ThinkServer RD120 server Machine Types 6444, 6445, 6446, and 6447

lenovo

Hardware Maintenance Manual

ThinkServer RD120 server Machine Types 6444, 6445,
6446, and 6447

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Hardware Maintenance Manual

> **Note**
>
> Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 201, and the *Warranty and Support Information* document on the *ThinkServer Documentation DVD*.

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 Safety Information
(安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας
(safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się
z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Guidelines for trained service technicians

This section contains information for trained service technicians.

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

Inspecting for unsafe conditions

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

Consider the following conditions and the safety hazards that they present:
- Electrical hazards, especially primary power. Primary voltage on the frame can cause serious or fatal electrical shock.
- Explosive hazards, such as a damaged CRT face or a bulging capacitor.
- Mechanical hazards, such as loose or missing hardware.

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

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply for power safety information and procedures.

1. Make sure that the power is off and the power cord is disconnected.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

2. Make sure that the exterior cover is not damaged, loose, or broken, and observe any sharp edges.

3. Check the power cord:

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

   - Make sure that the third-wire ground connector is in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
   - Make sure that the power cord is the correct type, as specified in "Power cords" on page 44.
   - Make sure that the insulation is not frayed or worn.

4. Remove the cover.

5. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.

6. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.

7. Check for worn, frayed, or pinched cables.

8. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Guidelines for servicing electrical equipment

Observe the following guidelines when you service electrical equipment:

- Check the area for electrical hazards such as moist floors, nongrounded power extension cords, and missing safety grounds.

- Use only approved tools and test equipment. Some hand tools have handles that are covered with a soft material that does not provide insulation from live electrical currents.

- Regularly inspect and maintain your electrical hand tools for safe operational condition. Do not use worn or broken tools or testers.

- Do not touch the reflective surface of a dental mirror to a live electrical circuit. The surface is conductive and can cause personal injury or equipment damage if it touches a live electrical circuit.

- Some rubber floor mats contain small conductive fibers to decrease electrostatic discharge. Do not use this type of mat to protect yourself from electrical shock.

- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.

- Locate the emergency power-off (EPO) switch, disconnecting switch, or electrical outlet so that you can turn off the power quickly in the event of an electrical accident.

- Disconnect all power before you perform a mechanical inspection, work near power supplies, or remove or install main units.

  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

- Before you work on the equipment, disconnect the power cord. If you cannot disconnect the power cord, have the customer power-off the wall box that supplies power to the equipment and lock the wall box in the off position.

  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

- Never assume that power has been disconnected from a circuit. Check it to make sure that it has been disconnected.

  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

- If you have to work on equipment that has exposed electrical circuits, observe the following precautions:

  – Make sure that another person who is familiar with the power-off controls is near you and is available to turn off the power if necessary.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

– When you are working with powered-on electrical equipment, use only one hand. Keep the other hand in your pocket or behind your back to avoid creating a complete circuit that could cause an electrical shock.

– When you use a tester, set the controls correctly and use the approved probe leads and accessories for that tester.

– Stand on a suitable rubber mat to insulate you from grounds such as metal floor strips and equipment frames.

• Use extreme care when you measure high voltages.

• To ensure proper grounding of components such as power supplies, pumps, blowers, fans, and motor generators, do not service these components outside of their normal operating locations.

• If an electrical accident occurs, use caution, turn off the power, and send another person to get medical aid.

Safety statements

Important:

Each caution and danger statement in this document is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document.

For example, if a caution statement is labeled "Statement 1", translations for that caution statement are in the *Safety Information* document under "Statement 1."

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

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

Statement 1:

DANGER

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

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

To Connect:	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 device ON.	

Statement 2:

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

Do not
- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

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

Statement 3:

CAUTION:
When laser products (such as CD drives, 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.

Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

Statement 4:
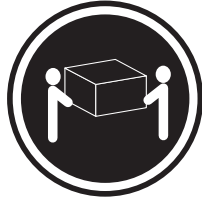
≥ 18 kg (39.7 lb)   ≥ 32 kg (70.5 lb)   ≥ 55 kg (121.2 lb)
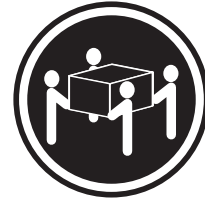
CAUTION:
Use safe practices when lifting.

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.
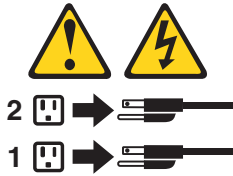
2

1

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 26:

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

Chapter 1. Introduction

This Hardware Maintenance Manual contains information to help you solve problems that might occur in the Lenovo ThinkServer™ RD120 Machine Types 6444, 6445, 6446, and 6447 server. It describes the diagnostic tools that come with the server, error codes and suggested actions, and instructions for replacing failing components.

Replaceable components are of three types:

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

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

The server has two model styles, which are based on the size and number of hard disk drive bays:

- The *3.5-inch* models have six 3.5-inch hot-swap hard disk drive bays. Install only 3.5-inch drives in these models. If you intend to install an optional tape drive, the tape drive will occupy two of the six 3.5-inch drive bays.
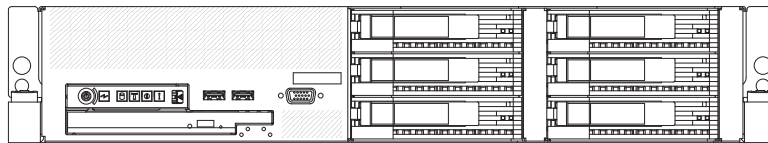
- The *2.5-inch* models have eight 2.5-inch hot-swap hard disk drive bays and one 3.5-inch tape-drive bay. Install only 2.5-inch hard disk drives and an optional 3.5-inch tape drive in these models.
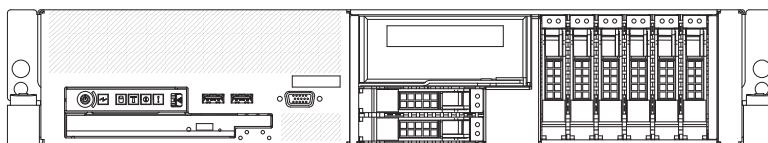
Throughout this documentation, the terms *2.5-inch models* and *3.5-inch models* are used to distinguish between the server styles.

Related documentation

In addition to this document, the following documentation also comes with the server:

- *Installation Guide*

  This document is in Portable Document Format (PDF) is available on the *ThinkServer Documentation DVD*. It contains instructions for setting up the server and basic instructions for installing some optional devices.

- *User Guide*

This PDF is available on the *ThinkServer Documentation DVD*. It provides general information about the server, including information about features, and how to configure the server. It also contains detailed instructions for installing, removing, and connecting optional devices that the server supports.

- *Rack Installation Instructions*

  This PDF is available on the *ThinkServer Documentation DVD*. It contains instructions for installing the server in a rack.

- *Safety Information*

  This document is in PDF on the *ThinkServer Documentation DVD*. It contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

- *Warranty and Support Information*

  This document is in PDF on the *ThinkServer Documentation DVD*. It contains information about the terms of the warranty and getting service and assistance.

Depending on the server model, additional documentation might be included on the *ThinkServer Documentation DVD*.

The server might have features that are not described in the documentation that comes with the server. The documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the server documentation. These updates are available from the Lenovo Web site. To check for updated documentation and technical updates, complete the following steps.

Note: Changes are made periodically to the Lenovo Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to: http://www.lenovo.com/support.
2. Enter your product number (machine type and model number) or select **Servers** from the **Select your product** list.
3. Select **Servers** from the **Brand** list.
4. From **Family** list, select **ThinkServer RD120**, and click **Continue**.
5. Click **Downloads and drivers** to download firmware updates.

Notices and statements in this document

The caution and danger statements that appear in this document are also in the multilingual *Safety Information* document, which is on the *ThinkServer Documentation DVD*. Each statement is numbered for reference to the corresponding statement in the *Safety Information* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.

- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

The following information is a summary of the features and specifications of the server. Depending on the server model, some features might not be available, or some specifications might not apply.

Racks are marked in vertical increments of 4.45 cm (1.75 inches). Each increment is referred to as a unit, or "U." A 1-U-high device is 1.75 inches tall.

Notes:

1. Power consumption and heat output vary depending on the number and type of optional features that are installed and the power-management optional features that are in use.

2. The sound levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.

Table 1. Features and specifications

Microprocessor:
- Intel® Xeon® FC-LGA 771 dual-core with 4 MB Level-2 cache or quad-core with 8 MB (2x4 MB) Level-2 cache
- Support for up to two microprocessors
- Support for Intel Extended Memory 64 Technology (EM64T)

Note:
- Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors.
- For a list of supported microprocessors, see http://www.ibm.com/servers/eserver/serverproven/compat/us/

Memory:
- Twelve DIMM connectors
- Minimum: 1 GB
- Maximum: 48 GB
- Type: Fully buffered DIMM (FBD) PC2-5300 DIMMs only
- Sizes: 512 MB, 1 GB, 2 GB, or 4 GB (when available), in pairs
- Chipkill™ supported

Drives:

CD/DVD: IDE 24x CD-RW/ 8x DVD combination

Expansion bays:
- Hot-swap hard disk drive bays: SAS only. Number and size depend on the server model. One of the following configurations:
  - Six 3.5-inch drive bays (optional tape drive [SATA or SCSI] requires two of these bays)
  - Eight 2.5-inch drive bays and one tape-drive (SATA or SCSI) bay
- One 5.25-inch Ultrabay Enhanced bay (CD-RW/DVD drive installed)

Expansion slots:
- Two PCI Express x8 slots (x4 lanes) on system board (low profile)
- Support for either of the following optional riser cards:
  - Riser card with two PCI Express x8 slots (x8 lanes) (standard)
  - Riser card with two 133 MHz/64-bit PCI-X slots

Hot-swap fans:
- Standard: Five
- Maximum: Ten - provide redundant cooling

Hot-swap power supplies:

835 watts (100 - 240 V ac)
- Minimum: One
- Maximum: Two - provide redundant power

Size (2 U):
- Height: 85.4 mm (3.36 in.)
- Depth: 705 mm (27.8 in.)
- Width: 443.6 mm (17.5 in.)
- Weight: approximately 21.09 kg (46.5 lb) to 29.03 kg (64 lb) depending upon configuration

Integrated functions:
- Baseboard management controller
- Two Broadcom 10/100/1000 Ethernet controllers with Wake on LAN® support and TCP/IP Offload Engine (TOE) support
- One RAID controller, active only when a 8k or 8k-I SAS controller is installed
- One serial port
- One serial-attached SCSI (SAS) controller
- Seven Universal Serial Bus (USB) ports (two on front and four on rear of server, plus one internal), v2.0 supporting v1.1
- Two video ports (one on front and one on rear of server)
- One internal serial ATA (SATA) connector for tape
- Support for Remote Supervisor Adapter II SlimLine

Note: In messages and documentation, the term *service processor* refers to the baseboard management controller or the optional Remote Supervisor Adapter II SlimLine.

