RAID, refer to the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server. This document is also available on the Lenovo Web site at:
http://www.lenovo.com/UserManuals

Configuring RAID using the ThinkServer EasyStartup program

The ThinkServer EasyStartup program simplifies the process of configuring supported RAID and installing supported Windows and Linux operating systems and device drivers on your server. The user guide for the program can be accessed directly from the program interface.

The ThinkServer EasyStartup program has the following features for RAID configuration:

- For use with all supported RAID controllers
- Automatically detects hardware and lists all supported RAID configurations
- Configures one or more disk arrays per controller depending on the number of drives attached to the controller and the RAID level selected
- Supports hot-spare drives
- Creates a RAID response file that can be used to configure RAID controllers on similarly configured Lenovo servers

See “Using the ThinkServer EasyStartup program” on page 46 and view the user guide from the main interface of the program.

Some RAID management software also is provided on the *ThinkServer EasyStartup* DVD to help you manage RAID arrays and RAID controllers in an operating system environment. After you enter the operating system, insert the *ThinkServer EasyStartup* DVD into the optical drive. The installation packages for the programs are located in the Utilities and Others folder in the root directory of the DVD. The *ThinkServer EasyStartup* DVD is

designed for different types of servers and the Utilities and Others folder might contain additional installation packages that are not required to be installed into your server. For more information, see “Installing and using the MegaRAID Storage Manager program” on page 54 and “Configuring the advanced SATA or SAS hardware RAID” on page 53.

Installing and using the MegaRAID Storage Manager program

You can install and use the MegaRAID Storage Manager program to manage the RAID array and RAID controller in an operating system environment after configuring RAID.

The installation package for the MegaRAID Storage Manager program is on the *ThinkServer EasyStartup* DVD. After you enter the operating system, insert the *ThinkServer EasyStartup* DVD into the optical drive. The installation package for the MegaRAID Storage Manager program is located in the Utilities and Others folder in the root directory of the DVD.

To install and use the MegaRAID Storage Manager program, refer to the following chapters in the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server:

Note: Some information in these chapters might be intended for the advanced SATA/SAS hardware RAID configurations and might not apply to the onboard SATA software configurations.

- “MegaRAID Storage Manager Overview and Installation”
- “MegaRAID Storage Manager Window and Menus”
- “Monitoring System Events and Storage Devices”
- “Maintaining and Managing Storage Configurations”

The *MegaRAID SAS Software User Guide* also is available on the Lenovo Web site at:
http://www.lenovo.com/UserManuals

Configuring the Ethernet controllers

The Ethernet controllers are integrated on the system board. They provide an interface for connecting to a 10 Mbps, 100 Mbps, or 1000 Mbps network and provide full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network.

You do not have to set any jumpers or configure the Ethernet controllers. However, you must install a device driver to enable the operating system to recognize the controllers.

The ThinkServer EasyStartup program simplifies the process of configuring RAID and installing supported operating systems and device drivers on your server. See “Using the ThinkServer EasyStartup program” on page 46.

The device drivers for onboard Ethernet controllers are also available for download at:
http://www.lenovo.com/drivers

Updating the firmware

The firmware in the server is periodically updated and is available for download on the Lenovo Web site.

Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to check for the latest level of firmware, such as the BIOS updates and device drivers.

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 reflash the BIOS and the FRU/SDR.

Using the Firmware Updater program

The Firmware Updater program enables you to maintain your system firmware up-to-date and helps you avoid unnecessary outages.

To update your system firmware using the Firmware Updater program, do the following:

Note: Before distributing the firmware updates to a server, ensure that your server can restart successfully without encountering hardware problems.

1. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to locate the Firmware Updater program.
2. Download the ISO image for the Firmware Updater program and the TXT file that contains the installation instructions.
3. Use any CD or DVD burning software to create a bootable disc with the ISO image.
4. Print the TXT file and follow the instructions to use the Firmware Updater program to update your system firmware.

Chapter 6. Installing, removing, or replacing hardware

This chapter provides instructions on how to install, remove, or replace hardware for your server.

This chapter contains the following items:

For a list of ThinkServer options, go to:
http://lenovoquickpick.com/usa/home/thinkserver/rack-and-tower-server

Guidelines

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

Precautions

Before using the server, ensure that you read and understand the following precautions:

- Before using the product, ensure that you read and understand the multilingual safety instructions and the Lenovo Limited Warranty (LLW) on the documentation DVD that comes with the product. Reading and understanding the safety instructions reduces the risk of personal injury and damage to your product.
- 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, go to http://www.lenovo.com/drivers and follow the instructions on the Web page. See “Updating the firmware” on page 54 for more information.
- Before you install optional hardware devices, ensure that the server is working correctly. If the server is not working correctly, see Chapter 7 “Troubleshooting and diagnostics” on page 115 to do basic troubleshooting. If the problem cannot be solved, see Chapter 8 “Getting information, help, and service” on page 121.
- 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, ensure 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:
  - Ensure 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.
- Ensure that you have enough 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 LEDs on the system board and internal components, leave the server connected to power.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.

Handling static-sensitive devices

Attention: Do not open the static-protective package that contains 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.

Any server part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). ESD damage can occur when there is a difference in charge between objects. Protect against ESD damage by equalizing the charge so that the machine, the part, the work mat, and the person handling the part are all at the same charge.

Notes:

- Use product-specific ESD procedures when they exceed the requirements noted here.
- Ensure that the ESD protective devices you use have been certified (ISO 9000) as fully effective.

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.
- Always carefully handle the parts and other components (such as PCI Express cards, memory modules, system boards, and microprocessors) by edges or frame. Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- Before you replace a new part, touch the static-protective package containing the new part to an unpainted metal part of 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.
- Use a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
- Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
- The use of a grounding system is recommended. For example, it is recommended to wear an electrostatic discharge (ESD) wrist strap, if one is available. Ensure that you work in an ESD-safe area. Select a grounding system, such as those listed below, to provide protection that meets the specific service requirement.

  Note: The use of a grounding system to guard against ESD damage is desirable but not necessary.

  - Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
  - When working on a double-insulated or battery-operated system, use an ESD common ground or reference point. You can use coax or connector-outside shells on these systems.
  - Use the ground prong of the ac plug on ac-operated servers.

System reliability guidelines

To help ensure proper cooling and system reliability, strictly follow these guidelines:

- Each of the drive bays has a drive or a dummy tray installed; or there is an electromagnetic interface (EMI) protective panel or EMI shield installed to protect the drive cage.
- Leave adequate space around the server to ensure that the server cooling system works well. Leave approximately 50 mm (2 inches) of open space around the front and rear of the server. Do not place objects in front of the fans. For proper cooling and airflow, install the server cover before you turn on the server. Operating the server for extended periods of time (more than 30 minutes) with the server cover removed might damage server components.
- Properly route the cables. For some options, such as PCI cards, follow the cabling instructions that come with the options in addition to the instructions in this manual.
- If your server has air ducts or air baffles, do not remove them while the server is running. Operating the server without the air ducts or air baffles might cause the microprocessors to overheat.
- For servers that support up to two microprocessors, ensure that the second microprocessor socket always contains a microprocessor or is protected by a microprocessor socket cover.

Removing the server cover

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To remove the server cover, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.

3. Loosen the thumbscrew that secures the server cover. Slide the server cover to the rear until it is disengaged from the chassis. Then, lift the server cover off the chassis and set it aside.

   Note: The thumbscrew is an integrated part of the server cover. Do not try to remove the thumbscrew from the server cover.

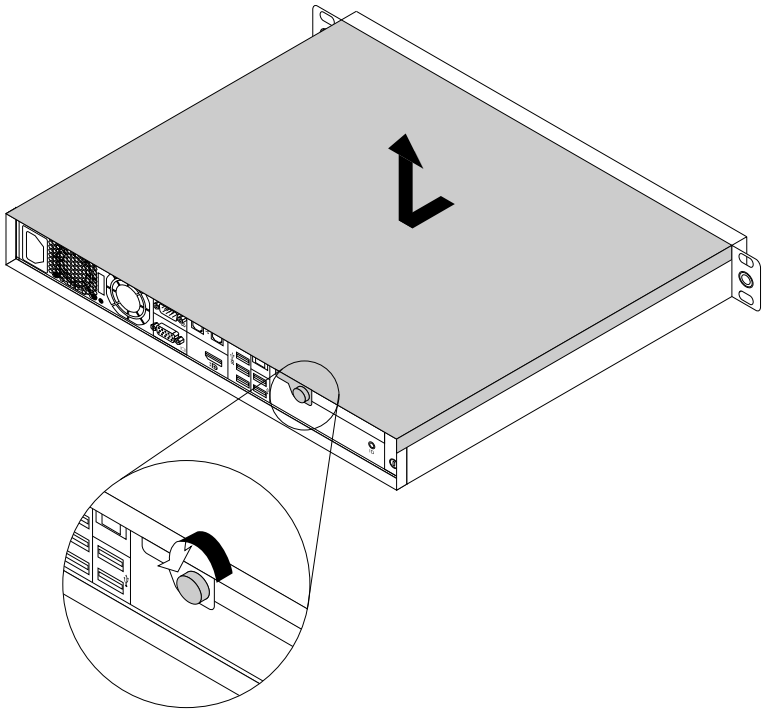


Figure 25. Removing the server cover

Attention: For proper cooling and airflow, install the server cover before turning on the server. Operating the server for more than 30 minutes with the server cover removed might damage server components.

To reinstall the server cover, see “Reinstalling the server cover and reconnecting cables” on page 110.

Installing, removing, or replacing hardware

This topic provides instructions on how to install, remove, or replace hardware for your server. You can expand the capabilities of your server by adding new hardware devices, such as memory modules, PCI Express cards, or other server options, and maintain your server by replacing the failing hardware devices.

If you are handling a server option, refer to the appropriate installation and or removal instructions in this topic along with the instructions that come with the option.

Notes:

- Use only parts provided by Lenovo.
- Depending on the model, your server might look slightly different from the illustrations in this topic.

The EMI integrity and cooling of the server are protected by having all drive bays and PCI card slots covered or occupied. When you install an internal drive or a PCI card, save the EMI shield or dummy tray from the drive bay or save the PCI card slot bracket in case you later remove the device.

Attention: An unoccupied drive bay or PCI card slot without a cover, shield, dummy tray, filler, or any other protection might impact the EMI integrity and cooling of the server, which might result in overheating or component damage.

Removing and reinstalling the rack handles

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustration in this topic.

To remove and reinstall the rack handles, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. On each side of the server, remove the two screws **1** that secure the rack handle and then remove the rack handle from the chassis.

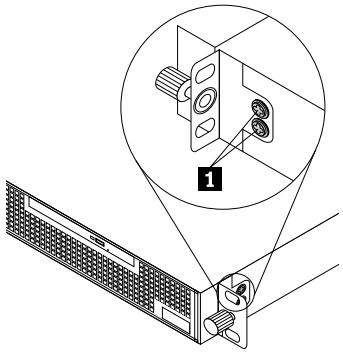


Figure 26. Removing the rack handles

4. To reinstall each rack handle, ensure that the screw holes in the rack handle are aligned with the corresponding holes in the chassis. Then, install the two screws to secure the rack handle.
5. Go to “Completing the parts replacement” on page 110.

Removing and reinstalling the fan duct

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

To access some server components on the system board, you must remove the fan duct. To ensure proper cooling and airflow, you must reinstall the fan duct before turning on the server.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

To remove and reinstall the fan duct, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the fan duct in the server. Disconnect the 4-pin power cable 1 from the system board and then release the power cable from the tabs that attach the power cable to the fan duct. Lift the fan duct out of the server.

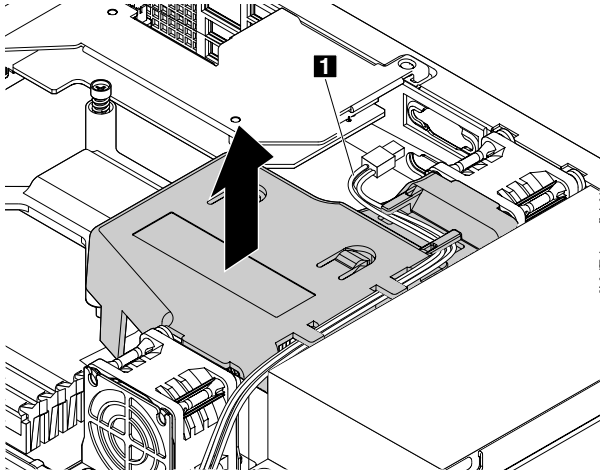


Figure 27. Removing the fan duct

5. To reinstall the fan duct, note the orientation of the fan duct and then place it above the heat sink. Then, lower the fan duct into the chassis until it is secured into place.

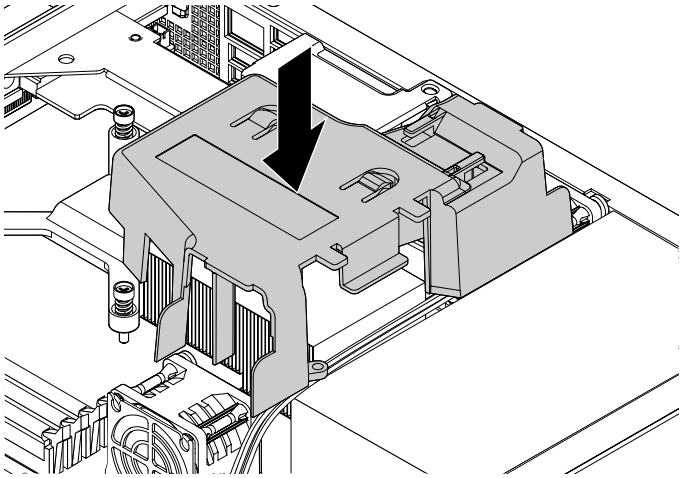


Figure 28. Installing the fan duct

6. Route the 4-pin power cable under the tabs on the fan duct and then connect the 4-pin power cable to the system board. See “System board components” on page 33.
7. Go to “Completing the parts replacement” on page 110.

Installing or removing a memory module

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

Note: The memory modules are sensitive to ESD. Ensure that you read and understand “Handling static-sensitive devices” on page 58 first and carefully perform the operation.

Memory module installation rules

Your server has four memory slots to provide the following features:

- Each slot supports 2 GB, 4 GB, and 8 GB double data rate 3 (DDR3) unbuffered dual inline memory modules (UDIMMs) with Error Checking and Correcting (ECC) technology.
- The minimum system memory is 2 GB (only one 2 GB memory module installed in the DIMM2 slot).
- The maximum system memory is 32 GB (one 8 GB memory module installed in each of the four memory slots).

For more information about the memory modules in your specific server model, use the Setup Utility program. See “Viewing information in the Setup Utility program” on page 39.

For a list of supported ThinkServer memory module options, go to:
http://lenovoquickpick.com/usa/home/thinkserver/rack-and-tower-server

The following illustration shows the locations of all memory slots on the system board.

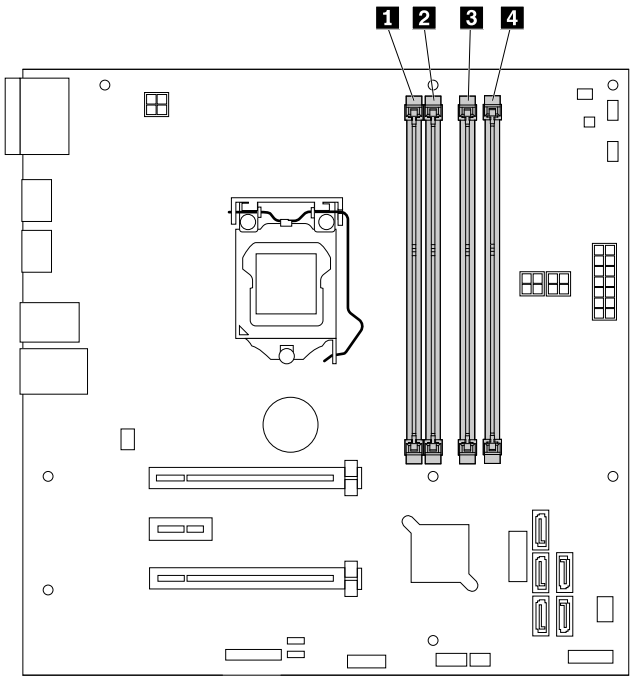


Figure 29. Memory slots on the system board

1 Memory slot (DIMM1)	2 Memory slot (DIMM2)
3 Memory slot (DIMM3)	4 Memory slot (DIMM4)

The following table explains the memory module installation rules for your server. The “X” mark indicates the memory slots into which the memory modules should be installed in different situations.