Video controller:
- ATI RN50 video on system board
- Compatible with SVGA and VGA
- 16 MB DDR video memory

ServeRAID SAS controller:
- ServeRAID™-8k-I SAS Controller that supports RAID levels 0, 1, 10 (standard)
- Upgradeable to ServeRAID-8k SAS Controller, 256 MB with battery backup, that supports RAID levels 0, 1, 1E, 5, 6, and 10

Environment:
- Air temperature:
  - Server on: 10° to 35°C (50.0° to 95.0°F); altitude: 0 to 914.4 m (3000 ft). Decrease system temperature by 0.75°C for every 1000-foot increase in altitude.
  - Server off: 10° to 43°C (50.0° to 109.4°F); maximum altitude: 2133 m (7000 ft)
  - Shipment: -40° to +60°C (-40° to 140°F); maximum altitude: 2133 m (7000 ft)
- Humidity:
  - Server on/off: 8% to 80%
  - Shipment: 5% to 100%

Acoustical noise emissions:
- Declared sound power, idle: 6.8 bel
- Declared sound power, operating: 6.8 bel

Heat output:

Approximate heat output in British thermal units (Btu) per hour:
- Minimum configuration: 1230 Btu per hour (360 watts)
- Maximum configuration: 3390 Btu per hour (835 watts)

Electrical input with hot-swap ac power supplies:
- Sine-wave input (50-60 Hz) required
- Input voltage range automatically selected
- Input voltage low range:
  - Minimum: 100 V ac
  - Maximum: 127 V ac
- Input voltage high range:
  - Minimum: 200 V ac
  - Maximum: 240 V ac
- Input kilovolt-amperes (kVA) approximately:
  - Minimum: 0.29 kVA
  - Maximum: 1.00 kVA

Server controls, LEDs, and connectors

This section describes the controls, light-emitting diodes (LEDs), and connectors.

Front view

The following illustration shows the controls, light-emitting diodes (LEDs), and connectors on the front of the 3.5-inch model server.
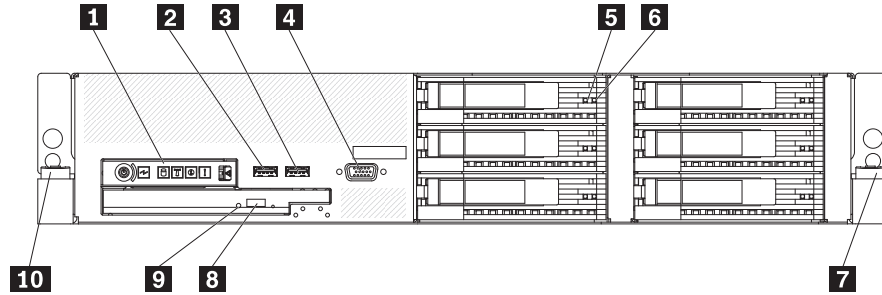
1	Operator information panel	6	Hard disk drive status LED (amber)
2	USB 5 connector	7	Rack release latch
3	USB 6 connector	8	CD/DVD eject button
4	Video connector	9	CD/DVD drive activity LED
5	Hard disk drive activity LED (green)	10	Rack release latch

The following illustration shows the controls, light-emitting diodes (LEDs), and connectors on the front of the 2.5-inch model server.
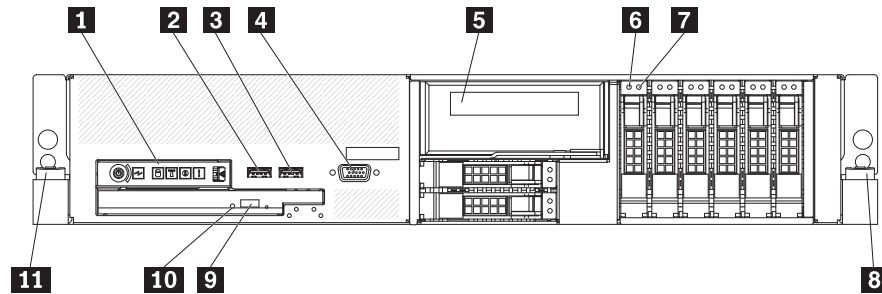
1	Operator information panel	7	Hard disk drive status LED (amber)
2	USB 5 connector	8	Rack release latch
3	USB 6 connector	9	CD/DVD eject button
4	Video connector	10	CD/DVD drive activity LED
5	Tape drive bay	11	Rack release latch
6	Hard disk drive activity LED (green)		

Operator information panel: This panel contains controls, LEDs, and connectors. The following illustration shows the controls, LEDs, and connectors on the operator information panel.

1 Power-on LED 5 System-error LED
2 Hard disk drive activity LED 6 System-locator LED
3 Information LED 7 Power-control button
4 Release latch
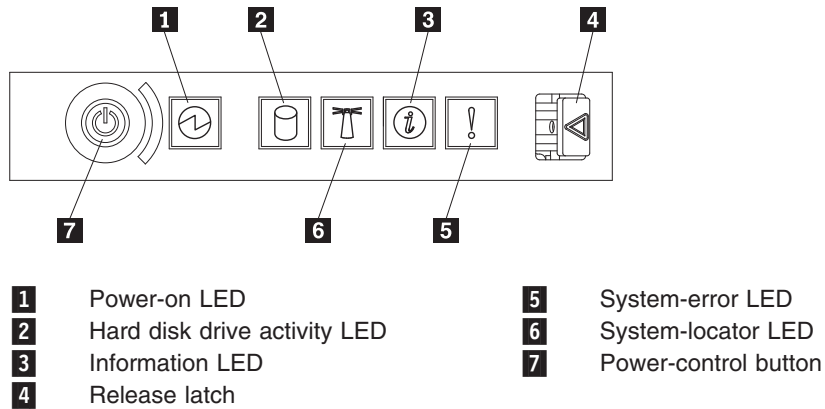
The following controls, LEDs, and connectors are on the operator information panel:

- **Power-control button:** Press this button to turn the server on and off manually. A power-control-button shield comes installed on the server to prevent the server from being turned off accidentally.
- **Power-on LED:** When this LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server is turned off and still connected to a power source. When this LED is off, it indicates that power is not present, or the power supply or the LED itself has failed.

  Note: If this LED is off, it does not mean that there is no electrical power in the server. The LED might be burned out. To remove all electrical power from the server, you must disconnect the power cord from the electrical outlet.

  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
- **Hard disk drive activity LED:** When this LED is flashing, it indicates that a hard disk drive is in use.
- **System-locator LED:** Use this LED to visually locate the server among other servers.
- **Information LED:** When this LED is lit, it indicates that a noncritical event has occurred. An LED on the Easy LED Diagnostics panel is also lit to help isolate the error.
- **System-error LED:** When this LED is lit, it indicates that a system error has occurred. An LED on the Easy LED Diagnostics panel is also lit to help isolate the error.
- **Release latch:** Slide this latch to the left to access the Easy LED Diagnostics panel, which is behind the operator information panel.

USB connectors: Connect a USB device, such as USB mouse, keyboard, or other USB device, to either of these connectors.

Video connector: Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.

Hard disk drive activity LED: Each hot-swap hard disk drive has an activity LED. When this LED is flashing, it indicates that the drive is in use.

Hard disk drive status LED: Each hot-swap hard disk drive has a status LED. When this LED is lit, it indicates that the drive has failed. When this LED is flashing

slowly (one flash per second), it indicates that the drive is being rebuilt as part of a RAID configuration. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.

CD/DVD-eject button: Press this button to release a CD or DVD from the CD-RW/DVD drive.

CD/DVD drive activity LED: When this LED is lit, it indicates that the CD-RW/DVD drive is in use.

Rack release latches: Press these latches to release the server from the rack.

Rear view

The following illustration shows the connectors and LEDs on the rear of the server.

Attention: In a dc power environment, see the documentation that comes with the dc power supply for information about the power-supply LEDs.
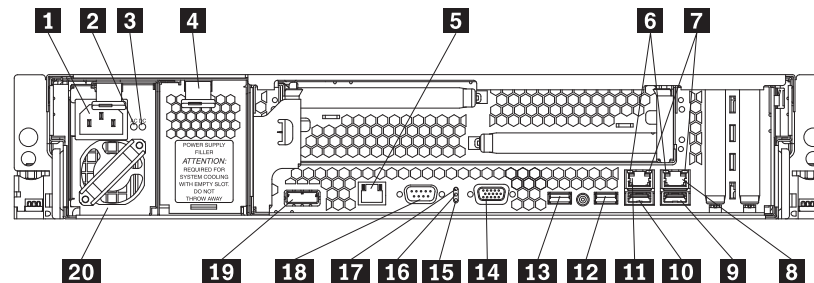
1	Power cord connector 1	**11**	Ethernet connector 2
2	AC power LED	**12**	USB connector 2
3	DC power LED	**13**	USB connector 1
4	Power supply filler panel	**14**	Video connector
5	Systems-management Ethernet connector	**15**	System-error LED
6	Ethernet activity LEDs	**16**	System-locator LED
7	Ethernet link LEDs	**17**	Power-on LED
8	Ethernet connector 1	**18**	Serial connector
9	USB connector 4	**19**	SAS connector
10	USB connector 3	**20**	Power supply 1

Power-cord connector (ac power supply only): Connect the power cord to this connector.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

AC power LED: Each hot-swap power supply has an ac power LED and a dc power LED. When the ac power LED is lit, it indicates that sufficient power is coming into the power supply through the power cord. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see "Power-supply LEDs" on page 167.