Table 3. Memory module installation rules

DIMM	DIMM1	DIMM2	DIMM3	DIMM4
One DIMM		X		
Two DIMMs		X		X
Three DIMMs	X	X		X
Four DIMMs	X	X	X	X

Installing a memory module

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- Ensure that you follow the memory module installation rules when performing the operation. See “Memory module installation rules” on page 63.
- Use any documentation that comes with the memory module and follow those instructions in addition to the instructions in this topic.

To install 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the memory slots on the system board and read the memory module installation rules. See “Memory module installation rules” on page 63.
5. Open the retaining clips of the appropriate memory slot.

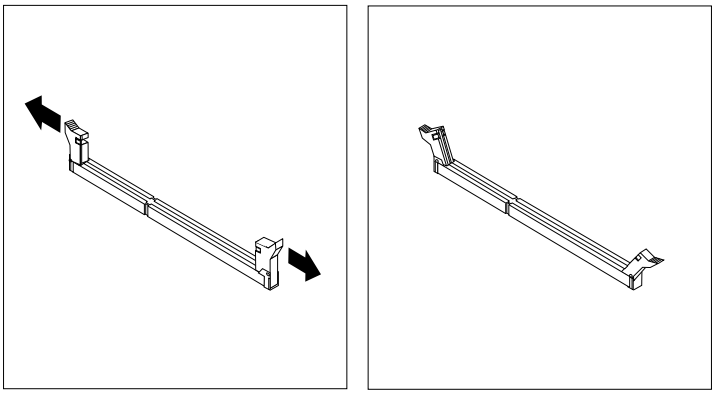


Figure 30. Opening the retaining clips of the memory slot

6. Touch the static-protective package that contains the new memory module to any unpainted surface on the outside of the server. Then, take the new memory module out of the package.

   Note: Carefully handle the memory module by its edges.

7. Position the new memory module over the memory slot. Ensure 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 memory slot until the retaining clips are closed.

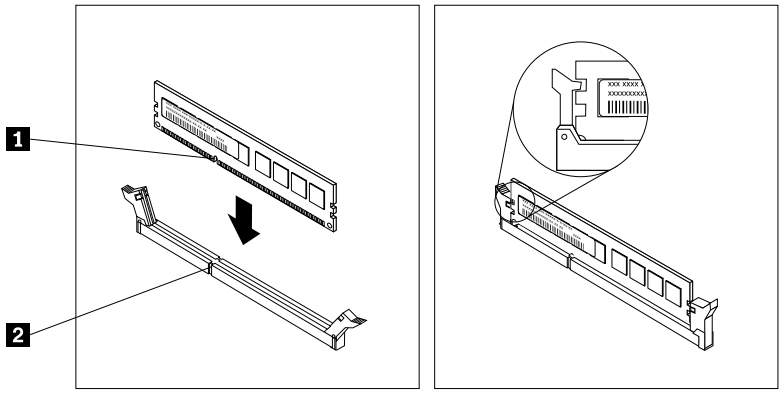


Figure 31. Installing a memory module

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 110.

Removing a memory module

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 57.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

To remove 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See "Removing the server cover" on page 59.
4. Locate the memory slots on the system board and read the memory module installation rules. See "Memory module installation rules" on page 63.

5. Locate the memory module that you want to remove and open the retaining clips on both ends of the memory slot. Then, grasp the memory module by its edges and carefully pull it straight up to remove it from the memory slot.

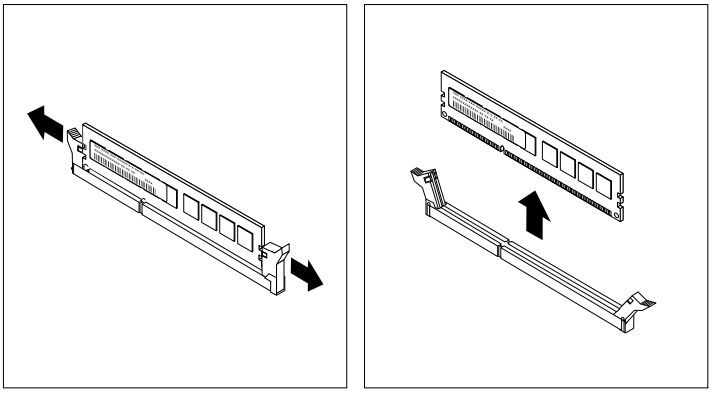


Figure 32. Removing a memory module

6. If you are instructed to return the old memory module, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to "Completing the parts replacement" on page 110.

Installing or removing the RAID card

This topic provides instructions on how to install or remove the RAID card. If you are installing or removing any other types of supported PCI Express cards, such as HBA cards, the procedure is similar.

You can install a supported RAID card into your server to provide advanced hardware RAID functions. For more information, see "RAID card" on page 22 and "Configuring RAID" on page 49.

Installing the RAID card

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 57.

Attention: Ensure that you back up your data before installing the RAID card because you might need to reconfigure RAID and reinstall the operating system after installing the RAID card.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- The RAID card is sensitive to ESD. Ensure that you read and understand "Handling static-sensitive devices" on page 58 first and carefully perform the operation.
- Depending on the specific type, your RAID card might look different from the illustrations in this topic.
- Use any documentation that comes with the RAID card and follow those instructions in addition to the instructions in this topic.

To install the RAID 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the riser card assembly in the server. See “Server components” on page 18.
5. Remove the screw that secures the PCI-Express-card-slot bracket and then remove the bracket from the chassis. Store it in case you later remove the PCI Express card and need the bracket to cover the place.

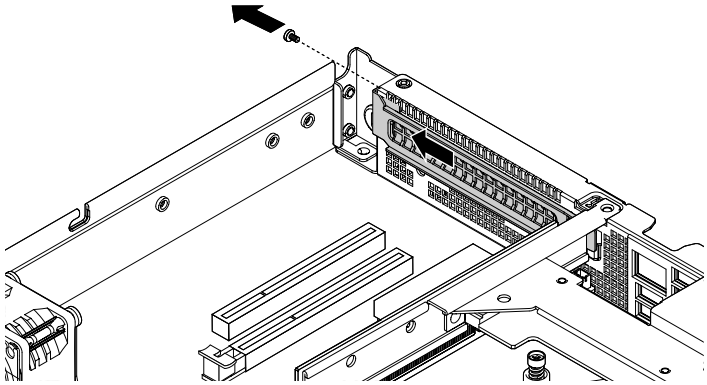


Figure 33. Removing a PCI-Express-card-slot bracket

6. Touch the static-protective package that contains the new RAID card to any unpainted surface on the outside of the server. Then, take the new RAID card out of the package.

   Note: Carefully handle the RAID card by its edges.
7. Connect the mini-SAS to SAS combo cable to the RAID card. See “Connecting the cables” on page 23.

8. Correctly position the new RAID card near the PCI Express card slot on the riser card assembly. Then, carefully press the new RAID card into the slot until it is securely seated and its bracket also is secured at the rear of the server.

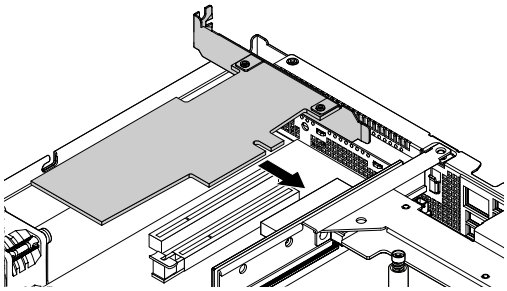


Figure 34. Installing the RAID card

9. Install the screw to secure the RAID card to the chassis.

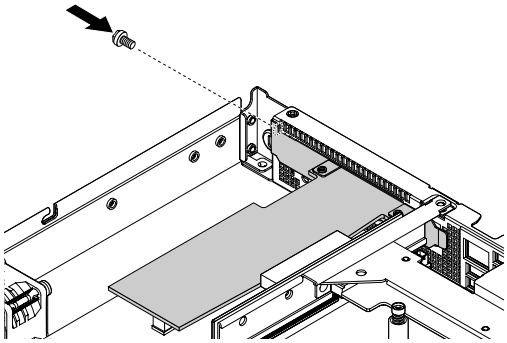


Figure 35. Installing the screw to secure the RAID card

10. Connect cables depending on your specific server configuration. See “Connecting the cables” on page 23.

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 110. Then, configure RAID for your server. See “Configuring RAID” on page 49.
- After you install a Lenovo RAID card, do the following:
  1. Check the firmware version of the new RAID card firmware by pressing Ctrl+H when starting the Setup Utility program.
  2. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to verify if there is an updated firmware version for the RAID card. If available, download and install the latest firmware version to your server.

Note: If you want to use the Firmware Updater program, ensure that it is the latest version. To get the latest version of the Firmware Updater program, go to http://www.lenovo.com/drivers, locate the different versions of the program, and then identify the latest version by comparing readme files. If the latest version of the Firmware Updater program does not contain the latest version of the driver you need, download that driver separately from the Web page and install it to your server individually.

Removing the RAID card

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 57.

Attention: Ensure that you back up your data before removing the RAID card because you might need to reconfigure RAID and reinstall the operating system after removing the RAID card.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- If you remove the RAID card, you will lose the advanced hardware RAID functions.
- The RAID card is sensitive to ESD. Ensure that you read and understand "Handling static-sensitive devices" on page 58 first and carefully perform the operation.
- Depending on the specific type, your RAID card might look different from the illustrations in this topic.
- Use any documentation that comes with the RAID card and follow those instructions in addition to the instructions in this topic.

To remove the RAID 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See "Removing the server cover" on page 59.
4. Remove the screw that secures the RAID card to the riser card assembly. Then, grasp the RAID card by its edges and carefully pull it out of the PCI Express card slot.

   Note: The RAID card might fit tightly into the PCI Express card slot. If necessary, alternate moving each side of the RAID card a small and equal amount until it is removed from the slot.

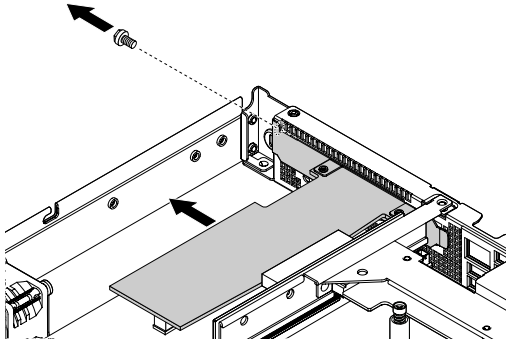


Figure 36. Removing the RAID card

5. Disconnect any cables from the RAID card.
6. If you want to install a new RAID card, see “Installing the RAID card” on page 66.
7. If you are instructed to return the old RAID card, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 110. Then, configure RAID for your server. See “Configuring RAID” on page 49.

Installing or removing the ThinkServer RAID 500 Upgrade Key for Advanced RAID

This topic provides instructions on how to install or remove the ThinkServer RAID 500 Upgrade Key for Advanced RAID (hereinafter referred to as the TR 500 Key).

The TR 500 Key expands the capability of the ThinkServer RAID 500 Adapter by activating RAID 5 for advanced SATA/SAS hardware RAID. You can purchase a TR 500 Key from Lenovo.

Installing the TR 500 Key

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

Attention: Back up your data before you begin if you want to reconfigure RAID and reinstall the operating system after installing the TR 500 Key.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the TR 500 Key and follow those instructions in addition to the instructions in this topic.

To install the TR 500 Key, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the ThinkServer RAID 500 Adapter, which is installed on the riser card assembly.
5. Touch the static-protective package that contains the TR 500 Key to any unpainted surface on the outside of the server. Then, take the TR 500 Key out of the package.

   Note: Carefully handle the TR 500 Key by its edges.

6. Locate the TR 500 key connector on the ThinkServer RAID 500 Adapter and then carefully insert the TR 500 Key into the connector. If necessary, you can remove the ThinkServer RAID 500 Adapter first, install the TR 500 Key on it, and then reinstall the ThinkServer RAID 500 Adapter. See “Installing or removing the RAID card” on page 66.

   Note: Ensure that the TR 500 Key is securely seated on the ThinkServer RAID 500 Adapter.

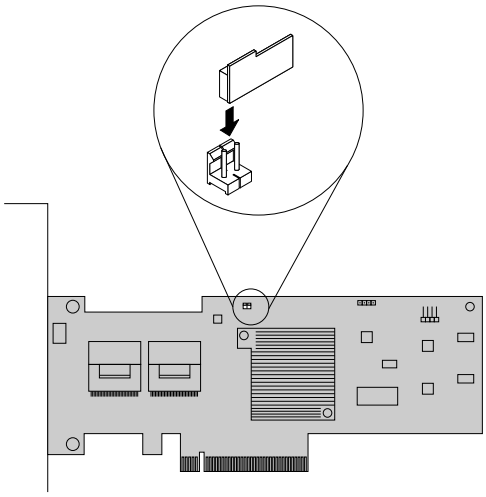


Figure 37. Installing the TR 500 Key

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 110. Then, the hardware RAID 5 is available for your server if your server has the required number of hard disk drives installed. Refer to the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server for information about how to configure the hardware RAID.

Removing the TR 500 Key

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

Attention: Back up your data before you begin if you need to reconfigure RAID and reinstall the operating system after removing the TR 500 Key.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- If you remove the TR 500 Key, the hardware RAID 5 will be disabled.
- Use any documentation that comes with the TR 500 Key and follow those instructions in addition to the instructions in this topic.

To remove the TR 500 Key, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the ThinkServer RAID 500 Adapter, which is installed on the riser card assembly.
5. Remove the TR 500 Key from the ThinkServer RAID 500 Adapter. If necessary, you can remove the ThinkServer RAID 500 Adapter first, remove the TR 500 Key from it, and then reinstall the ThinkServer RAID 500 Adapter. See “Installing or removing the RAID card” on page 66.

   Note: Carefully handle the TR 500 Key by its edges.

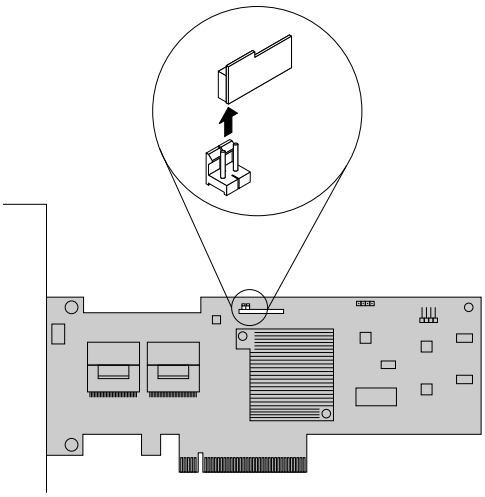


Figure 38. Removing the TR 500 Key

6. If you are instructed to return the old TR 500 Key, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 110. As the hardware RAID 5 is not available without the TR 500 Key, you might need to reconfigure RAID for your server. Refer to the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your server for information about how to configure the hardware RAID.

Installing or removing the ThinkServer RAID 700 Battery

This topic provides instructions on how to install or remove the ThinkServer RAID 700 Battery (hereinafter referred to as the TR 700 Battery).

The TR 700 Battery protects the integrity of the cached data on the ThinkServer RAID 700 Adapter by providing backup power up to 72 hours in the case of a complete ac power failure or a brief power outage. It has built-in functionality to charge the battery pack automatically and to communicate battery status information (such as voltage, temperature, and current) to your server. It also provides an inexpensive alternative to using an uninterruptible power supply, and a second level of fault tolerance when used with an uninterruptible power supply.

The temperature of the TR 700 Battery is generally 15-20°C (59-68°F) higher than the ambient temperature during fast charge. Therefore, to complete a recharge cycle, the ambient temperature should be lower

than 55°C (131°F). If the ambient temperature exceeds 55°C (131°F), the recharge cycle will terminate prematurely, thus preventing the TR 700 Battery from reaching a fully charged state. A recharge cycle lasts at least six hours under normal operating conditions.

Attention: It is recommended that you replace the TR 700 Battery annually or after 500 recharging cycles, whichever comes first.

Installing the TR 700 Battery

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 57.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the TR 700 Battery and follow those instructions in addition to the instructions in this topic.

To install the TR 700 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface. See the *Rack Installation Instructions* that comes with the server.
3. Remove the server cover. See "Removing the server cover" on page 59.
4. Remove the ThinkServer RAID 700 Adapter from the riser card assembly. See "Installing or removing the RAID card" on page 66.

   Note: Carefully handle the ThinkServer RAID 700 Adapter by its edges and place it on a flat, clean, and static-protective surface after you remove it.
5. Touch the static-protective package that contains the TR 700 Battery to any unpainted surface on the outside of the server. Then, take the TR 700 Battery out of the package.

6. Position the TR 700 Battery above the ThinkServer RAID 700 Adapter so that the board-to-board connector 1 on the bottom of the TR 700 Battery is aligned with the connector 2 on the ThinkServer RAID 700 Adapter; and the three mounting studs on the bottom of the TR 700 Battery are aligned with the corresponding holes in the ThinkServer RAID 700 Adapter. Carefully press the TR 700 Battery onto the ThinkServer RAID 700 Adapter until the two connectors (1 and 2) are firmly joined. Then, install the three screws that come with the TR 700 Battery option kit to secure the TR 700 Battery in place.

   Notes:

   - Center the screwdriver when you install the screws and do not over-tighten the screws to avoid possible damage to any parts.
   - Do not touch the board on the bottom of the TR 700 Battery.

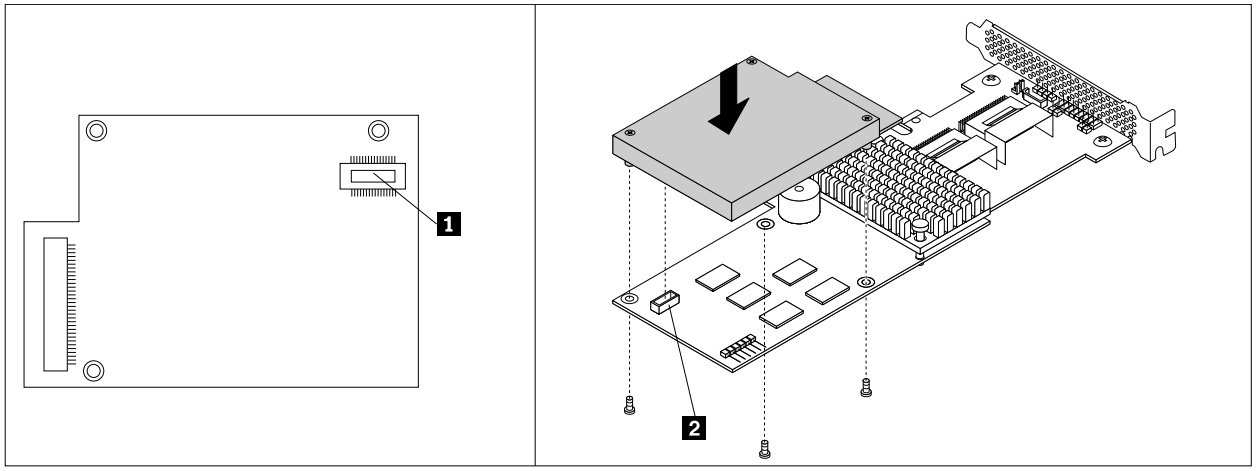


Figure 39. Installing the TR 700 Battery

7. Install the ThinkServer RAID 700 Adapter with the TR 700 Battery on the riser card assembly. See "Installing or removing the RAID card" on page 66.
8. Reinstall the riser card assembly. See "Replacing the riser card assembly" on page 79.

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 110.

Removing the TR 700 Battery

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 57.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- If you remove the TR 700 Battery, you will lose the backup power for the ThinkServer RAID 700 Adapter.
- Use any documentation that comes with the TR 700 Battery and follow those instructions in addition to the instructions in this topic.

To remove the TR 700 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Remove the ThinkServer RAID 700 Adapter from the riser card assembly. See “Installing or removing the RAID card” on page 66.
5. Carefully remove the three screws that secure the TR 700 Battery and then remove the TR 700 Battery from the ThinkServer RAID 700 Adapter.

   Note: Center the screwdriver when you remove the screws to avoid possible damage to any parts.

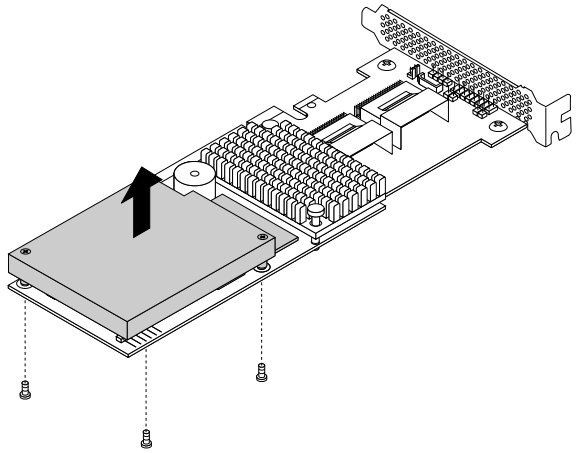


Figure 40. Removing the TR 700 Battery

6. If you want to install a new TR 700 Battery, see “Installing the TR 700 Battery” on page 73.
7. Reinstall the ThinkServer RAID 700 Adapter onto the riser card assembly. See “Installing or removing the RAID card” on page 66.
8. Reinstall the riser card assembly. See “Replacing the riser card assembly” on page 79.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 110.

Installing or removing the slim optical drive

This topic provides instructions on how to install or remove the slim optical drive.

Installing the slim optical drive

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

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.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- Depending on the model, your server might look slightly different from the illustrations in this topic.
- Use any documentation that comes with the new optical drive and follow those instructions in addition to the instructions in this topic.

To install the slim 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. The slim-optical-drive bay is protected with a metal bezel. Remove the two screws that secure the metal bezel to the chassis. Then, remove the metal bezel from the front of the server. Store the metal bezel in case you later remove the slim optical drive and need the metal bezel to cover the place.

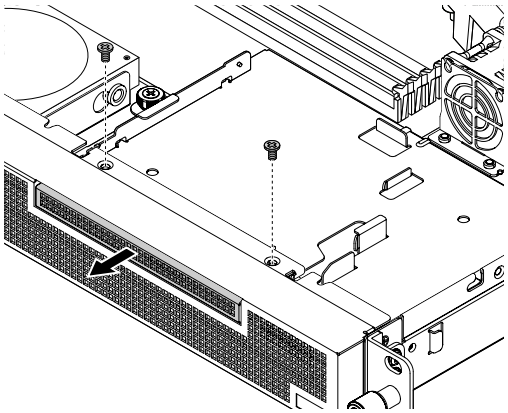


Figure 41. Removing the optical-drive-bay metal bezel

5. Loosen the thumbscrew **1** that secures the slim-optical-drive retainer and then remove the retainer from the chassis.

   Note: The thumbscrew is an integrated part of the slim-optical-drive retainer. Do not try to remove the thumbscrew from the retainer.

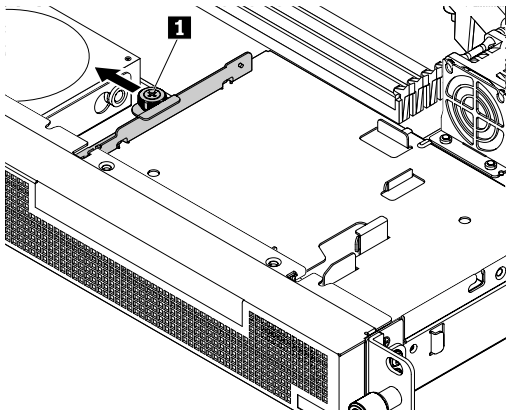


Figure 42. Removing the slim-optical-drive retainer

6. Touch the static-protective package that contains the slim optical drive to any unpainted surface on the outside of the server. Then, take the slim optical drive out of the package.
7. Slide the slim optical drive into the chassis from the front of the server.

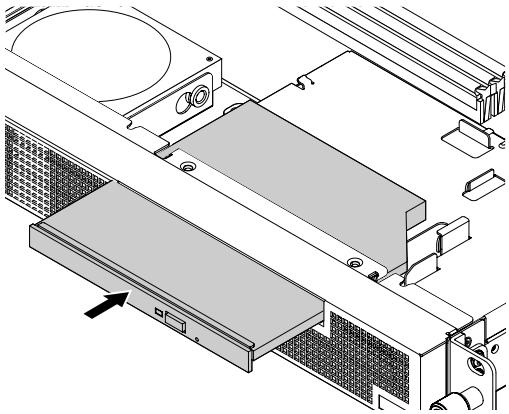


Figure 43. Installing the slim optical drive

8. Attach the slim-optical-drive retainer to the side of the slim optical drive. Then, tighten the thumbscrew 1 to secure the slim-optical-drive retainer.

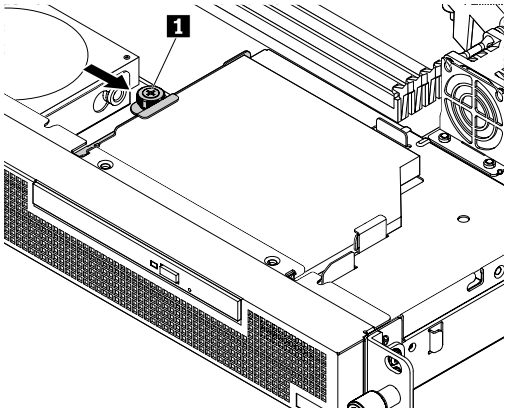


Figure 44. Installing the slim-optical-drive retainer

9. Connect the cables to the rear of the slim optical drive. See “Connecting the cables” on page 23.

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 110.

Removing the slim optical drive

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

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.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- Depending on the model, your server might look slightly different from the illustrations in this topic.

- Use any documentation that comes with the new optical drive and follow those instructions in addition to the instructions in this topic.

To remove the slim 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the slim optical drive. See “Server components” on page 18.
5. Disconnect the cables from the rear of the slim optical drive.
6. Loosen the thumbscrew **1** that secures the slim-optical-drive retainer and then remove the retainer from the chassis. Slide the slim optical drive out of the front of the server.

   Note: The thumbscrew is an integrated part of the slim-optical-drive retainer. Do not try to remove the thumbscrew from the retainer.

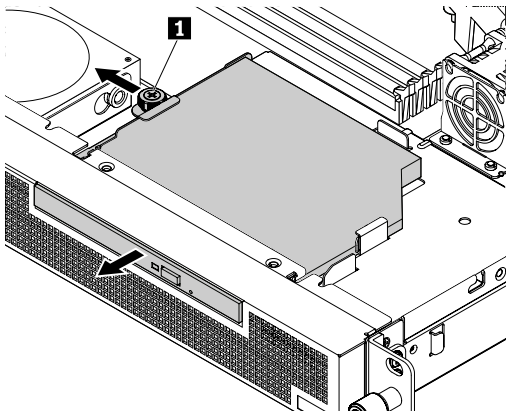


Figure 45. Removing the slim optical drive

7. If you want to install a new slim optical drive, see “Installing the slim optical drive” on page 75.
8. If you are instructed to return the old optical drive, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 110.

Replacing the riser card assembly

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

To replace the riser card 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the riser card assembly. See “Server components” on page 18.
5. If there is a RAID card installed on the riser card assembly, remove the card. See “Removing the RAID card” on page 69.
6. Remove the two screws that secure the riser card assembly to the chassis.

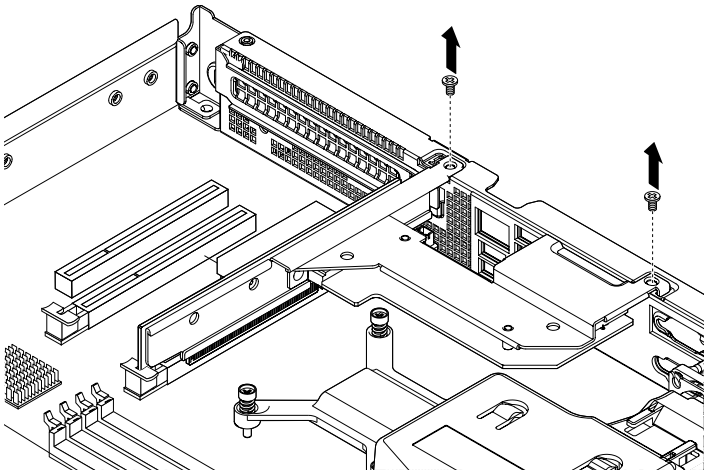


Figure 46. Removing the screws that secure the riser card assembly

7. Open the retaining clip that secures the riser card assembly in the riser card assembly slot on the system board. Grasp the riser card assembly by its edges and carefully lift it straight up and off the chassis.

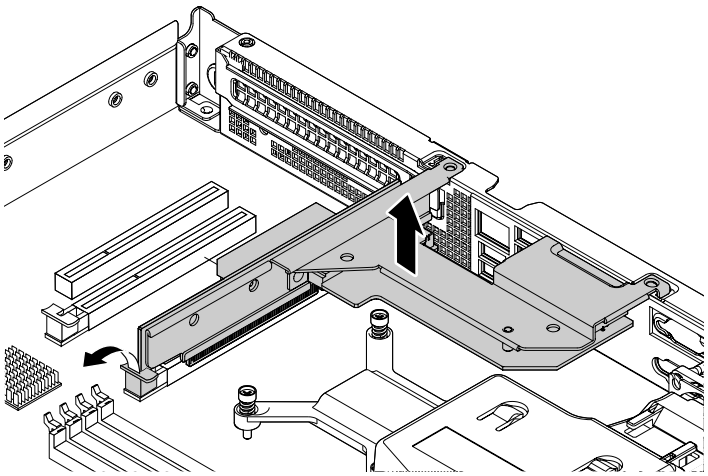


Figure 47. Removing the riser card assembly

8. Disconnect the Ethernet-card/ID-LED cable from the Ethernet card. Then, remove the Ethernet card from the old riser card assembly. See “Replacing the Ethernet card” on page 81.

9. Touch the static-protective package that contains the new riser card assembly to any unpainted surface on the outside of the server. Then, remove the new riser card assembly from the package.
10. Install the Ethernet card on the new riser card assembly. See “Replacing the Ethernet card” on page 81.
11. Reconnect the Ethernet-card/ID-LED cable to the Ethernet card. Route the Ethernet-card/ID-LED cable from the bottom of the riser card assembly to avoid interference with reinstalling the server cover.
12. Position the new riser card assembly on the chassis and align it with the riser card assembly slot on the system board. Align the two screw holes in the new riser card assembly with the corresponding holes in the chassis. Then, carefully press the new riser card assembly straight down into the slot until the new riser card assembly is fully seated.