DC power LED: Each hot-swap power supply has a dc power LED and an ac power LED. When the dc power LED is lit, it indicates that the power supply is

supplying adequate DC power to the system. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see "Power-supply LEDs" on page 167.

Systems-management Ethernet connector: Use this connector to connect the server to a network for systems-management information control. This connector is active only if you have installed a Remote Supervisor Adapter II SlimLine, and it is used only by the Remote Supervisor Adapter II SlimLine.

Ethernet activity LEDs: When these LEDs are lit, they indicate that the server is transmitting to or receiving signals from the Ethernet LAN that is connected to the Ethernet port.

Ethernet link LEDs: When these LEDs are lit, they indicate that there is an active link connection on the 10BASE-T, 100BASE-TX, or 1000BASE-TX interface for the Ethernet port.

Ethernet connectors: Use either of these connectors to connect the server to a network.

USB connectors: Connect a USB device, such as USB mouse, keyboard, or other USB device, to any of these connectors.

Video connector: Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.

System-error LED: When this LED is lit, it indicates that a system error has occurred. An LED on the Easy LED Diagnostics panel is also lit to help isolate the error.

System-locator LED: Use this LED to visually locate the server among other servers.

Power-on LED: When this LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server is turned off and still connected to a power source. When this LED is off, it indicates that power is not present, or the power supply or the LED itself has failed.

Serial connector: Connect a 9-pin serial device to this connector. The serial port is shared with the baseboard management controller (BMC). The BMC can take control of the shared serial port to perform text console redirection and to redirect serial traffic, using Serial over LAN (SOL).

SAS connector: Connect a serial-attached SCSI (SAS) device to this connector.

Internal connectors, LEDs, and jumpers

The illustrations in this section show the LEDs, connectors, and jumpers on the internal boards. The illustrations might differ slightly from your hardware.

System-board optional-device connectors

The following illustration shows the connectors on the system board for user-installable optional devices.

1	PCI Express slot connectors (2)	**6**	Fan connectors (8)
2	Remote Supervisor Adapter II SlimLine connector	**7**	Voltage regulator module connector
3	PCI riser card connector	**8**	Microprocessor connectors (2)
4	ServeRAID SAS connector	**9**	Battery connector
5	DIMM connectors (12)		
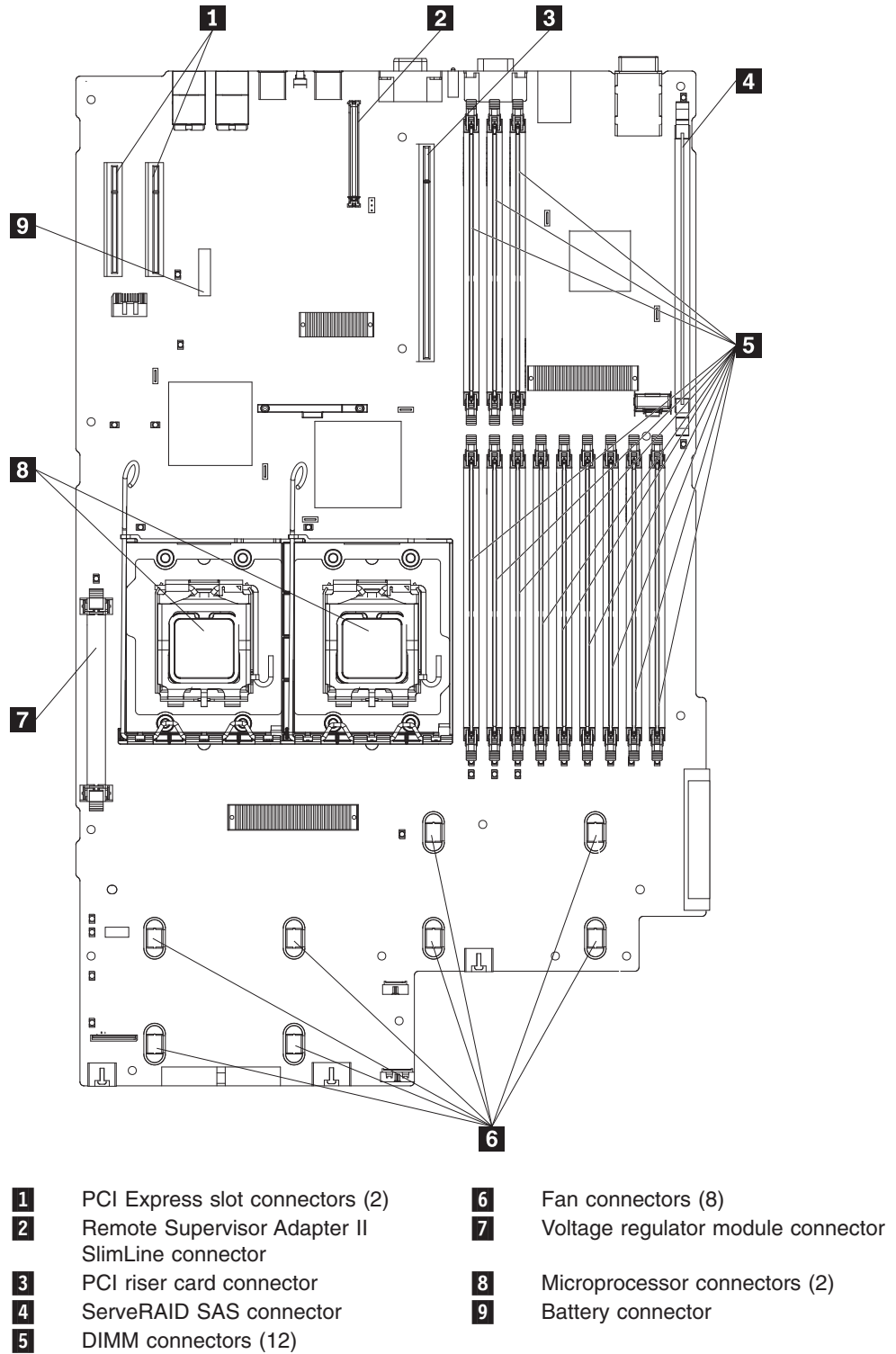
Note: The connectors for fans 7 and 10 are on the power backplane. See "Power-backplane-board connectors" on page 10.

PCI riser-card adapter connectors

The following illustration shows the connectors **1** on the PCI riser card for user-installable PCI adapters.

Note: For clarity, in the following illustration the PCI riser-card assembly is inverted.
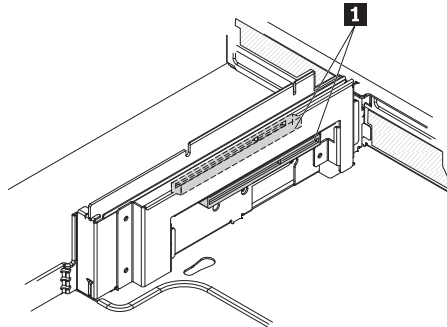
Power-backplane-board connectors

The following illustration shows the internal connectors on the power-backplane board.
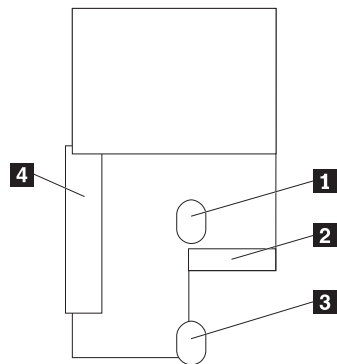
1	Fan 10 connector	**3**	Fan 7 connector
2	Hard disk drive power connector	**4**	System-board connector

System-board internal cable connectors

The following illustration shows the internal connectors on the system board.
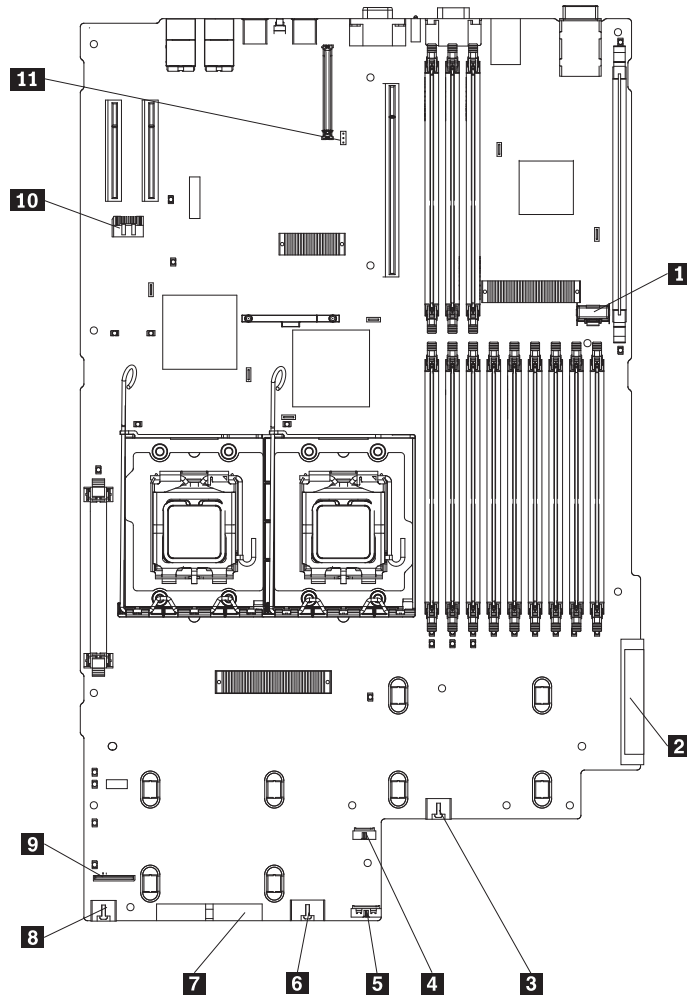
1	Hard disk drive backplane signal (J92)	**7**	CD/DVD signal (J37)
2	Power backplane (J72)	**8**	CD/DVD power (J12)
3	Tape drive power (J100)	**9**	Operator panel (J50)
4	Front USB (J80)	**10**	SATA tape drive signal (J102)
5	Front video (J51)	**11**	IPMB connector
6	Internal USB (J82)		