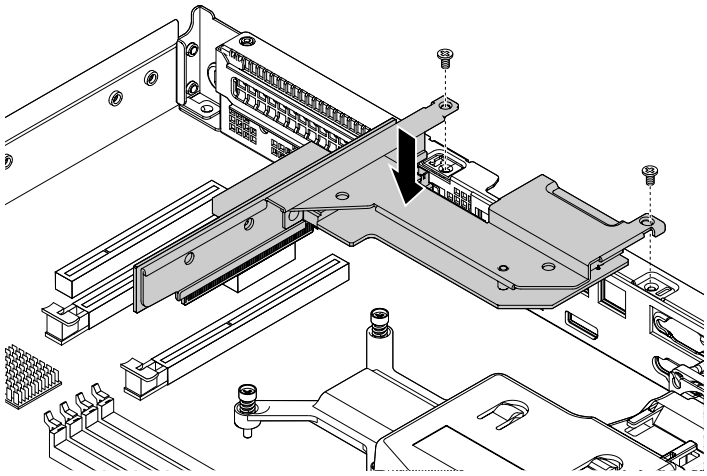


Figure 48. Installing the new riser card assembly

13. Reinstall the PCI Express card on the new riser card assembly. See “Installing the RAID card” on page 66.
14. If you are instructed to return the old riser card assembly, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

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 110.

Replacing the Ethernet card

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- The Ethernet card is sensitive to ESD. Ensure that you read and understand “Handling static-sensitive devices” on page 58 first and carefully perform the operation.
- Depending on the specific type, the Ethernet card might look different from the illustrations in this topic.
- Use any documentation that comes with the Ethernet card and follow those instructions in addition to the instructions in this topic.

To replace the Ethernet 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the Ethernet card in your server. See “Server components” on page 18.
5. Remove the riser card assembly and lay it on a flat, clean, and static-protective surface. See “Replacing the riser card assembly” on page 79.
6. Disconnect the Ethernet-card/ID-LED cable from the Ethernet card.
7. Remove the two screws that secure the Ethernet card to the riser card assembly. Then, grasp the Ethernet card by its edges and carefully pull it out of the PCI Express card slot.

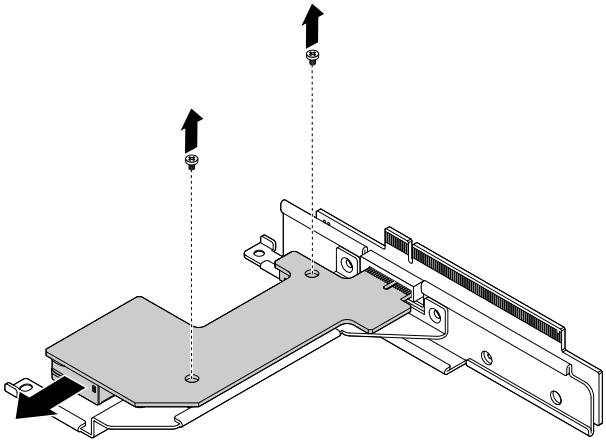


Figure 49. Removing the Ethernet card

8. Touch the static-protective package that contains the new Ethernet card to any unpainted surface on the outside of the server. Then, take the new Ethernet card out of the package.

   Note: Carefully handle the Ethernet card by its edges.
9. Carefully press the new Ethernet card straight into the Ethernet card slot on the riser card assembly until the new Ethernet card is seated securely.

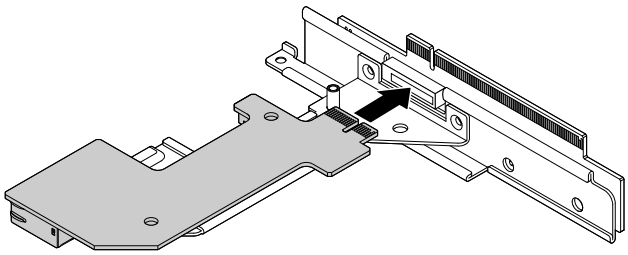


Figure 50. Installing the new Ethernet card

10. Align the two screw holes in the new Ethernet card with the corresponding holes in the riser card assembly. Then, install the two screws to secure the new Ethernet card.

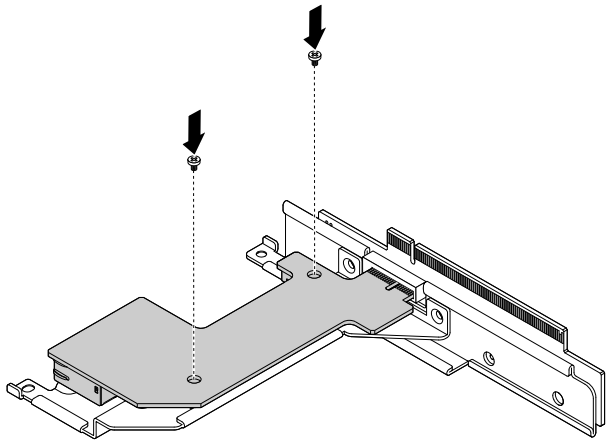


Figure 51. Installing the screws to secure the new Ethernet card

11. Connect the Ethernet-card/ID-LED cable to the new Ethernet card. Route the Ethernet-card/ID-LED cable from the bottom of the riser card assembly to avoid interference with reinstalling the server cover.
12. Reinstall the riser card assembly. See “Replacing the riser card assembly” on page 79.
13. If you are instructed to return the old Ethernet card, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

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 110.

Replacing the Ethernet-card/ID-LED cable

To replace the Ethernet-card/ID-LED cable, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the Ethernet card in your server. See “Server components” on page 18.
5. Disconnect the Ethernet-card/ID-LED cable from the Ethernet card. You might need to remove the riser card assembly for easier access to the Ethernet-card-cable connector. See “Replacing the riser card assembly” on page 79.

6. Locate the ID LED at the rear of the server. Flex the two sides of the plastic retaining clip that secures the ID LED and then remove the ID LED from the plastic retaining clip.

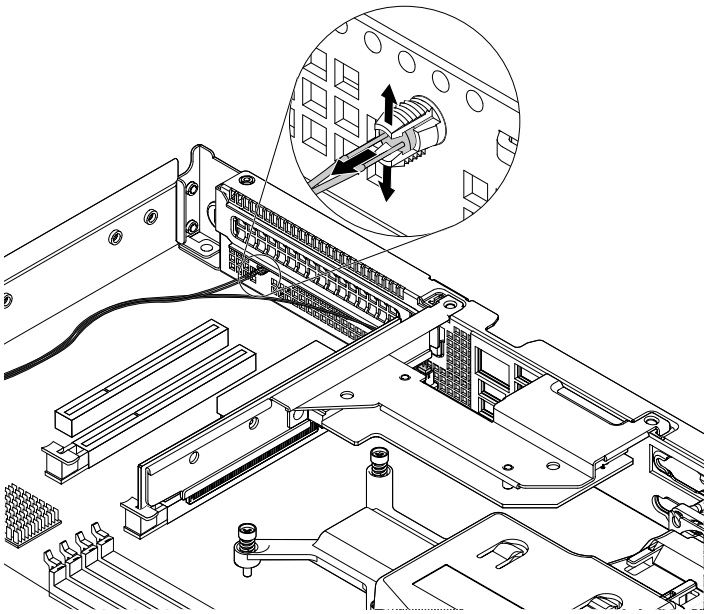


Figure 52. Removing the ID LED from the plastic retaining clip

7. Note the cable routing in the chassis. Then, remove the Ethernet-card/ID-LED cable from the cable ties in the chassis.
8. Remove the front panel board from the server. See “Replacing the front panel board” on page 94.
9. Disconnect the Ethernet-card/ID-LED cable from the front panel board.
10. Connect the new Ethernet-card/ID-LED cable to the front panel board and then reinstall the front panel board. See “Replacing the front panel board” on page 94.
11. Correctly route the new Ethernet-card/ID-LED cable and secure the cable with the cable ties in the chassis.
12. Flex the two sides of the plastic retaining clip and then insert the ID LED into the plastic retaining clip to secure the ID LED.
13. Connect the Ethernet-card/ID-LED cable to the Ethernet card. If you have removed the riser card assembly, reinstall it into the chassis. See “Replacing the riser card assembly” on page 79.

What to do next:

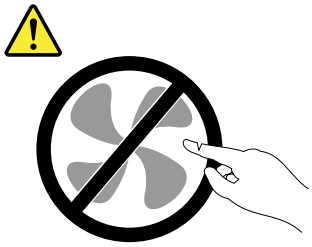
- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 110.

Replacing the power supply assembly

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

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

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



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.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Use any documentation that comes with the new power supply assembly and follow those instructions in addition to the instructions in this topic.

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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Disconnect the power cables from the system board.

5. Locate the failing power supply in your server. Remove the five screws **1** to **5** that secure the power supply assembly.

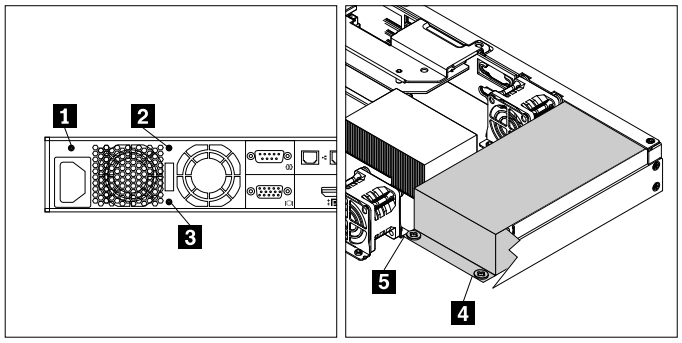


Figure 53. Removing the screws that secure the power supply assembly

6. Lift the failing power supply assembly up and out of your server.
7. Touch the static-protective package that contains the new power supply assembly to any unpainted surface on the outside of the server. Then, remove the new power supply assembly from the package.
8. Note the orientation of the new power supply assembly and then position it into the chassis. Ensure that the five screw holes in the new power supply assembly are aligned with the corresponding holes in the chassis. Then, install the five screws to secure the new power supply assembly.

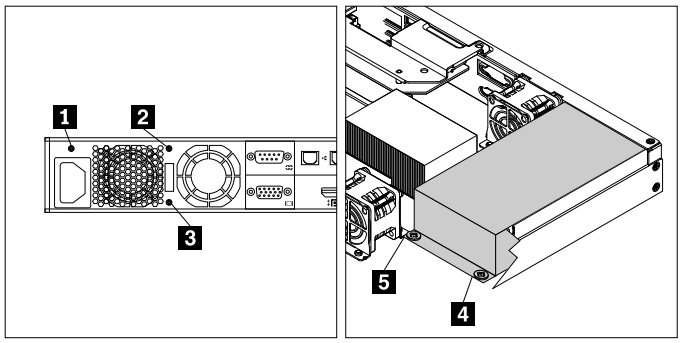


Figure 54. Installing the screws to secure the power supply assembly

9. Connect the power cables to the system board. See “System board components” on page 33.
10. Reinstall the server cover. See “Reinstalling the server cover and reconnecting cables” on page 110.
11. Connect the power cord to the power cord connector on the new power supply assembly.
12. If you are instructed to return the old power supply assembly, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

Removing and reinstalling the slim-optical-drive bracket

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

To remove and reinstall the slim-optical-drive bracket, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the slim-optical-drive bracket in the server. See “Server components” on page 18.
5. If there is a slim optical drive installed, remove it from the server. See “Removing the slim optical drive” on page 78.
6. Lift the release pin **1** of the slim-optical-drive bracket. Then, slide the bracket to the rear of the server as shown to release the bracket from the server. Lift the slim-optical-drive bracket out of the chassis.

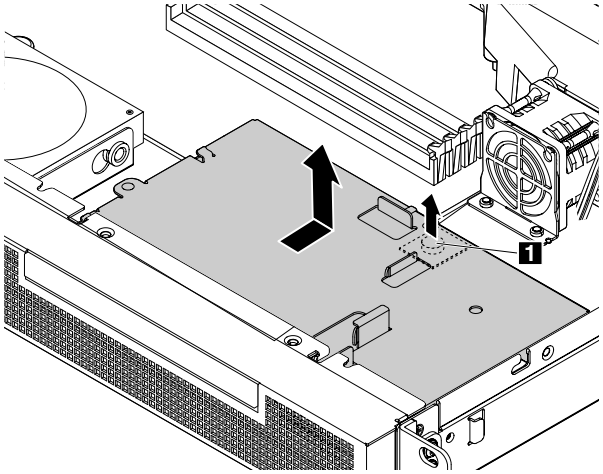


Figure 55. Removing the slim-optical-drive bracket

7. To reinstall the slim-optical-drive bracket, align the four slots in the bracket with the mounting studs on the chassis. Position the bracket in the chassis and then slide the bracket to the front of the server until the release pin 1 is snapped into position.

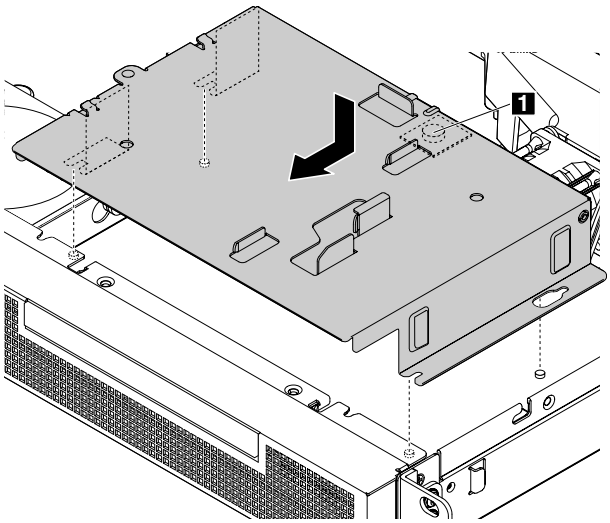


Figure 56. Reinstalling the slim-optical-drive bracket

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 110.

Replacing a 2.5-inch hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 57.

This topic provides instructions on how to replace a 2.5-inch hard disk drive. If you are replacing a 2.5-inch solid-state drive, the procedure is the same.

Note: This procedure must be performed only by trained service personnel of Lenovo.

For a list of ThinkServer hard disk drive options, go to:
http://lenovoquickpick.com/usa/home/thinkserver/rack-and-tower-server

Before you begin, review the following hard-disk-drive installation rules:

- Follow the order of the hard-disk-drive bays when installing a hard disk drive. See "Server components" on page 18 to locate the hard-disk-drive bays in your server.
- For RAID configuration, the hard disk drives must be the same type with the same capacity if they are within a single RAID array. For more information, see "Using the Setup Utility program" on page 39.
- For hard disk drives with different capacities, install the hard disk drive by following the order of the hard-disk-drive bays as well as the order from the lowest capacity to the highest capacity.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- Depending on the model, your server might come with 3.5-inch hard disk drives, 2.5-inch hard disk drives, or 2.5-inch solid-state drives.
- Depending on the model, your server might look slightly different from the illustrations in this topic.
- Use any documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this topic.

To replace a 2.5-inch 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the appropriate 2.5-inch hard disk drive that you want to replace. See “Server components” on page 18.

   Note: If you want to remove the 2.5-inch hard disk drives that are installed under the slim-optical-drive bracket, remove the slim-optical-drive bracket first. See “Removing and reinstalling the slim-optical-drive bracket” on page 86.
5. Disconnect the SATA combo connector from the 2.5-inch hard disk drive that you want to replace.
6. Lift the release pin **1** of the hard-disk-drive bracket. Then, slide the 2.5-inch hard disk drive with the bracket to the rear of the server to release the bracket from the server. Lift the 2.5-inch hard disk drive together with the bracket out of the chassis.

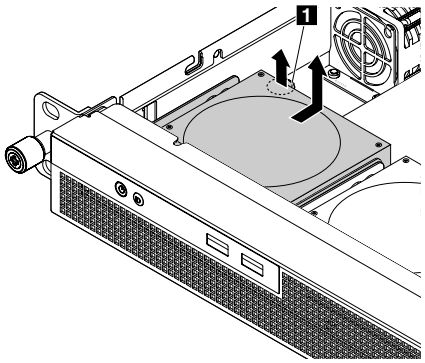


Figure 57. Removing the 2.5-inch hard disk drive together with the bracket

7. Remove the four screws that secure the 2.5-inch hard disk drive to the bracket. Then, lift the 2.5-inch hard disk drive up to remove it from the bracket.

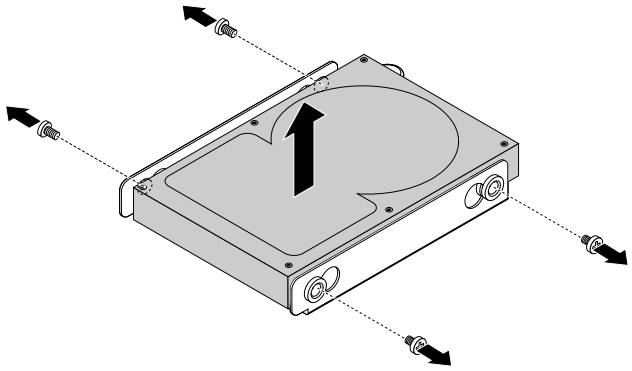


Figure 58. Removing the 2.5-inch hard disk drive from the bracket

8. Position the new 2.5-inch hard disk drive into the bracket and then install the four screws to secure the new 2.5-inch hard disk drive.

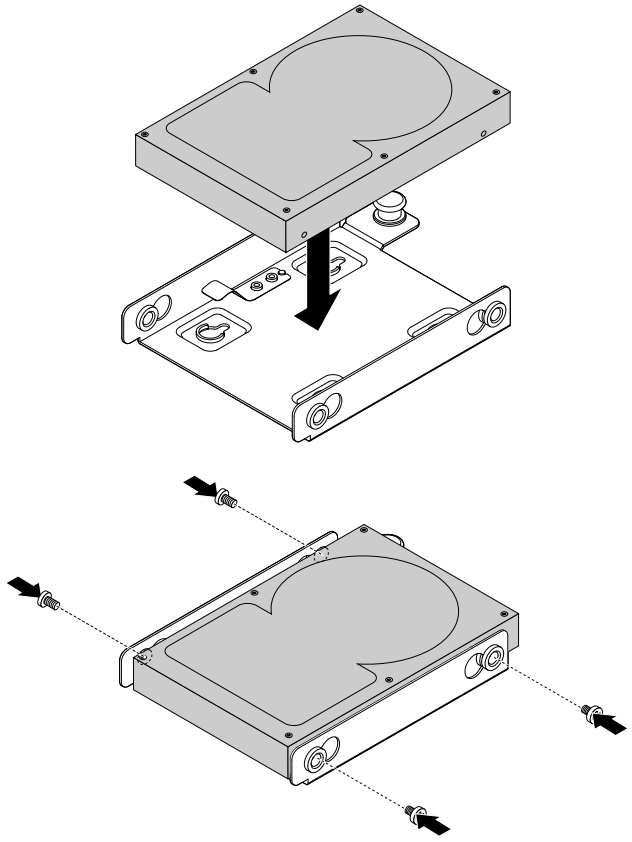


Figure 59. Installing the 2.5-inch hard disk drive to the bracket

9. Position the 2.5-inch hard disk drive with the bracket into the server. Then, slide the drive to the front of the server until the release pin 1 snaps into place.

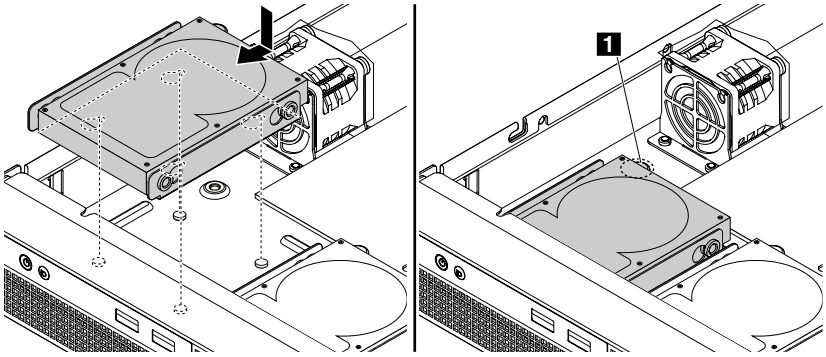


Figure 60. Installing the 2.5-inch hard disk drive together with the bracket

10. Connect the SATA combo connector to the 2.5-inch hard disk drive. See “Connecting the cables” on page 23.
11. If you are instructed to return the old 2.5-inch hard disk drive, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

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 110.

Replacing a 3.5-inch hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

Note: This procedure must be performed only by trained service personnel of Lenovo.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- Depending on the model, your server might come with 3.5-inch hard disk drives, 2.5-inch hard disk drives, or 2.5-inch solid-state drives.
- Depending on the model, your server might look slightly different from the illustrations in this topic.
- Use any documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this topic.

For a list of ThinkServer hard disk drive options, go to:
http://lenovoquickpick.com/usa/home/thinkserver/rack-and-tower-server

Before you begin, review the following hard disk drive installation rules:

- Follow the order of the hard-disk-drive bays when installing a hard disk drive. See “Server components” on page 18 to locate the hard-disk-drive bays in your server.
- For RAID configuration, the hard disk drives must be the same type with the same capacity if they are within a single RAID array. For more information, see “Using the Setup Utility program” on page 39.

- For hard disk drives with different capacities, install the hard disk drive by following the order of the hard-disk-drive bays as well as the order from the lowest capacity to the highest capacity.

To replace a 3.5-inch 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the appropriate 3.5-inch hard disk drive that you want to replace. See “Server components” on page 18.

   Note: If you want to remove the 3.5-inch hard disk drive that is installed under the slim-optical-drive bracket, remove the slim-optical-drive bracket first. See “Removing and reinstalling the slim-optical-drive bracket” on page 86.
5. Disconnect the SATA combo connector from the 3.5-inch hard disk drive that you want to replace.
6. Lift the release pin **1** of the 3.5-inch hard-disk-drive bracket. Then, slide the 3.5-inch hard disk drive with the bracket as shown to release the bracket from the server. Lift the 3.5-inch drive together with the bracket out of the chassis.

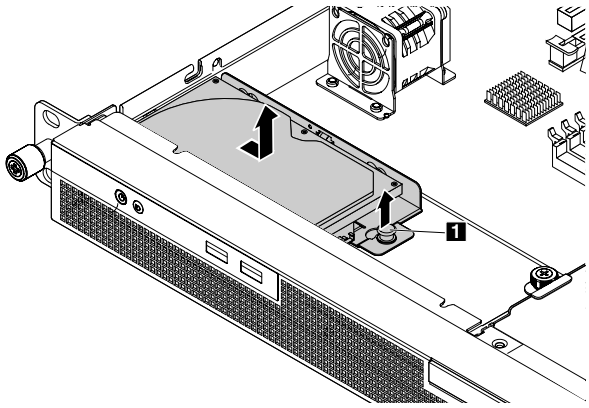


Figure 61. Removing the 3.5-inch hard disk drive together with the bracket

7. Remove the four screws that secure the 3.5-inch hard disk drive to the bracket and then lift the drive up to remove it from the bracket.

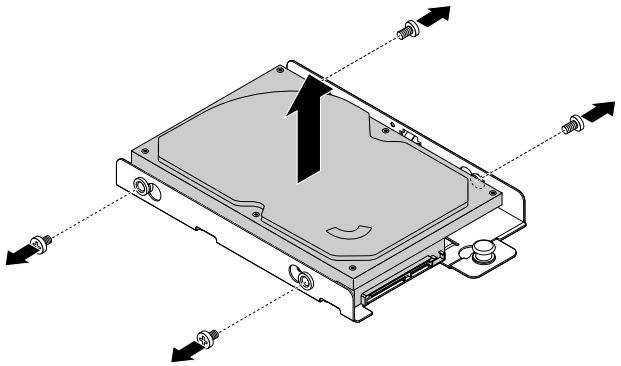


Figure 62. Removing the 3.5-inch hard disk drive from the bracket

8. Position the new 3.5-inch hard disk drive into the bracket and then install the four screws to secure the new 3.5-inch hard disk drive.

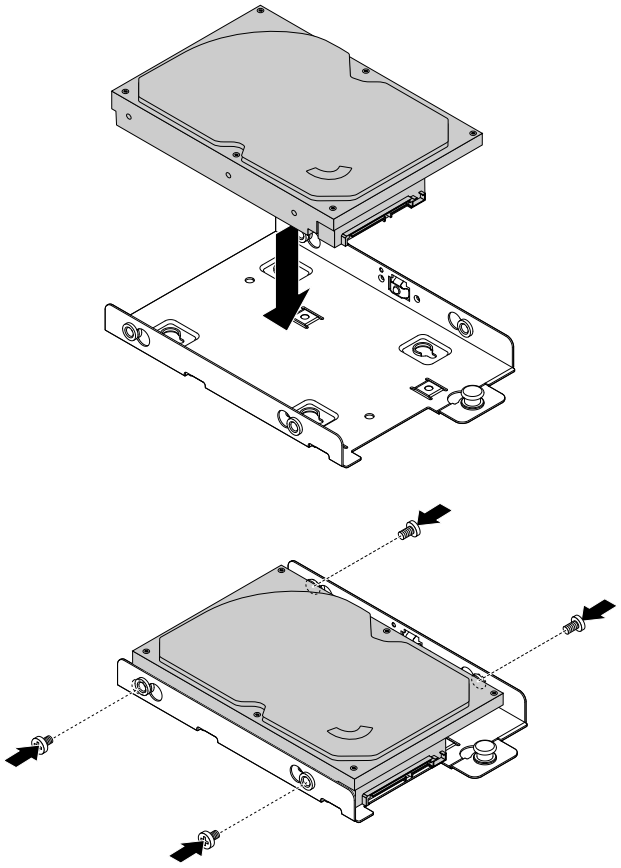


Figure 63. Installing the 3.5-inch hard disk drive to the bracket

9. Position the 3.5-inch hard disk drive together with the bracket into the server and then slide the drive as shown until the release pin **1** snaps into place.

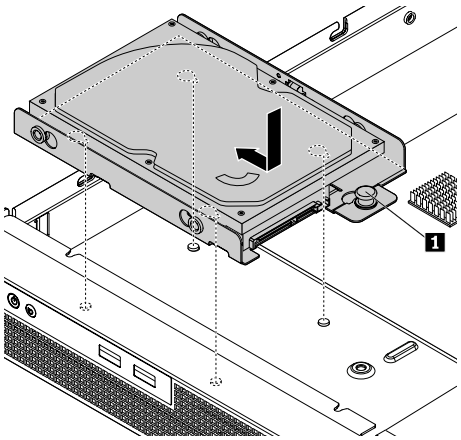


Figure 64. Installing the 3.5-inch hard disk drive

10. Connect the SATA combo connector to the 3.5-inch hard disk drive. See “Connecting the cables” on page 23.
11. If you are instructed to return the old hard disk drive, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

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 110.

Replacing the front panel board

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

Note: This procedure must be performed only by trained service personnel of Lenovo.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- The front panel board is sensitive to ESD. Ensure that you read and understand “Handling static-sensitive devices” on page 58 first and carefully perform the operation.
- Depending on the model, your server might look slightly different from the illustrations in this topic.

To replace the front panel board, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the front panel board. See “Server components” on page 18.

5. If necessary, remove the hard disk drives. See “Replacing a 2.5-inch hard disk drive” on page 88 and “Replacing a 3.5-inch hard disk drive” on page 91.
6. Remove the two screws that secure the front panel board and then carefully remove the front panel board from the chassis.

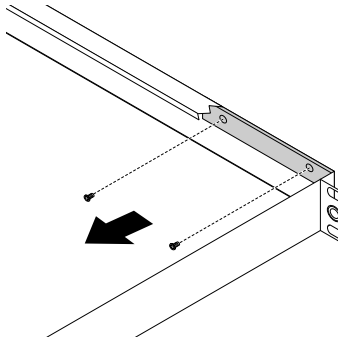


Figure 65. Removing the front panel board

7. Record the cable routing and cable connections. Then, disconnect all the cables from the front panel board.
8. Touch the static-protective package that contains the new front panel board to any unpainted surface on the outside of the server. Then, take the new front panel board out of the package.

   Note: Carefully handle the front panel board by its edges.
9. Connect all the cables to the new front panel board.
10. Carefully position the new front panel board so that the two screw holes in the front panel board are aligned with the corresponding holes in the chassis. Then, install the screws to secure the front panel board in place.

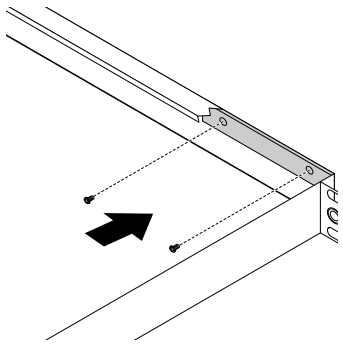


Figure 66. Installing the front panel board

11. Reinstall the hard disk drives in the server if you have removed them. See “Replacing a 2.5-inch hard disk drive” on page 88 and “Replacing a 3.5-inch hard disk drive” on page 91.
12. If you are instructed to return the old front panel board, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

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 110.

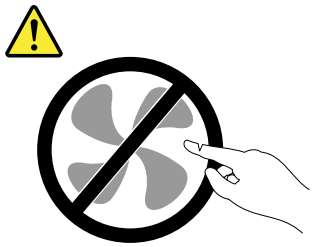
Replacing a system fan

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

This topic provides instructions on how to replace a system fan. Your server has three system fans.

Note: This procedure must be performed only by trained service personnel of Lenovo.

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



Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- Ensure that the new system fan is the same type with the system fan that you want to replace.
- Depending on the model, your server might look slightly different from the illustrations in this topic.

To replace a system fan, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the system fan that you want to replace. See “Server components” on page 18.
5. Disconnect the system fan cable from the system board. See “System board components” on page 33.

   Note: If you want to replace the system fan 1 that is near the rear of the server, remove the riser card assembly to access the system fan 1 connector on the system board. See “Replacing the riser card assembly” on page 79.

6. Grasp the top of the system fan with your index finger and thumb and then lift the system fan out of the server.

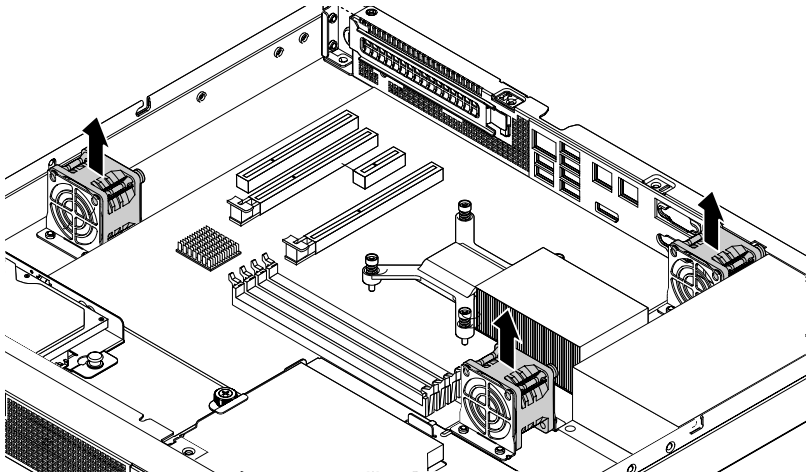


Figure 67. Removing the system fan

7. Touch the static-protective package that contains the new system fan to any unpainted surface on the outside of the server. Then, remove the new system fan from the package.
8. Note the orientation of the new system fan and ensure that rear side of the system fan with the system fan cable is facing the rear of the server. Then, press the new system fan straight down until it is seated into place.