System-board external connectors

The following illustration shows the external input/output connectors on the system board.
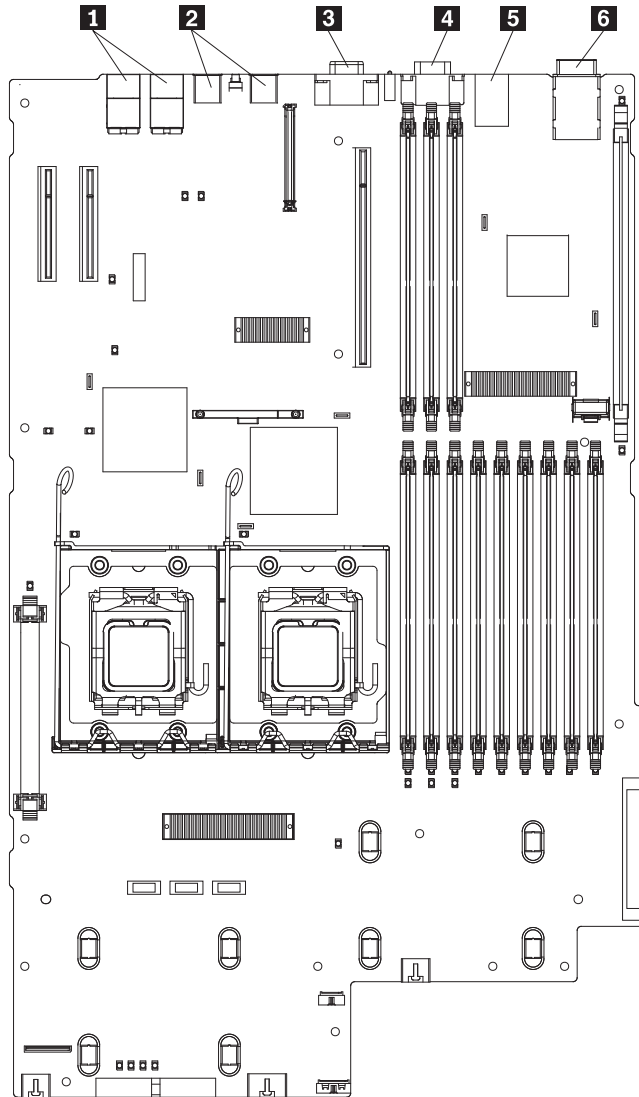
1	Ethernet/USB (2)	**4**	Serial
2	USB (2)	**5**	Systems-management Ethernet
3	Video	**6**	SAS

System-board switches and jumpers

The following illustration shows the switches and jumpers on the system board.

Any switches or jumpers on the system board that are not shown in the illustration are reserved. See "Recovering the BIOS code" on page 181 for information about the boot block recovery jumper.
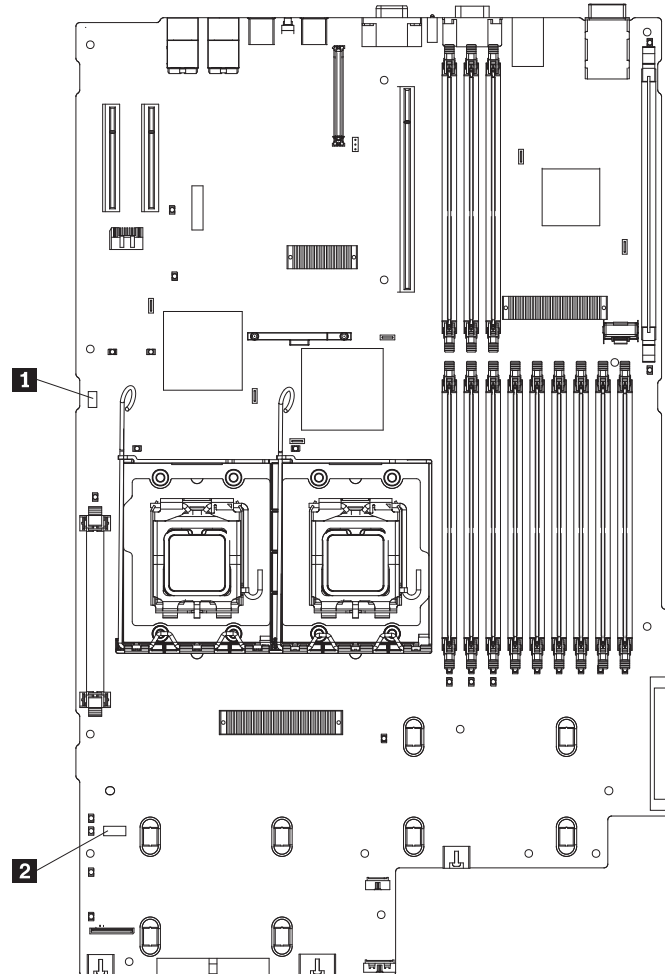
1	Boot block recovery jumper (J42)
2	Switch block (SW2)

Table 2 on page 14 describes the function of each switch on switch block 2.

Table 2. Switches 1 - 8

Switch number	Default value	Switch description
8	Off	Reserved.
7	Off	Remote Supervisor Adapter II SlimLine BIST. When this switch is toggled to On, it causes the Remote Supervisor Adapter II SlimLine to execute the Built In Self Test (BIST).
6	Off	Power-on override. When this switch is toggled to On, it forces the power on, overriding the power-on button.
5	Off	Power-on password override. Changing the position of this switch bypasses the power-on password check the next time the server is turned on and starts the Configuration/Setup Utility program so that you can change or delete the power-on password. You do not have to move the switch back to the default position after the password is overridden. Changing the position of this switch does not affect the administrator password check if an administrator password is set. See the *User Guide* on the *ThinkServer Documentation DVD* for additional information about the power-on password.
4	Off	Force BMC update. When this switch is toggled to On, it causes an update of BMC firmware from the diskette drive.
3	Off	Force BMC reset. When this switch is toggled to On, it forces the BMC to reset.
2	Off	Reserved.
1	Off	Clear CMOS. When this switch is toggled to On, it clears the CMOS data, which clears the power-on password.

Notes:

1. Before you change any switch settings or move any jumpers, turn off the server; then, disconnect all power cords and external cables. (Review the information in "Safety" on page vii, "Installation guidelines" on page 53, and "Handling static-sensitive devices" on page 55.)

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

2. Any system-board switch or jumper blocks that are not shown in the illustrations in this document are reserved.

System-board LEDs

The following illustration shows the light-emitting diodes (LEDs) on the system board.

1	Riser-card-missing error LED	**6**	VRM error LED
2	RAID error LED	**7**	Microprocessor error LED (2)
3	DIMM error LED (12)	**8**	PCI slot error LED (2)
4	BMC heartbeat LED	**9**	Remote Supervisor Adapter II SlimLine error LED
5	Power channel error LED (4)	**10**	3 V battery error LED

Table 3. System-board LEDs

LED	Description
Error LEDs	The associated component has failed.
BMC heartbeat LED	This LED flashes to indicate that the BMC (baseboard management controller) is functioning normally.
12-volt power (A, B, C, D) LEDs	If any of these LEDs is lit, there is a failure in the associated system board power channel (see "Power problems" on page 155).

Riser-card assembly LEDs

The following illustration shows the light-emitting diodes (LEDs) on the riser-card assembly.
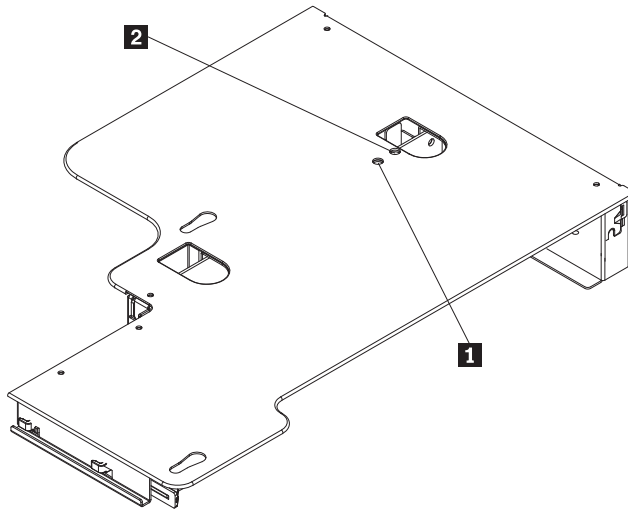
| 1 | PCI slot 1 error LED |
| 2 | PCI slot 2 error LED |

Chapter 2. Configuration information and instructions

This chapter provides information about updating the firmware and using the configuration utilities.

Updating the firmware

The firmware in the server is periodically updated and is available for download on the Web. To check for the latest level of firmware, such as BIOS code, vital product data (VPD) code, device drivers, and service processor firmware, use the ThinkServer EasyUpdate program or go to: http://www.lenovo.com/support/.

When you replace a device in the server, you might have to either update the server with the latest version of the firmware that is stored in memory on the device or restore the pre-existing firmware from a diskette or CD image.
- BIOS code is stored in ROM on the system board.
- BMC firmware is stored in ROM on the baseboard management controller on the system board.
- Ethernet firmware is stored in ROM on the Ethernet controller.
- ServeRAID firmware is stored in ROM on the ServeRAID SAS controller.
- SAS firmware is stored in ROM on the integrated RAID controller on the system board.
- Major components contain vital product data (VPD) code. You can select to update the VPD code during the BIOS code update procedure.

Configuring the server

The *ThinkServer EasyStartup DVD* that comes with the server provides programs to help you set up the server and install an operating system. The EasyStartup program detects installed hardware devices and guides you through the process of creating a response file and performing an unattended installation of the operating system and associated device drivers.

For more information about the *ThinkServer EasyStartup DVD*, see "Using the *ThinkServer EasyStartup DVD*" on page 18.

In addition to the *ThinkServer EasyStartup DVD*, you can use the following configuration programs to customize the server hardware:
- Configuration/Setup Utility program
- Baseboard management controller utility programs
- RAID configuration programs
  - Adaptec RAID Configuration Utility program
  - ServeRAID Manager

For more information about these programs, see "Configuring the server" in the *User Guide* on the *ThinkServer Documentation DVD*.

Using the *ThinkServer EasyStartup DVD*

The *ThinkServer EasyStartup DVD* contains a setup and installation program designed for your server. The program works in conjunction with your operating-system installation disc to simplify and automate the process of installing the operating system and device drivers.