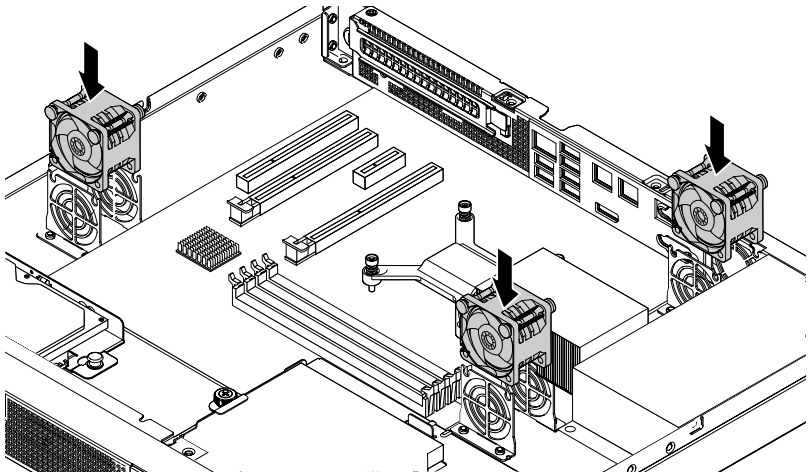


Figure 68. Installing the system fan

9. Connect the system fan cable to the system board. See “System board components” on page 33.

   Note: If you are replacing the system fan 1 that is near the rear of the server, reinstall the riser card assembly to the system board. See “Replacing the riser card assembly” on page 79.
10. If you are instructed to return the old system fan, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

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 110.

Replacing the heat sink

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

CAUTION:

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

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To replace the heat sink, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the heat sink in the server. See “Server components” on page 18.
5. Remove the fan duct. See “Removing and reinstalling the fan duct” on page 61.

6. Remove the four screws that secure the heat sink to the system board. It is recommended that you carefully remove the four screws from the system board using the following method to avoid any possible damage to the system board.
   a. Partially remove screw 1, then completely remove screw 2, and then return to screw 1 and completely remove it.
   b. Partially remove screw 3, then completely remove screw 4, and then return to screw 3 and completely remove it.

   Note: The four screws are integrated parts of the heat sink. Do not try to remove the four screws from the heat sink.

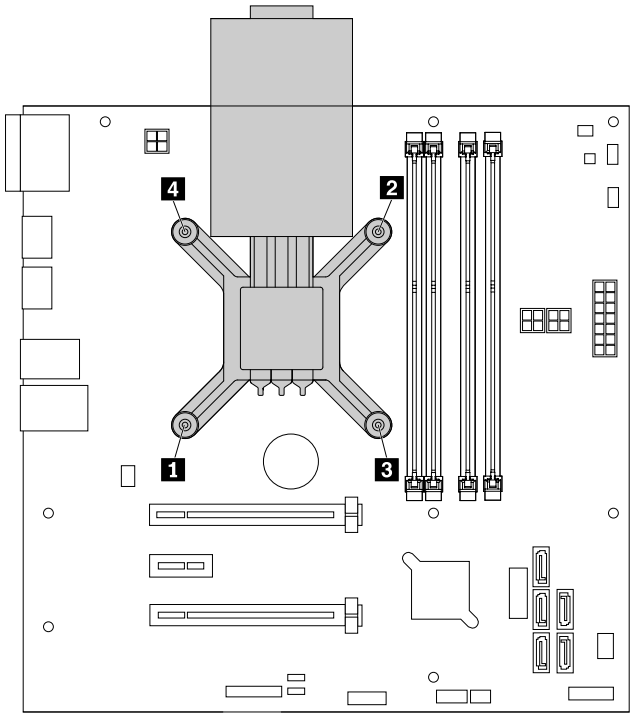


Figure 69. Removing the screws that secure the heat sink

7. Gently twist the heat sink to free it from the microprocessor and then lift the heat sink off the system board.
8. Lay aside the old heat sink. Touch the static-protective package that contains the new heat sink to any unpainted surface on the outside of the server. Then, remove the new heat sink from the package.

   Notes:

   - If you are replacing a heat sink, you must use a cleaning pad that might come with the new heat sink to wipe the thermal grease from the top of the microprocessor before installing the new heat sink. Dispose of the cleaning pad after all thermal grease is removed from the microprocessor.
   - When handling the heat sink, do not touch the thermal grease on the bottom of it.
9. Remove any protective cover that protects the thermal grease on the bottom of the new heat sink. Then, place the new heat sink on the system board so that the four screws on the new heat sink are aligned with the corresponding mounting studs on the system board.

10. Install the four screws to secure the new heat sink on the system board. It is recommended that you carefully install the four screws using the following method to avoid any possible damage to the system board.
    a. Partially tighten screw 1, then firmly tighten screw 2, and then return to screw 1 and firmly tighten it. Do not over-tighten the screws.
    b. Partially tighten screw 3, then firmly tighten screw 4, and then return to screw 3 and firmly tighten it. Do not over-tighten the screws.

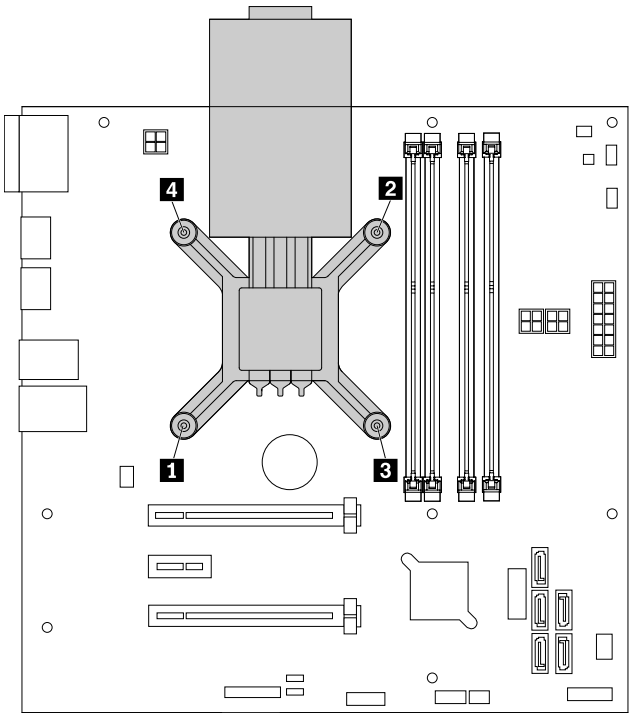


Figure 70. Installing the screws to secure the heat sink

11. Reinstall the fan duct. See “Removing and reinstalling the fan duct” on page 61.
12. If you are instructed to return the old heat sink, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

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 110.

Replacing the microprocessor

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

CAUTION:

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

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- Ensure that the new microprocessor is the correct type your server supports. See “Features” on page 7.
- Use any documentation that comes with the microprocessor option kit and follow those instructions in addition to the instructions in this topic.
- Your microprocessor, socket, and socket cover might look slightly different from the illustrations in this topic.

To replace the microprocessor, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Remove the fan duct. See “Removing and reinstalling the fan duct” on page 61.
5. Remove the heat sink. See “Replacing the heat sink” on page 98.

6. Gently press down the small handle **1** on the microprocessor socket and then pull the handle slightly outward to release it from the secured position. Then, pivot the handle upward to the fully open position. Then, gently open the retainer **2** to access the microprocessor **3**.

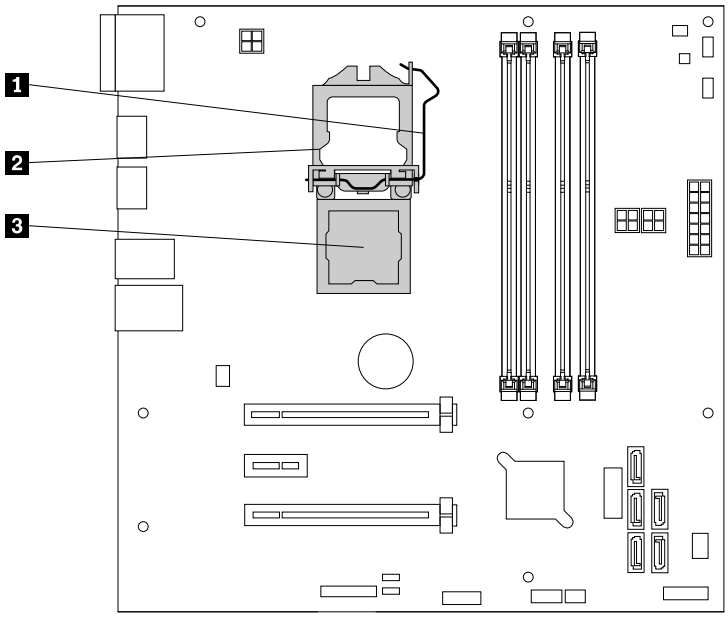


Figure 71. Accessing the microprocessor

7. Ensure that the small handle and the microprocessor retainer are in the fully open position. Touch only the edges of the microprocessor and carefully lift it straight up and out of the microprocessor socket. Place the old microprocessor on a static-protective surface.

   Notes:

   - Do not touch the gold contacts on the bottom of the microprocessor.
   - Do not drop anything onto the microprocessor socket while it is exposed. The socket pins must be kept as clean as possible.

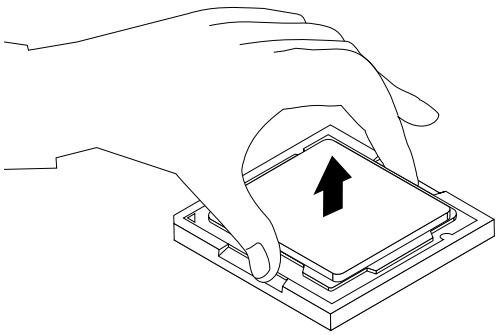


Figure 72. Removing the microprocessor

8. Touch the static-protective package that contains the new microprocessor to any unpainted surface on the outside of the server. Then, remove the new microprocessor from the package.

9. Remove the protective cover that protects the gold contacts on the bottom of the new microprocessor. Do not touch the pins on the microprocessor socket and the gold contacts on the bottom of the new microprocessor.
10. Note the orientation of the new microprocessor. Hold the new microprocessor by its edges and align the notches 1 on it with the tabs 2 in the microprocessor socket. Then, carefully lower the new microprocessor straight down into the microprocessor socket.

    Note: The small triangle 3 on one corner of the new microprocessor is the microprocessor orientation indicator. The new microprocessor is in the correct orientation when this indicator faces the beveled corner 4 of the microprocessor socket.

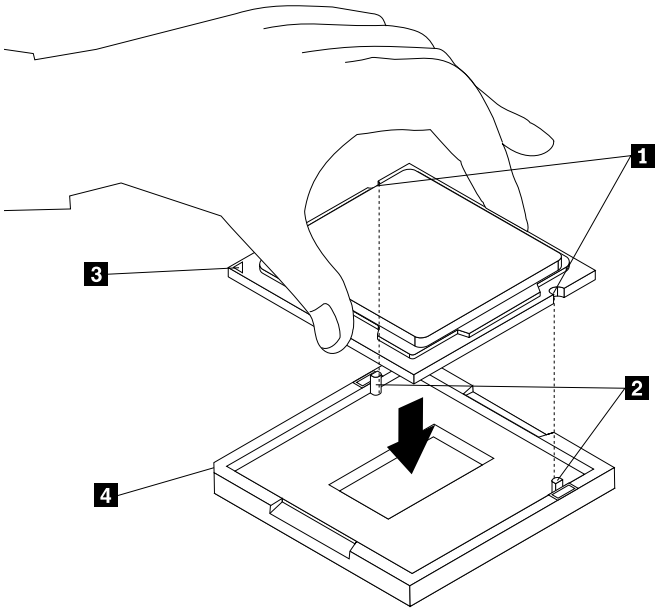


Figure 73. Installing the microprocessor

11. Carefully close the microprocessor retainer. Then, carefully close the small handle to lock the retainer into position and secure the new microprocessor in the socket.
12. Reinstall the heat sink. See “Replacing the heat sink” on page 98.
13. Reinstall the fan duct. See “Removing and reinstalling the fan duct” on page 61.
14. If you are instructed to return the old microprocessor, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

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 110.

Replacing the coin-cell battery

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 57.

Your server has a special type of memory that maintains the date, time, and configuration information for built-in features. The coin-cell battery keeps the information active when you turn off the server. The coin-cell battery normally requires no charging or maintenance throughout its life; however, no battery lasts

forever. If the coin-cell battery fails, the date, time, and configuration information, including passwords, are lost and an error message is displayed when you turn on the server.

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.

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

California Perchlorate Information:

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

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

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

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

Note: After you replace the coin-cell battery, you must reset passwords, reset system date and time, and reconfigure the server.

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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Locate the coin-cell battery. See “System board components” on page 33.
5. Remove the old coin-cell battery.

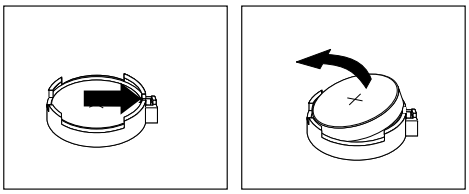


Figure 74. Removing the coin-cell battery

6. Install a new coin-cell battery.

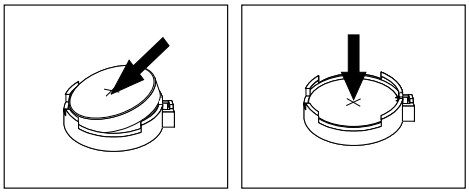


Figure 75. Installing the coin-cell battery

7. Dispose of the old coin-cell battery as required by local ordinances or regulations.

What to do next:

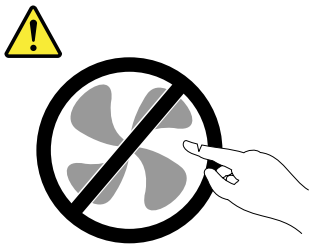
- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to "Completing the parts replacement" on page 110. After you replace the coin-cell battery, you must reset passwords, reset system date and time, and reconfigure the server. See Chapter 5 "Configuring the server" on page 39.

Replacing the system board

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 57.

Note: This procedure must be performed only by trained service personnel of Lenovo.

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



CAUTION:

The heat sinks and microprocessors might be very hot. Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

To replace the system board, 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. If the server is installed in a rack cabinet, remove the server from the rack cabinet and place it on a flat, clean, and static-protective surface.
3. Remove the server cover. See “Removing the server cover” on page 59.
4. Record the component locations, cable connections, and cable routing in the server.
5. Remove the fan duct. See “Removing and reinstalling the fan duct” on page 61.
6. Remove the heat sink. See “Replacing the heat sink” on page 98.
7. Remove the riser card assembly. See “Replacing the riser card assembly” on page 79.
8. Remove all memory modules. See “Removing a memory module” on page 65.
9. Record the cable routing and cable connections. Then, disconnect all the cables from the system board.
10. Remove the eight screws **1** to **8** that secure the system board following the recommended numerical sequence as shown.

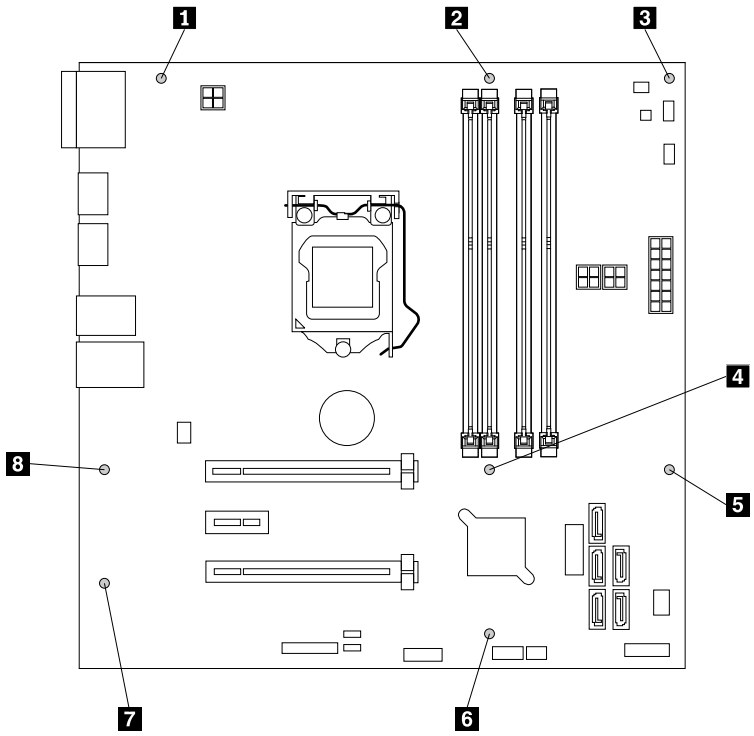


Figure 76. Removing the screws that secure the system board

11. Use a flat screwdriver to remove the two hexagonal screws **1** that secure the rear of the system board to the chassis.

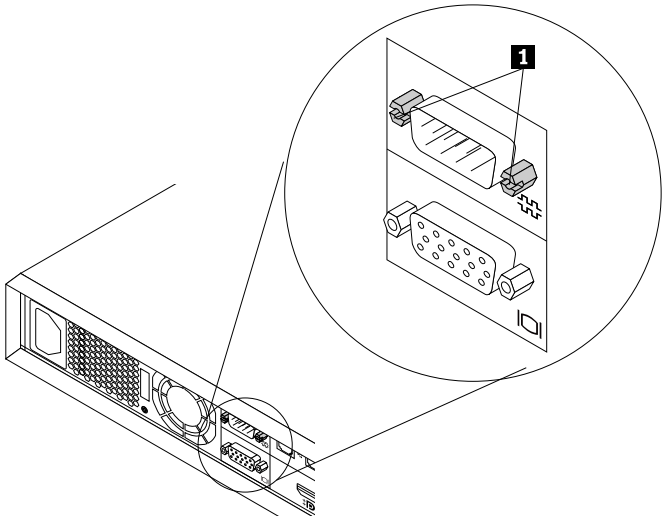


Figure 77. Removing the two hexagonal screws that secure the rear of the system board

12. Gently lift each edge of the system board slightly upward so that the system board is released from the mounting studs on the chassis. Then, move the system board to the front of the server and then carefully pivot the system board upward to remove it out of the chassis.

    Notes:

    - Carefully handle the system board by its edges.
    - Leave the black Mylar under the old system board in the chassis.

13. Place the old system board on a clean, flat, and static-protective surface. Touch the static-protective package that contains the new system board to any unpainted surface on the outside of the server. Then, take the new system board out of the package.
14. Install the new system board into the chassis. Ensure that the rear connectors on the new system board are inserted into the corresponding holes in the rear panel. Ensure that the eight screw holes in the new system board are aligned with the corresponding mounting studs on the chassis.

15. Install the eight screws following the recommended numerical sequence as shown to secure the new system board on the chassis.

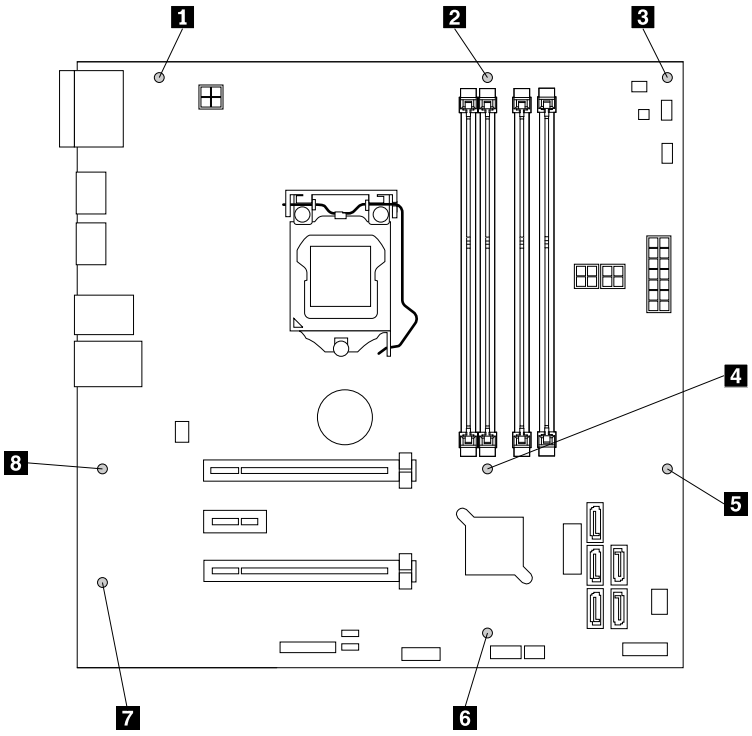


Figure 78. Installing the screws that secure the system board

16. Reinstall the two hexagonal screws **1** to secure the rear of the system board to the chassis.

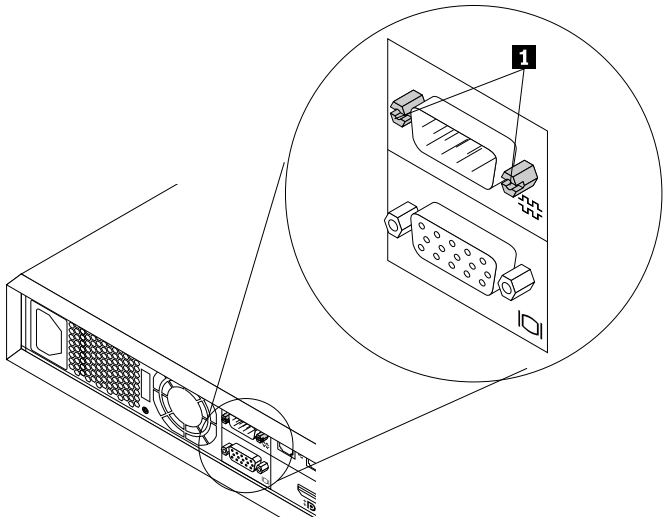


Figure 79. Reinstalling the two hexagonal screws to secure the rear of the system board

17. Remove the protective cover that protects the pins on the microprocessor socket on the new system board.

18. Remove the microprocessor from the old system board and install it on the new system board. See “Replacing the microprocessor” on page 100.
19. The old system board must be returned with the microprocessor socket cover to protect the pins on the microprocessor socket during shipping and handling. Use the microprocessor socket cover removed from the new system board.

    To install a microprocessor socket cover on the old system board, do the following:

    a. After you have removed the microprocessor from the failing system board, close the microprocessor retainer. Then, put the lever to the locked position to secure the retainer in place.

    b. Note the orientation of the socket cover, and install one side of the socket cover into the microprocessor socket. Carefully press the other side of the socket cover downward until the socket cover snaps into position.

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

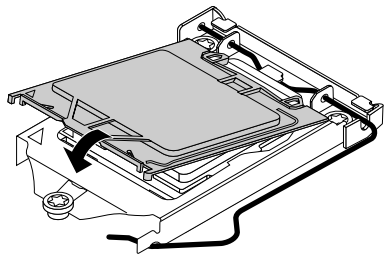


Figure 80. Installing the microprocessor socket cover

    c. Check the four corners of the socket cover to ensure that the cover is secured.

    d. Follow any additional instructions that are included with the replacement part you received.
20. Install the heat sink on the new system board. See “Replacing the heat sink” on page 98.
21. Install the fan duct in the chassis. See “Removing and reinstalling the fan duct” on page 61.
22. Install the memory modules on the new system board. See “Installing a memory module” on page 64.
23. Install the riser card assembly on the new system board. See “Replacing the riser card assembly” on page 79.
24. Install the coin-cell battery on the new system board. See “Replacing the coin-cell battery” on page 103.
25. Install any other parts that you have removed and connect all cables to the new system board. Refer to the information that you have recorded and the related topics in “Installing, removing, or replacing hardware” on page 60.
26. If you are instructed to return the old system board, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

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 110.
- After a system board is replaced, do the following:
  1. Start the Setup Utility program by pressing the F1 key, and then check the BIOS and BMC version.
  2. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to download the latest version of firmware. Then, install the firmware to your server.
  3. Update the machine type, model number, and serial number of the system board. Either you will be prompted to do this while upgrading the BIOS, or you can locate the files for updating the VPD

within the DOS BIOS package. For some servers, the VPD utility is available for download at http://www.lenovo.com/drivers.

Note: If you want to use the Firmware Updater program, ensure that it is the latest version. To get the latest version of the Firmware Updater program, go to http://www.lenovo.com/drivers, locate different versions of the program, and then identify the latest version by comparing readme files. If the latest version of the Firmware Updater program does not contain the latest version of the driver you need, download that driver separately from the Web page and install it individually to your server.

Connecting an external tape drive

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 57.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- Depending on the model, your tape drive might look slightly different from the illustrations in this topic.
- Use any documentation that comes with the tape drive and follow those instructions in addition to the instructions in this topic.

To connect an external tape drive, do the following:

1. Connect one end of the Y cable to the USB 3.0 connector on the rear of the external tape drive. Then, connect the other end of the Y cable to two available USB connectors on the server.

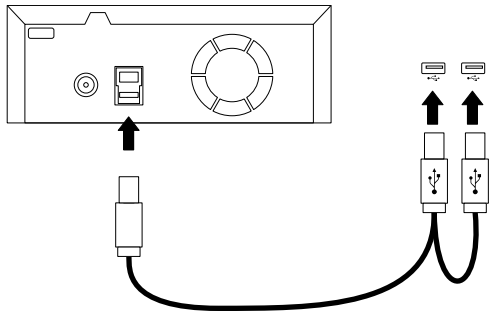


Figure 81. Connecting the external tape drive

2. Verify if the tape drive works correctly.

Completing the parts replacement

This topic provides instructions to help you complete the parts replacement and turn on your server.

To complete the parts replacement, you must properly route the cables inside the server, reinstall the server cover, reconnect all the external cables and, for some devices, update the firmware and run the Setup Utility program to do further setup.

Reinstalling the server cover and reconnecting cables

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 57.

Attention: For proper cooling and airflow, reinstall the server cover before turning on the server. Operating the server for extended periods of time (more than 30 minutes) with the server cover removed might damage server components.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: Depending on the model, your server might look slightly different from the illustrations in this topic.

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

1. Ensure that all components have been reassembled correctly and that no tools or loose screws are left inside your server.
2. Ensure that all internal cables are connected and routed correctly and secured by any cable clips or ties in the server. Keep cables clear of the hinges and sides of the chassis to avoid interference with reinstalling the fan duct and the server cover. The following illustration shows an example of the cable routing in the chassis with two 3.5-inch hard disk drives and a RAID card.

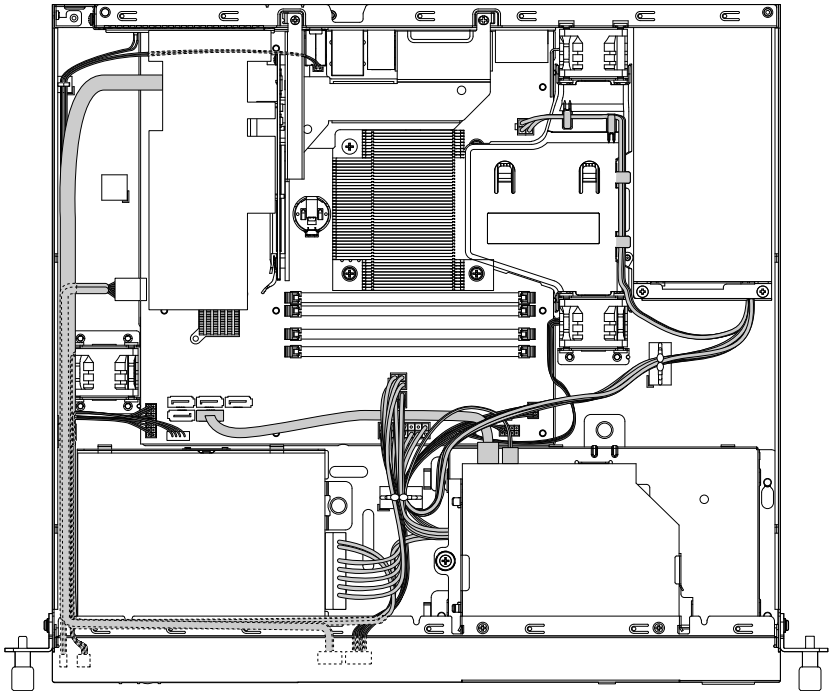


Figure 82. An example of cable routing (server models with two 3.5-inch hard disk drives and a RAID card)

3. If you have removed the fan duct, reinstall it. See “Removing and reinstalling the fan duct” on page 61.

4. Place the server cover above the chassis and then lower the server cover onto the chassis. Ensure that both sides of the server cover engage the guides on both sides of the chassis. Slide the server cover to the front of the chassis until the server cover snaps into position. Tighten the thumbscrew to secure the server cover.

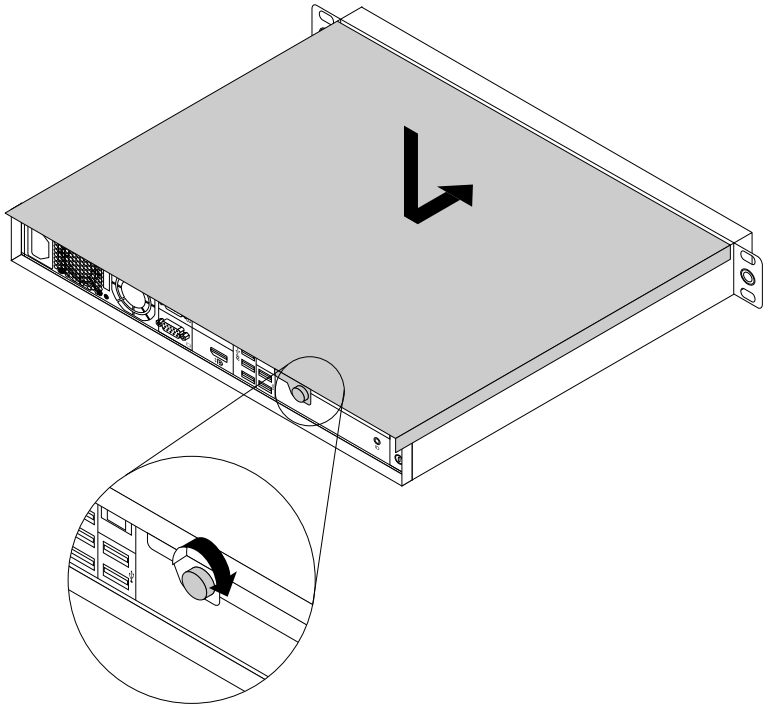


Figure 83. Installing the server cover

5. If you have a rail kit, install the server into a rack cabinet.
6. Reconnect external cables and power cords to the server. See “Rear view of the server” on page 15 to identify the connectors on the rear panel of the server.

   Attention: To avoid component damage, connect the power cords last.

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

Updating the server configuration

When you turn on the server for the first time after you install, remove, or replace a device, you might need to update the server configuration.

Some optional devices have device drivers that you must install. For information about installing device drivers, use the documentation that comes with each optional device. To obtain the supported device drivers for your server from the Lenovo Support Web site, go to http://www.lenovo.com/drivers and follow the instructions on the Web page to find and download the device drivers you need.

Refer to the following information resources to update the server configuration:

- To update the BIOS configuration, see “Using the Setup Utility program” on page 39.
- To update the RAID configuration, see “Configuring RAID” on page 49.