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

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

Before you use the *ThinkServer EasyStartup DVD*

Functionality and supported operating systems can vary with different versions of the EasyStartup program. To learn more about the version you have, do the following:

1. Insert the *ThinkServer EasyStartup DVD* and restart the server.
2. Advance to the Home screen.
3. Click **Release notes**. The release notes feature provides detailed information about the operating systems and server configurations supported by that version of the EasyStartup program.
4. Click **User Guide**. The User Guide provides an overview of the various functions provided by that version of the EasyStartup program.

Before using the EasyStartup program to install an operating system, if you intend to use a RAID configuration, make sure that your storage controller is configured for the RAID level and functionality that you want to use. Also, make sure any external storage devices and fiber channels are configured correctly.

EasyStartup overview

The EasyStartup program requires a supported Lenovo server with an enabled, startable (bootable) DVD drive. In addition to the *ThinkServer EasyStartup DVD*, you also must have the operating-system installation CD or DVD and the product key for the operating system (if provided).

The EasyStartup program performs the following tasks:
- Sets the system date and time
- Detects installed hardware devices
- Guides the network administrator through the process of creating a response file
- Prepares the hard disk for installation

- Prompts the network administrator to insert the operating-system installation disc
- Initiates an unattended installation of the operating system and device drivers for most adapters and devices

Setup and configuration: When you start the *ThinkServer EasyStartup DVD*, you will be prompted for the following:

- Select the language in which you want to view the program.
- Select the language of the keyboard you will be using with the program.

Note: The following language keyboards are supported: English, French, German, Spanish, and Japanese.

You will then see one or more reminders about configuring storage devices, and then you will be presented with the Lenovo License Agreement. Read the license agreement carefully. You must agree with terms in order to continue.

After agreeing to the license agreement, you will be given a choice of continuing to the main program interface or using a shortcut to install an operating system based a response file that you previously created using the EasyStartup program.

If you continue to the main program interface, you will have the following selectable options:

- **Compatibility notes:** This selection provides information about the operating systems and server configurations supported by that version of the EasyStartup program.
- **User Guide:** This selection provides information about the features provided by that version of the EasyStartup program.
- **Hardware list:** This selection displays a list of hardware devices detected by the EasyStartup program.
- **Install operating system:** This selection displays a series of choices and prompts to collect information required for installation, prepares the hard disk for installation, and then initiates the installation process using the user-provided operating-system installation CD or DVD.
- **About:** This selection displays version information and legal notices.

Typical operating system installation: When you select **Install operating system**, you will be prompted for information required for the installation. This section describes the tasks associated with a typical operating system installation. Each task must be completed in order before moving to the next task.

- **Select operating system:** This task enables you to select that operating system you will be installing.
- **Select disk:** This task enables you to select the disk where you want to install the operating system.

  Note: The disk that you select must be set as the boot disk in BIOS.
- **Partitions options:** This task enables you to choose whether you want to repartition the selected drive or use an existing partition.
- **Partition settings:** This task enables you to choose the file system type and define the partition size.
- **Installation settings:** This task prompts you for user and system settings, time zone, the operating system product key, and the administrator password.

- **Network settings:** This task prompts you for domain and workgroup settings, Ethernet controller type, IP address settings, DNS settings, and WINS address settings.
- **Install applications:** This task enables you to run custom commands or scripts at the end of the installation process, install ThinkServer EasyManage software to help you manage your servers, and install the ThinkServer EasyUpdate program to keep your servers up to date.
- **Confirm settings:** This task enables you to review all of the information you provided and optionally save the information on a diskette or USB device as a response file for future installations on similarly configured Lenovo servers.
- **Start installation:** This task starts the actual installation process. First, the disk is prepared using the disk and partition information you specified. Then you are prompted to insert the operating system disk and the operating system is installed using the information that you specified.

Installing your operating system without using EasyStartup

If you have already configured the server hardware and you are not using the EasyStartup program to install your operating system, complete the following steps to download the latest operating-system installation instructions from the Lenovo Web site:

Note: Changes are made periodically to the Lenovo Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to: http://www.lenovo.com/support.
2. Enter your product number (machine type and model number) or select **Servers** from the **Select your product** list.
3. Select **Servers** from the **Brand** list.
4. From **Family** list, select **ThinkServer RD120**, and click **Continue**.
5. Select the operating system that you want from the **Operating system** list, and click **Continue**.
6. Click **Operating system installation** to download instructions to install the operating system.

Using the Configuration/Setup Utility program

The Configuration/Setup Utility program is part of the BIOS. You can use it to perform the following tasks:

- View configuration information
- View and change assignments for devices and I/O ports
- Set the date and time
- Set and change passwords
- Set and change the startup characteristics of the server and the order of startup devices (startup-drive sequence)
- Set and change settings for advanced hardware features
- View and clear the error log
- Change interrupt request (IRQ) settings
- Resolve configuration conflicts

To start the Configuration/Setup Utility program, complete the following steps:

1. Turn on the server.

2. When the message `Press F1 for Configuration/Setup` appears, press F1. If an administrator password has been set, you must type the administrator password to access the full Configuration/Setup Utility menu.

3. Follow the instructions on the screen.

Using the ServeRAID configuration programs

The ServeRAID controller enables you to configure multiple physical SAS hard disk drives to operate as logical drives in a disk array. The server comes with a CD containing the ServeRAID Manager program and the ServeRAID Mini-Configuration program, which you can use to configure the ServeRAID controller. For information about these programs, see the *User Guide* on the *ThinkServer Documentation DVD*.

Using the RAID configuration programs

Use the IBM ServeRAID Configuration Utility program and ServeRAID Manager to configure and manage redundant array of independent disks (RAID) arrays. Be sure to use these programs as described in this document.

- Use the IBM ServeRAID Configuration Utility program to:
  - Perform a low-level format on a hard disk drive
  - View or change IDs for attached devices
  - Set protocol parameters on hard disk drives
- Use ServeRAID Manager to:
  - Configure arrays
  - View the RAID configuration and associated devices
  - Monitor operation of the RAID controller

Consider the following information when using the IBM ServeRAID Configuration Utility program and ServeRAID Manager to configure and manage arrays:

- The ServeRAID-8k-l SAS controller that comes with the server supports only RAID level-0, level-1, and level-10. You can replace it with a ServeRAID-8k SAS controller that supports additional RAID levels.
- Hard disk drive capacities affect how you create arrays. The drives in an array can have different capacities, but the ServeRAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- To help ensure signal quality, do not mix drives with different speeds and data rates.
- To update the firmware and BIOS code for an optional ServeRAID SAS controller, you must use the IBM *ServeRAID Support* CD that comes with the ServeRAID device.

Using the IBM ServeRAID Configuration Utility program

Use the IBM ServeRAID Configuration Utility programs to perform the following tasks:

- Configure a redundant array of independent disks (RAID) array
- View or change the RAID configuration and associated devices

Starting the IBM ServeRAID Configuration Utility program: To start the IBM ServeRAID Configuration Utility program, complete the following steps:

1. Turn on the server.

2. When the prompt `<<< Press <CTRL><A> for IBM ServeRAID Configuration Utility! >>>` appears, press Ctrl+A. If you have set an administrator password, you are prompted to type the password.

3. To select a choice from the menu, use the arrow keys.

4. Use the arrow keys to select the channel for which you want to change settings.

5. To change the settings of the selected items, follow the instructions on the screen. Be sure to press Enter to save your changes.

IBM ServeRAID Configuration Utility menu choices: The following choices are on the IBM ServeRAID Configuration Utility menu:

- **Array Configuration Utility**

  Select this choice to create, manage, or delete arrays, or to initialize drives.

- **SerialSelect Utility**

  Select this choice to configure the controller interface definitions or to configure the physical transfer and SAS address of the selected drive.

- **Disk Utilities**

  Select this choice to format a disk or verify the disk media. Select a device from the list and read the instructions on the screen carefully before making a selection.

Using ServeRAID Manager

Use ServeRAID Manager, which is on the *ThinkServer Documentation DVD*, to perform the following tasks:

- Configure a redundant array of independent disks (RAID) array
- Erase all data from a hard disk drive and return the disk to the factory-default settings
- View the RAID configuration and associated devices
- Monitor the operation of the RAID controller

To perform some tasks, you can run ServeRAID Manager as an installed program. However, to configure the RAID controller and perform an initial RAID configuration on the server, you must run ServeRAID Manager in Startable CD mode, as described in the instructions in this section.

See the ServeRAID documentation on the *ThinkServer Documentation DVD* for additional information about RAID technology and instructions for using ServeRAID Manager to configure the RAID controller. Additional information about ServeRAID Manager is also available from the **Help** menu. For information about a specific object in the ServeRAID Manager tree, select the object and click **Actions --> Hints and tips**.

Configuring the RAID controller: By running ServeRAID Manager in Startable CD mode, you can configure the RAID controller before you install the operating system. The information in this section assumes that you are running ServeRAID Manager in Startable CD mode.

To run ServeRAID Manager in Startable CD mode, turn on the server; then, insert the CD into the CD-RW/DVD drive. If ServeRAID Manager detects an unconfigured controller and ready drives, the Configuration wizard starts.

In the Configuration wizard, you can select express configuration or custom configuration. Express configuration automatically configures the controller by grouping the first two physical drives in the ServeRAID Manager tree into an array

and creating a RAID level-1 logical drive. If you select custom configuration, you can select the two physical drives that you want to group into an array and create a hot-spare drive.

Using express configuration: To use express configuration, complete the following steps:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Express configuration**.
3. Click Next.
4. In the "Configuration summary" window, review the information. To change the configuration, click **Modify arrays**.
5. Click **Apply**; when you are asked whether you want to apply the new configuration, click **Yes**. The configuration is saved in the controller and in the physical drives.
6. Exit from ServeRAID Manager and remove the CD from the CD-RW/DVD drive.
7. Restart the server.

Using custom configuration: To use custom configuration, complete the following steps:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Custom configuration**.
3. Click **Next**.
4. In the "Create arrays" window, from the list of ready drives, select the drives that you want to group into the array.
5. Click the (Add selected drives) icon to add the drives to the array.
6. If you want to configure a hot-spare drive, complete the following steps:
   a. Click the **Spares** tab.
   b. Select the physical drive that you want to designate as the hot-spare drive, and click the (Add selected drives) icon.
7. Click **Next**.
8. Review the information in the "Configuration summary" window. To change the configuration, click **Back**.
9. Click **Apply**; when you are asked whether you want to apply the new configuration, click **Yes**. The configuration is saved in the controller and in the physical drives.
10. Exit from ServeRAID Manager and remove the CD from the CD-RW/DVD drive.
11. Restart the server.

Viewing the configuration: You can use ServeRAID Manager to view information about RAID controllers and the RAID subsystem (such as arrays, logical drives, hot-spare drives, and physical drives). When you click an object in the ServeRAID Manager tree, information about that object appears in the right pane. To display a list of available actions for an object, click the object and click **Actions**.

Chapter 3. Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447

The following replaceable components are available for the ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447, except as specified otherwise in "Replaceable server components." For an updated parts listing, consult the latest version of the Hardware Maintenance Manual on the Lenovo Support Web site.

Replaceable server components

Replaceable components are of three types:

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

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

View 1

Table 4. View 1 parts listing, Types 6444

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
1	Cover (all models)		42C9487	
2	Power supply, 835 W (models 13U 13G 13A 12G 12M 12A 12Q 12T 12K 12R 12E 12J)		24R2731	
3	Filler panel, power supply bay (all models)	24R2735		
4	Power backplane (all models)		24R2733	
5	Cage with backplane, 2.5-inch drive (all models)		40K6552	
6	Hard disk drive, SAS, 2.5-inch 146 GB, 10K, hot-swap, with tray (models)	45J9652		
6	Hard disk drive, SAS, 2.5-inch 73 GB, 10K, hot-swap, with tray (models)	45J9654		

Table 4. View 1 parts listing, Types 6444 (continued)

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
7	Filler panel, 2.5-inch hard disk drive bay (all models)	26K8680		
8	Center bracket, 3.5-inch drive cage (all models)			41Y8733
9	Hard disk drive, SAS, 3.5-inch 146 GB, 15K, hot-swap, with tray (models)	45J9658		
9	Hard disk drive, SATA, 3.5-inch 500 GB, 10K, hot-swap, with tray (models)	45J9644		
9	Hard disk drive, SATA, 3.5-inch 750 GB, 10K, hot-swap, with tray (models)	45J9646		
9	Hard disk drive, SATA 3.5-inch 1TB , hot-swap (models)	45J9648		
9	Hard disk drive, SAS, 3.5-inch 300 GB, 15K, hot-swap, with tray (models)	45J9660		
9	Hard disk drive, SAS 450GB 15K 3.5″ HS HDD (all models)	46U2108		
10	Filler panel, 3.5-inch hard disk drive bay (all models)		39M4375	
11	CD-RW/DVD drive, 24/8X, HLDS (models 13U 13G 13A 12G 12M 12A 12Q 12T 12K 12R 12E 12J)		39M3541	
11	CD-RW/DVD drive, 24/8X, Teac (models 13U 13G 13A 12G 12M 12A 12Q 12T 12K 12R 12E 12J)		39M3563	
11	DVD-ROM, 8/24XDVD(models 11G)		39M3533	
12	Operator information panel assembly (all models)		43W0626	
15	Filler panel, tape-drive bay (all models)		41Y8739	
16	CD/DVD media backplane (all models)		41Y8735	
17	Microprocessor air baffle (all models)		41Y8727	
19	Fan bracket (all models)		41Y8726	
20	Fan (60 mm) (all models)		46C4014	
	3.5 inch tape carrier (all models)		44E8850	
	System service label (all models)		41Y8737	
	CRU/FRU label (all models)		41Y8738	
	Rack power cable (all models)		39M5377	
	Brackets, EIA (all models)		40K6497	
	Air baffles kit (all models)		41Y8727	
	Battery, 3.0 VOLT battery (all models)		33F8354	
	Cable, CD/DVD signal (all models)		39M6765	
	Cable, CD/DVD power (all models)		39M6757	
	Cable, 2.5-inch hard disk drive power (all models)		26K8068	
	Cable, 3.5-inch hard disk drive power (all models)		39M6759	
	Cable, front video (all models)		39M6761	
	Cable, front USB (all models)		39M6763	
	Cable, hard disk drive signal (all models)		42C2378	
	Cable, USB signal (optional-device) (all models)		39M6781	

Table 4. View 1 parts listing, Types 6444 (continued)

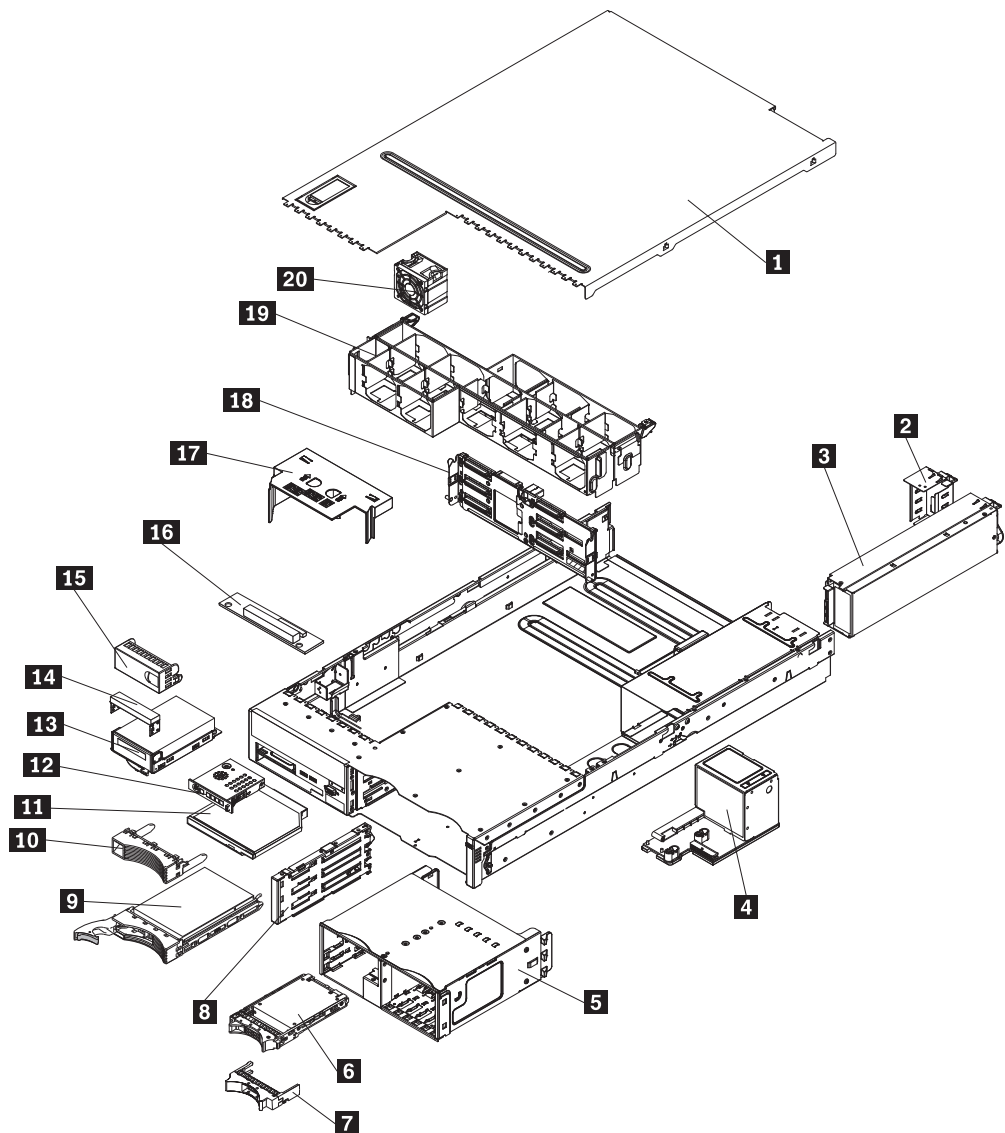| Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
	Cable, SCSI tape signal (all models)		25R0048	
	Chassis assembly (all models)		41Y8724	
	Kit, misc. (all models)		41Y8730	
	Cable management arm kit (all models)		40K6556	
	Slide kit, toolless (all models)		40K6591	
	Slide shipping brackets (all models)		40K6592	
	Slide kit, screw-in (all models)		41Y8731	
	DVD drive retention clip (all models)		41Y8730	
	DVD drive filler (all models)		41Y8740	
	DC power supply (some configurations only) (all models)		39Y7191	
	Mouse, optical, 3-button (optional) (models)			41U3013
	Keyboard, US (models)			41A5100
	3U SCSI adapter (all models)		43W4325	
	IBM ServeRAID 8k-I SAS Controller (all models)		25R8079	
	RSA SlimLine (all models)		44T1412	

Table 5. View 1 parts listing, Types 6445

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
1	Cover (all models)		42C9487	
2	Power supply, 835 W (models 12U 12F 12S 12L 12D 12Y 12G 12M 12A 12Q 12T 12K 12R 12E 12J 13G 14U 14F 14S 14L 14D 14Y 11G)		24R2731	
3	Filler panel, power supply bay (all models)	24R2735		
4	Power backplane (all models)		24R2733	
5	Cage with backplane, 2.5-inch drive (all models)		40K6552	
6	Hard disk drive, SAS, 2.5-inch 146 GB, 10K, hot-swap, with tray (models)	45J9652		
6	Hard disk drive, SAS, 2.5-inch 73 GB, 10K, hot-swap, with tray (models)	45J9654		
7	Filler panel, 2.5-inch hard disk drive bay (all models)	26K8680		
8	Center bracket, 3.5-inch drive cage (all models)			41Y8733
9	Hard disk drive, SAS, 3.5-inch 146 GB, 15K, hot-swap, with tray (models)	45J9658		
9	Hard disk drive, SATA, 3.5-inch 500 GB, 10K, hot-swap, with tray (models 12U 12F 12S 12L 12D 12Y 12G 12M 12A 12Q 12T 12K 12R 12E 12J 13G 14U 14F 14S 14L 14D 14Y 11G)	45J9644		
9	Hard disk drive, SATA, 3.5-inch 750 GB, 10K, hot-swap, with tray (models)	45J9646		
9	Hard disk drive, SATA 3.5-inch 1TB , hot-swap (models)	45J9648		
9	Hard disk drive, SAS, 3.5-inch 300 GB, 15K, hot-swap, with tray (models)	45J9660		
9	Hard disk drive, SAS 450GB 15K 3.5″ HS HDD (all models)	46U2108		
10	Filler panel, 3.5-inch hard disk drive bay (all models)		39M4375	
11	CD-RW/DVD drive, 24/8X, HLDS (models 12U 12F 12S 12L 12D 12Y 12G 12M 12A 12Q 12T 12K 12R 12E 12J 13G)		39M3541	
11	CD-RW/DVD drive, 24/8X, Teac (models 14U 14F 14S 14L 14D 14Y 11G)		39M3563	
11	DVD drive, 24/8X, (models 14U 14F 14S 14L 14D 14Y 11G)		39M3533	
12	Operator information panel assembly (all models)		43W0626	
15	Filler panel, tape-drive bay (all models)		41Y8739	
16	CD/DVD media backplane (all models)		41Y8735	
17	Microprocessor air baffle (all models)		part of 41Y8727	
19	Fan bracket (all models)		41Y8726	
20	Fan (60 mm) (all models)		46C4014	
	3.5 inch tape carrier (all models)		44E8850	
	System service label (all models)		41Y8737	