- To use the ThinkServer EasyStartup program, see “Using the ThinkServer EasyStartup program” on page 46.
- To update your system firmware, see “Updating the firmware” on page 54.

Chapter 7. Troubleshooting and diagnostics

This chapter provides information about basic troubleshooting and diagnostic methods to help you solve problems that might occur in the server.

If you cannot diagnose and correct a problem by using the information in this chapter, see Chapter 8 “Getting information, help, and service” on page 121 for additional troubleshooting resources.

Troubleshooting procedure

Use the following information as a general procedure for diagnosing and troubleshooting problems you experience with your server:

1. Verify that the power cords and the cables for all attached devices are connected correctly and securely.
2. Verify that the server and all attached devices that require ac power are connected to properly grounded, functioning electrical outlets.
3. Verify that all installed hardware and attached devices are enabled in the BIOS settings of your server. For more information about accessing and changing the BIOS settings, see “Using the Setup Utility program” on page 39.
4. If the server is not working after you have added new software, installed a new optional device, or replaced a piece of hardware, remove or reinstall the software, device, or hardware to see if the problem could be solved.
5. Turn on the server and press Esc as soon as you see the logo screen to view any diagnostic messages.
6. Download and use a diagnostic program to diagnose problems. See “Lenovo ThinkServer Diagnostics” on page 11.
7. Refer to “Basic troubleshooting tables” on page 115 and follow the instructions for the type of problem you are experiencing. If the basic troubleshooting information does not help you resolve a problem, continue with the next step.
8. Try using a previous server configuration to see if a recent change to hardware or software settings has caused a problem. Before restoring your previous configuration, capture your current configuration in case the older configuration settings do not solve the problem or have adverse effect.
9. Use an antivirus program to see if your server has been infected by a virus. If the program detects a virus, remove the virus.
10. If none of these actions solve the problem, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 121.

Basic troubleshooting tables

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

ThinkServer EasyStartup program problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 115 for the subsequent steps you should check after using the information in this topic. If the problem still cannot be solved, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 121.

Note: If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in Chapter 6 “Installing, removing, or replacing hardware” on page 57.

Symptom	Action
The *ThinkServer EasyStartup* DVD does not start.	1. Ensure that the server supports the ThinkServer EasyStartup program and has a bootable DVD drive installed or a bootable external DVD drive attached. 2. Ensure that you have set the optical drive with the *ThinkServer EasyStartup* DVD installed as the first startup device. See “Selecting a startup device” on page 44. 3. Verify if the optical drive or the disc has problems. See “Optical drive problems” on page 116.
The operating system installation program continuously loops.	Make more space available on the hard disk drive.
The ThinkServer EasyStartup program cannot start the operating system medium.	1. Ensure that the operating system medium is supported by the ThinkServer EasyStartup program version your are using. For a list of supported operating systems, refer to the user guide and compatibility notes for the ThinkServer EasyStartup program through the program main interface. See “Starting the ThinkServer EasyStartup program” on page 47. 2. Verify if the optical drive or the disc has problems. See “Optical drive problems” on page 116.

Optical drive problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 115 for the subsequent steps you should check after using the information in this topic. If the problem still cannot be solved, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 121.

Notes:

- If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in Chapter 6 “Installing, removing, or replacing hardware” on page 57.
- If an action step is preceded by “(Trained service technician only),” this action step is reserved for a trained service technician and must be performed only by a trained service technician.

Symptom	Action
The internal optical drive is not recognized.	1. Ensure that: • The related cables and connectors are not damaged and the connector pins are not bent. • The optical drive is securely connected to the correct SATA connector on the system board and the SATA connector is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 39. • All cables and jumpers (if any) are installed correctly. • The correct device driver is installed for the optical drive. 2. Run any optical drive diagnostic programs if you have. 3. Reinstall the optical drive and reconnect cables.

Symptom	Action
	4. Replace the signal cable for the optical drive. 5. Replace the power cable for the optical drive. 6. Replace the optical drive. 7. (Trained service technician only) Replace the system board.
A disc is not working correctly.	1. Ensure that the disc is in the optical drive with the shiny side facing down. 2. Ensure that the disc surface is clean and not scratched. 3. Check the disc or package for regional coding. You might need to purchase a disc with coding for the region where you are using the product. 4. Restart the disc player program. 5. Restart the server. 6. Run any optical drive diagnostic programs if you have. 7. Reinstall the optical drive and reconnect cables. 8. Replace the signal cable for the optical drive. 9. Replace the optical drive.

Hard-disk-drive problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 115 for the subsequent steps you should check after using the information in this topic. If the problem still cannot be solved, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 121.

Note: If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in Chapter 6 “Installing, removing, or replacing hardware” on page 57.

Symptom	Action
A newly installed hard disk drive is not recognized.	1. Make sure that: • The signal cable and connector are not damaged. • The hard disk drive is securely connected to the correct SATA connector on the system board and the SATA connector is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 39. • All cables and jumpers (if any) are installed correctly. 2. If you have any diagnostic programs, run the diagnostic programs to test the hard disk drive. 3. Reinstall the hard disk drive and reconnect cables. 4. Replace the signal cable for the hard disk drive. 5. Replace the hard disk drive.
Multiple hard disk drives fail.	1. If you have any diagnostic programs, run the diagnostic programs to test the hard disk drives. 2. Make sure that the cable connection is correct.

Symptom	Action
	3. Reconnect the power cable. 4. Reconnect the signal cable. 5. Replace the affected signal cable.

Memory module problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 115 for the subsequent steps you should check after using the information in this topic. If the problem still cannot be solved, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 121.

Notes:

- If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in Chapter 6 “Installing, removing, or replacing hardware” on page 57.
- If an action step is preceded by “(Trained service technician only),” this action step is reserved for a trained service technician and must be performed only by a trained service technician.

Symptom	Action
The amount of system memory that is displayed is less than the total capacity of the installed physical memory modules and you suspect a memory module problem.	1. Ensure that: • All memory modules are the correct type supported by the server. See “Memory module installation rules” on page 63. • You followed the memory module installation rules. See “Memory module installation rules” on page 63. • All memory modules are seated correctly and securely. • The system firmware is up-to-date. 2. Reinstall the memory modules. 3. Replace the suspect memory modules. 4. (Trained service technician only) Replace the system board.

Keyboard, mouse, and USB device problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 115 for the subsequent steps you should check after using the information in this topic.

Symptom	Action
All or some keys on the keyboard do not work.	1. Ensure that: • The USB keyboard cable is securely connected to a USB connector on the server. If the USB keyboard is connected to a USB hub, disconnect the keyboard from the hub and connect it directly to the server. • No keys are stuck.

Symptom	Action
	• The USB controller is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 39. 2. Restart the server. 3. Replace the keyboard.
The mouse or pointing device does not work.	1. Ensure that: • The mouse or pointing device cable is securely connected to the server. If the USB mouse or pointing device is connected to a USB hub, disconnect the mouse or pointing device from the hub and connect it directly to the server. • The mouse or pointing device is clean and no dust accumulates. • The device drivers are installed correctly. • The USB controller is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 39. 2. Restart the server. 3. Replace the mouse or pointing device.
A USB device does not work.	1. Ensure that: • The USB cable is securely connected to the server. If the USB device is connected to a USB hub, disconnect the device from the hub and connect it directly to the server. • The device drivers are installed correctly. • The USB controller is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 39. 2. Restart the server. 3. Replace the USB device.

Chapter 8. Getting information, help, and service

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

Information resources

You can use the information in this topic to access useful resources relating to your needs when using the product.

Using the documentation

Information about your Lenovo system and installed software, if any, or optional devices is available in the documentation that comes with the product. The documentation can include printed documents, online documents, readme files, and help files. Most of the documentation for your server is on the documentation DVD provided with your server. Refer to Chapter 7 “Troubleshooting and diagnostics” on page 115 for instructions on how to diagnose problems and do basic troubleshooting. The troubleshooting and diagnostics information might tell you that you need additional or updated device drivers or other software. Lenovo maintains pages on the World Wide Web where you can get the latest technical information and download documentation or device drivers and updates. To access the Lenovo Support Web site, go to: http://www.lenovo.com/support

For more information about your server documentation, see “Server documentation” on page 2.

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

ThinkServer Web site

The ThinkServer Web site provides up-to-date information and services to help you buy, use, upgrade, and maintain your server. You also can do the following by visiting the ThinkServer Web site at: http://www.lenovo.com/thinkserver

- Shop for servers as well as upgrades and accessories for your server.
- Purchase additional services and software.
- Purchase upgrades and extended hardware repair services.
- Access the Lenovo Limited Warranty (LLW).
- Access the online manuals for your products.
- Access troubleshooting and support information for your server model and other supported products.
- Download the latest device drivers and software updates for your server model.
- Find the service and support phone numbers for your country or region.
- Find a Service Provider located near you.

Lenovo Support Web site

Technical support information is available on the Lenovo Support Web site at: http://www.lenovo.com/support

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

- Drivers and software

- Diagnostic solutions
- Product and service warranty
- Product and parts details
- User guides and manuals
- Knowledge base and frequently asked questions

Help and service

This topic contains information about obtaining help and service.

Before you call

Before you call, do the following to try to solve the problem by yourself:

- Check all cables to ensure that they are connected.
- Check the power buttons to ensure that the system and optional devices are turned on.
- Use the troubleshooting information in your system documentation on the documentation DVD that comes with your product.
- Check for the updated information, new device drivers, and hints and tips on the Lenovo Support Web site at:
  http://www.lenovo.com/support

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

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

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.

The warranty does not cover the following:
- Replacement or use of parts not manufactured for or by Lenovo or non-warranted Lenovo parts
- Identification of software problem sources
- Configuration of the Unified Extensible Firmware Interface (UEFI) BIOS as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

For the warranty type and duration for your product, refer to the *Safety, Warranty, and Support Information* on the documentation DVD that comes with your server. You must retain your proof of purchase to obtain warranty service.

For warranty service, consult the worldwide Lenovo Support telephone list. Telephone numbers are subject to change without notice. The most up-to-date telephone list for Lenovo Support is always available on the Web site at http://www.lenovo.com/support/phone. If the telephone number for your country or region is not listed, contact your Lenovo reseller or Lenovo marketing representative.

Using other services

If you travel with a Lenovo notebook computer or relocate your computer to a country where your desktop, notebook, or server 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 installed Windows product, refer to the Microsoft Product Support Services Web site at http://support.microsoft.com/directory or you can contact the Customer Support Center. Some fees might apply.

Purchasing additional services

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

Appendix A. 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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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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Linux is a registered trademark of Linus Torvalds.

DisplayPort is a Trademark of the Video Electronics Standards Association.

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

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.

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***.

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/recycling

The latest environmental information is available at http://www.lenovo.com/ecodeclaration.

Battery return program

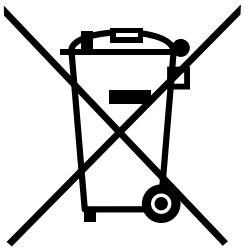
This product may contain a lithium or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal or batteries outside the United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

Battery recycling information for the United States and Canada

US & Canada Only

Battery recycling information for the European Union

EU



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

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

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

hazardous substances. For proper collection and treatment, go to:
http://www.lenovo.com/recycling

Requirement for batteries containing perchlorate

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

California Perchlorate Information:

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

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

Recycling information for Brazil

Declarações de Reciclagem no Brasil

Descarte de um Produto Lenovo Fora de Uso

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

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

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 4. Limits for particulates and gases

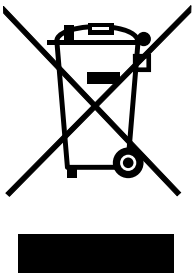
Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days

[1] 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.

[2] 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.

[3] 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 WEEE information



The WEEE marking on Lenovo products applies to countries with WEEE and e-waste regulations (for example, the European WEEE Directive, India E-Waste Management & Handling Rules, 2011). Appliances are labeled in accordance with local regulations concerning waste electrical and electronic equipment (WEEE). These regulations determine the framework for the return and recycling of used appliances as applicable within each geography. This label is applied to various products to indicate that the product is not to be thrown away, but rather put in the established collective systems for reclaiming these end of life products.

Users of electrical and electronic equipment (EEE) with the WEEE marking must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, and recovery of WEEE and to minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. For additional WEEE information, go to: http://www.lenovo.com/recycling

Restriction of Hazardous Substances Directive (RoHS)

This topic provides statements about the Restriction of Hazardous Substances Directive (RoHS). The latest environmental information is available at http://www.lenovo.com/ecodeclaration.

China RoHS

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
机架	O	O	O	O	O	O
外部盖板	O	O	O	O	O	O
机械组合件	O	O	O	O	O	O
空气传动设备	X	O	O	O	O	O
冷却组合件	X	O	O	O	O	O
内存模块	X	O	O	O	O	O
处理器模块	X	O	O	O	O	O
键盘	X	O	O	O	O	O
调制解调器	X	O	O	O	O	O
监视器	X	X	O	O	O	O
鼠标	X	O	O	O	O	O
电缆组合件	X	O	O	O	O	O
电源	X	O	O	O	O	O
存储设备	X	O	O	O	O	O
电池匣组合件	X	O	O	O	O	O
电池	X	O	O	O	O	O
有mech的电路卡	X	O	O	O	O	O
无mech的电路卡	X	O	O	O	O	O
激光器	X	O	O	O	O	O

本表格依据 SJ/T 11364 的规定编制。
○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。
注：表中标记“×”的部件，皆因全球技术发展水平限制而无法实现有害物质的替代。

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，装有电池的组合件）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 RoHS

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

Türkiye AEEE Yönetmeliğine Uygunluk Beyanı

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

AEEE Yönetmeliğine Uygundur.

India RoHS

RoHS compliant as per E-Waste (Management & Handling) Rules, 2011.

European Union RoHS

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

For more information about Lenovo worldwide compliance on RoHS, go to:
http://www.lenovo.com/social_responsibility/us/en/RoHS_Communication.pdf

Ukraine RoHS

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

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.

Export classification notice

This product is subject to the United States Export Administration Regulations (EAR) and has an Export Classification Control Number (ECCN) of 4A994.b. It can be re-exported except to any of the embargoed countries in the EAR E1 country list.

Electronic emission notices

The following information refers to the Lenovo ThinkServer machine types 70F2, 70F3, 70F8, and 70F9. The latest compliance information is available at http://www.lenovo.com/compliance.

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. 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 A emission compliance statement

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

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

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

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 A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Lenovo, Einsteinova 21, 851 01 Bratislava, Slovakia

CE

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

German Class A compliance statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A 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 A 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 Betriebsmittein
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 A.

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 A.

Nach der EN 55022: „Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.“

Nach dem EMVG: „Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind.“ (Auszug aus dem EMVG, Paragraph 3, Abs. 4). Dieses Genehmigungsverfahren ist nach Paragraph 9 EMVG in Verbindung mit der entsprechenden Kostenverordnung (Amtsblatt 14/93) kostenpflichtig.

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den Handbüchern angegeben, zu installieren und zu betreiben.

Korea Class A compliance statement

A급 기기 (업무용 방송통신기자재)
이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다

Taiwan Class A compliance statement

警告使用者
此為甲類資訊技術設備，於居住環境中使用時，可能會造成射頻擾動，在此種情況下，使用者會被要求採取某些適當的對策。

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
台北市內湖區堤頂大道二段89號5樓
服務電話： 0800-000-702

Eurasian compliance mark

Japan VCCI Class A compliance statement

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 ＶＣＣＩ－Ａ

通信規制の注記

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact a Lenovo representative or reseller for any questions.

本製品は、電気通信事業者の通信回線との責任分界点への、直接的な接続を想定した認定取得作業を行っていません。
そのような接続を行うには、電気通信事業者による事前検査等が必要となる場合があります。
ご不明な点については、Lenovo担当員または販売代理店にお問い合わせください。

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