Table 5. View 1 parts listing, Types 6445 (continued)

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
	CRU/FRU label (all models)		41Y8738	
	Rack power cable (all models)		39M5377	
	Brackets, EIA (all models)		40K6497	
	Air baffles kit (all models)		41Y8727	
	Battery, 3.0 VOLT (all models)		33F8354	
	Cable, CD/DVD signal (all models)		39M6765	
	Cable, CD/DVD power (all models)		39M6757	
	Cable, 2.5-inch hard disk drive power (all models)		26K8068	
	Cable, 3.5-inch hard disk drive power (all models)		39M6759	
	Cable, front video (all models)		39M6761	
	Cable, front USB (all models)		39M6763	
	Cable, hard disk drive signal (all models)		42C2378	
	Cable, USB signal (optional-device) (all models)		39M6781	
	Cable, SCSI tape signal (all models)		25R0048	
	Chassis assembly (all models)		41Y8724	
	Kit, misc. (all models)		41Y8730	
	Cable management arm kit (all models)		40K6556	
	Slide kit, toolless (all models)		40K6591	
	Slide shipping brackets (all models)		40K6592	
	Slide kit, screw-in (all models)		41Y8731	
	DVD drive retention clip (all models)		41Y8730	
	DVD drive filler (all models)		41Y8740	
	DC power supply (some configurations only) (all models)		39Y7191	
	Mouse, optical, 3-button (optional) (models)			41U3013
	Keyboard, US (models)			41A5100
	IBM Ultra320 SCSI PCIe Controller (all models)		43W4325	
	IBM ServeRAID 8k-I SAS Controller (all models)		25R8079	
	RSA SlimLine (all models)		44T1412	

Table 6. View 1 parts listing, Types 6446

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
1	Cover (all models)		42C9487	
2	Power supply, 835 W (models 15U 15f 15s 15l 15D 15Y 15G 15M 15A 15Q 15T 15K 15R 15E 15J)		24R2731	
3	Filler panel, power supply bay (all models)	24R2735		
4	Power backplane (models 15U 15f 15s 15l 15D 15Y 15G 15M 15A 15Q 15T 15K 15R 15E 15J)		24R2733	
5	Cage with backplane, 2.5-inch drive (all models)		40K6552	
6	Hard disk drive, SAS, 2.5-inch 146 GB, 10K, hot-swap, with tray (models 12U 12F 12S 12L 12D 12Y 13M 13A 13Q 13T 13K 13R 13E 13J 14M 14A 14Q 14T 14K 14R 14E 14J)	45J9652		
6	Hard disk drive, SAS, 2.5-inch 73 GB, 10K, hot-swap, with tray (models)	45J9654		
7	Filler panel, 2.5-inch hard disk drive bay (all models)	26K8680		
8	Center bracket, 3.5-inch drive cage (all models)			41Y8733
9	Hard disk drive, SAS, 3.5-inch 146 GB, 15K, hot-swap, with tray (models 12U 12F 12S 12L 12D 12Y 13M 13A 13Q 13T 13K 13R 13E 13J 14M 14A 14Q 14T 14K 14R 14E 14J)	45J9658		
9	Hard disk drive, SATA, 3.5-inch 500 GB, 10K, hot-swap, with tray (models 11U 11F 11S 11L 11D 11Y 11M 11A 11Q 11T 11K 11R 11E 11J)	45J9644		
9	Hard disk drive, SATA, 3.5-inch 750 GB, 10K, hot-swap, with tray (models)	45J9646		
9	Hard disk drive, SATA 3.5-inch 1TB , hot-swap (models)	45J9648		
9	Hard disk drive, SAS, 3.5-inch 300 GB, 15K, hot-swap, with tray (models)	45J9660		
9	Hard disk drive, SAS 450GB 15K 3.5-inch Hot-Swap SAS (all models)	46U2108		
10	Filler panel, 3.5-inch hard disk drive bay (all models)		39M4375	
11	CD-RW/DVD drive, 24/8X, HLDS (models 15U 15f 15s 15l 15D 15Y 15G 15M 15A 15Q 15T 15K 15R 15E 15J)		39M3541	
11	CD-RW/DVD drive, 24/8X, Teac (models 15U 15f 15s 15l 15D 15Y 15G 15M 15A 15Q 15T 15K 15R 15E 15J)		39M3563	
11	DVD-ROM (models 11U 11F 11S 11L 11D 11Y 11M 11A 11Q 11T 11K 11R 11E 11J 12U 12F 12S 12L 12D 12Y 13M 13A 13Q 13T 13K 13R 13E 13J 14M 14A 14Q 14T 14K 14R 14E 14J)		39M3533	
12	Operator information panel assembly (all models)		43W0626	
15	Filler panel, tape-drive bay (all models)		41Y8739	
16	CD/DVD media backplane (all models)		41Y8735	
17	Microprocessor air baffle (all models)		part of 41Y8727	
19	Fan bracket (all models)		41Y8726	

Table 6. View 1 parts listing, Types 6446 (continued)

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
20	Fan (60 mm) (all models)		46C4014	
	3.5 inch tape carrier (all models)		44E8850	
	System service label (all models)		41Y8737	
	CRU/FRU label (all models)		41Y8738	
	Rack power cable (all models)		39M5377	
	Brackets, EIA (all models)		40K6497	
	Air baffles kit (all models)		41Y8727	
	Battery, 3.0 volt (all models)		33F8354	
	Cable, CD/DVD signal (all models)		39M6765	
	Cable, CD/DVD power (all models)		39M6757	
	Cable, 2.5-inch hard disk drive power (all models)		26K8068	
	Cable, 3.5-inch hard disk drive power (all models)		39M6759	
	Cable, front video (all models)		39M6761	
	Cable, front USB (all models)		39M6763	
	Cable, hard disk drive signal (all models)		42C2378	
	Cable, USB signal (optional-device) (all models)		39M6781	
	Cable, SCSI tape signal (all models)		25R0048	
	Chassis assembly (all models)		41Y8724	
	Kit, misc. (all models)		41Y8730	
	Cable management arm kit (all models)		40K6556	
	Slide kit, toolless (all models)		40K6591	
	Slide shipping brackets (all models)		40K6592	
	Slide kit, screw-in (all models)		41Y8731	
	DVD drive retention clip (all models)		41Y8730	
	DVD drive filler (all models)		41Y8740	
	DC power supply (some configurations only) (all models)		39Y7191	
	Mouse, optical, 3-button (optional) (all models)			41U3013
	Keyboard, US (all models)			41A5100
	3U SCSI adapter (all models)		43W4325	
	IBM ServeRAID 8k-I SAS Controller (all models)		25R8079	
	RSA SlimLine (all models)		44T1412	

Table 7. View 1 parts listing, Types 6447

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
1	Cover (all models)		42C9487	
2	Power supply, 835 W (models 18U 18F 18S 18L 18D 18Y 18M 18A 18Q 18T 18H 18K 18R 18E 18J 19G 21U 21F 21S 21L 21D 21Y 21G 21M 21A 21Q 21T 21H 21K 21R 21E 21J 22G 23U 23F 23S 23L 23D 23Y 23M 23A 23Q 23T 23H 23K 23R 23E 23J 24G 24M 24A 24Q 24T 24K 24R 24E 24J 25H 26G 26M 26A 26Q 26T 26K 26J 27G 27M 27A 27Q 27T 27H 27K 27J)		24R2731	
3	Filler panel, power supply bay (all models)	24R2735		
4	Power backplane (models 18U 18F 18S 18L 18D 18Y 18M 18A 18Q 18T 18H 18K 18R 18E 18J 19G 21U 21F 21S 21L 21D 21Y 21G 21M 21A 21Q 21T 21H 21K 21R 21E 21J 22G 23U 23F 23S 23L 23D 23Y 23M 23A 23Q 23T 23H 23K 23R 23E 23J 24G 24M 24A 24Q 24T 24K 24R 24E 24J 25H 26G 26M 26A 26Q 26T 26K 26J 27G 27M 27A 27Q 27T 27H 27K 27J)		24R2733	
5	Cage with backplane, 2.5-inch drive (all models)		40K6552	
6	Hard disk drive, 500GB 3.5″ Hot-Swap SATA II 500GB 3.5″ Hot-Swap SATA II (models 19G 12M 12A 12Q 12T 12K 12R 12E 12J)	45J9644		
6	Hard disk drive, 750GB 3.5″ Hot-Swap SATA II 750GB 3.5″ Hot-Swap SATA II (models)	45J9646		
6	Hard disk drive, IBM 1TB 7200 SATA 3.5'' HS HDD IBM 1TB 7200 SATA 3.5'' HS HDD (models)	45J9648		
6	Hard disk drive, SAS, 2.5-inch 146 GB, 10K, hot-swap, with tray (models 22G 13G 16G)	45J9652		
6	Hard disk drive, SAS, 2.5-inch 73 GB, 10K, hot-swap, with tray (models)	45J9654		
6	Hard disk drive, 146GB 15K 3.5″ Hot-Swap SAS 146GB 15K 3.5″ Hot-Swap SAS (models 22G 13G 16G)	45J9658		
6	Hard disk drive, 300GB 15K 3.5″ Hot-Swap SAS 300GB 15K 3.5″ Hot-Swap SAS (models)	45J9660		
6	Hard disk drive, 450GB 15K SAS 3.5″ HS HDD 300GB 15K 3.5″ Hot-Swap SAS (all models)	46U2108		
7	Filler panel, 2.5-inch hard disk drive bay (all models)	26K8680		
8	Center bracket, 3.5-inch drive cage (all models)			41Y8733
9	Hard disk drive, SAS, 3.5-inch 146 GB, 15K, hot-swap, with tray (models 22G 13G 16G)	45J9658		
9	Hard disk drive, SATA, 3.5-inch 500 GB, 10K, hot-swap, with tray (models 19G 12M 12A 12Q 12T 12K 12R 12E 12J)	45J9644		
9	Hard disk drive, SATA, 3.5-inch 750 GB, 10K, hot-swap, with tray (models)	45J9646		
9	Hard disk drive, SATA 3.5-inch 1TB , hot-swap (models)	45J9648		
9	Hard disk drive, SAS, 3.5-inch 300 GB, 15K, hot-swap, with tray (models)	45J9660		

Table 7. View 1 parts listing, Types 6447 (continued)

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
10	Filler panel, 3.5-inch hard disk drive bay (all models)		39M4375	
11	CD-RW/DVD drive, 24/8X, HLDS (models 18U 18F 18S 18L 18D 18Y 18M 18A 18Q 18T 18H 18K 18R 18E 18J 19G 21U 21F 21S 21L 21D 21Y 21G 21M 21A 21Q 21T 21H 21K 21R 21E 21J 22G 23U 23F 23S 23L 23D 23Y 23M 23A 23Q 23T 23H 23K 23R 23E 23J 24G 24M 24A 24Q 24T 24K 24R 24E 24J 25H 26G 26M 26A 26Q 26T 26K 26J 27G 27M 27A 27Q 27T 27H 27K 27J)		39M3541	
11	CD-RW/DVD drive, 24/8X, Teac (models 18U 18F 18S 18L 18D 18Y 18M 18A 18Q 18T 18H 18K 18R 18E 18J 19G 21U 21F 21S 21L 21D 21Y 21G 21M 21A 21Q 21T 21H 21K 21R 21E 21J 22G 23U 23F 23S 23L 23D 23Y 23M 23A 23Q 23T 23H 23K 23R 23E 23J 24G 24M 24A 24Q 24T 24K 24R 24E 24J 25H 26G 26M 26A 26Q 26T 26K 26J 27G 27M 27A 27Q 27T 27H 27K 27J)		39M3563	
11	DVD drive, 24/8X (models)		39M3533	
12	Operator information panel assembly (all models)		43W0626	
15	Filler panel, tape-drive bay (all models)		41Y8739	
16	CD/DVD media backplane (all models)		41Y8735	
17	Microprocessor air baffle (all models)		part of 41Y8727	
19	Fan bracket (all models)		41Y8726	
20	Fan (60 mm) (all models)		46C4014	
	3.5 inch tape carrier (all models)		44E8850	
	System service label (all models)		41Y8737	
	CRU/FRU label (all models)		41Y8738	
	Rack power cable (all models)		39M5377	
	Brackets, EIA (all models)		40K6497	
	Air baffles kit (all models)		41Y8727	
	Battery, 3.0 volt (all models)		33F8354	
	Cable, CD/DVD signal (all models)		39M6765	
	Cable, CD/DVD power (all models)		39M6757	
	Cable, 2.5-inch hard disk drive power (all models)		26K8068	
	Cable, 3.5-inch hard disk drive power (all models)		39M6759	
	Cable, front video (all models)		39M6761	
	Cable, front USB (all models)		39M6763	
	Cable, hard disk drive signal (all models)		42C2378	
	Cable, USB signal (optional-device) (all models)		39M6781	
	Cable, SCSI tape signal (all models)		25R0048	
	Chassis assembly (all models)		41Y8724	
	Kit, misc. (all models)		41Y8730	
	Cable management arm kit (all models)		40K6556	

Table 7. View 1 parts listing, Types 6447 (continued)

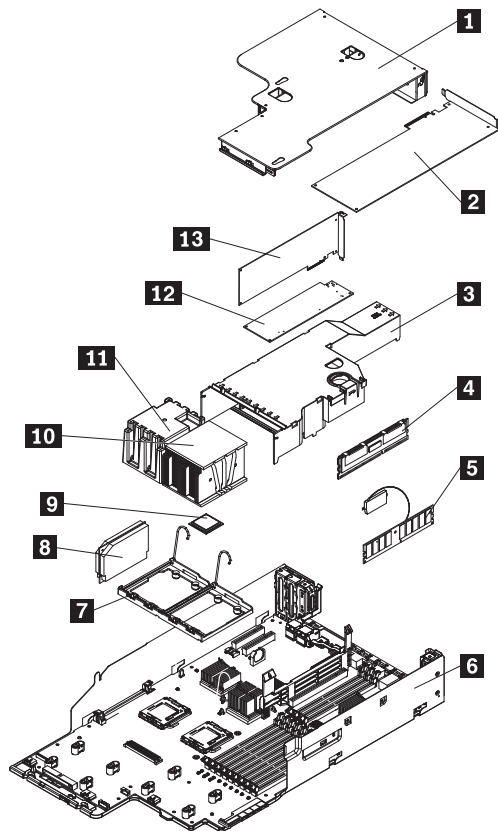| Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
	Slide kit, toolless (all models)		40K6591	
	Slide shipping brackets (all models)		40K6592	
	Slide kit, screw-in (all models)		41Y8731	
	DVD drive retention clip (all models)		41Y8730	
	DVD drive filler (all models)		41Y8740	
	DC power supply (some configurations only) (all models)		39Y7191	
	Mouse, optical, 3-button (optional) (all models)			41U3013
	Keyboard, US (all models)			41A5100
	3U SCSI adapter (all models)		43W4325	
	IBM ServeRAID 8k-I SAS Controller (all models)		25R8079	
	RSA SlimLine PEREGRINECD (all models)		44T1412	

View 2

Table 8. View 2 parts listing, Types 6444

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
1	PCI Express riser-card assembly (all models)		39Y6788	
1	PCI-X riser-card assembly (optional) (all models)		43W5861	
2	Full-length adapter (models)	varies		
3	DIMMs air baffle (all models)	41Y8727		
4	Memory, 1 GB PC2-5300 (models 12G 12M 12A 12Q 12T 12K 12R 12E 12J)	46U1017		
4	Memory, 2 GB PC2-5300 (option) (models 13U 13G 13A)	46U1018		
4	Memory, 4 GB PC2-5300 (option) (models)	46U1019		
5	ServeRAID-8k-I SAS Controller (optional) (all models)	25R8079		
5	Adapter 8K w/ Battery (all models)	25R8076		
6	System board, RD120 Planar (models 11G 13U 13G 13A 12G 12M 12A 12Q 12T 12K 12R 12E 12J)			46M7131
7	Heat-sink retention module (all models)		39M6783	
8	VRM 11 (all models)		24R2694	
9	Microprocessor, 1.60 GHz, dual core, 2M (models 11G)			41Y4275
9	Microprocessor, 1.87 GHz, dual core, 2M (models)			41Y4276
9	Microprocessor, 2.0 GHz, dual core, 2M (models)			41Y4277
9	Microprocessor, 2.33 GHz, dual core, 2M (models)			41Y4278
9	Microprocessor, 2.67 GHz, dual core, 2M (models)			41Y4279
9	Microprocessor, 3.0 GHz, dual core, 2M (models)			41Y4280
9	Microprocessor, 3.0 GHz, dual core, 2M (models)			41Y8905
9	Microprocessor, 3.2 GHz, dual core, 2M (models)			41Y8904
9	Microprocessor, 1.60 GHz, quad core, 8MB (models)			43W5174
9	Microprocessor, 1.86 GHz, quad core, 8MB (models)			43W5175
9	Microprocessor, 1.60 GHz, quad core, 8MB (models)			43W5915
9	Microprocessor, 1.86 GHz, quad core, 8MB (models)			43W5916
9	Microprocessor, 2.0 GHz, quad core, 8MB (models)			43W5182
9	Microprocessor, 2.33 GHz, quad core, 8MB (models)			43W5183
9	Microprocessor, 2.66 GHz, Xeon, 8MB (models)			43W5184
9	Microprocessor, 3.00GHz/1333, Quad-Core (models)			44E5040
9	Microprocessor, Intel Xeon X5460 Quad-Core 3.16 GHz/1333 MHz (12 MB L2 cache) Processor (120 W) (models)			44E5066
9	Microprocessor, Intel Xeon X5450 Quad-Core 3.00 GHz/1333 MHz (12 MB L2 cache) Processor (120 W) (models)			44E5117
9	Microprocessor, Intel Xeon L5420 Quad-Core 2.5 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44E5144
9	Microprocessor, Dual Core, 1.86G/1066 (models)			44E5145
9	Microprocessor, 2.00 GHz/1333MHz (models)			44R5644

Table 8. View 2 parts listing, Types 6444 (continued)

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
9	Microprocessor, Intel Xeon E5420 Quad-Core 2.50 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44R5646
9	Microprocessor, Intel Xeon E5430 Quad-Core 2.66 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44R5647
9	Microprocessor, Intel Xeon E5440 Quad-Core 2.83 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44R5648
9	Microprocessor, Intel Xeon E5450 Quad-Core 3.0 GHz/1333 MHz (12 MB L2 cache) Processor (80 W) (models)			44R5649
9	Microprocessor, Dual-Core 2.33 GHz/1333 MHz (models)			42D3788
9	Microprocessor, Intel Xeon 2.33GHz/1333MHz (models)			44R5645
10	Heat-sink filler (all models)		39M6800	
11	Heat sink (all models)		40K7438	
13	Low-profile adapter (all models)	varies		
	Battery, Adaptec 8K battery (all models)		25R8088	

Table 9. View 2 parts listing, Types 6445

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
1	PCI Express riser-card assembly (all models)		39Y6788	
1	PCI-X riser-card assembly (optional) (all models)		43W5861	
2	Full-length adapter (all models)	varies		
3	DIMMs air baffle (all models)	41Y8727		
4	Memory, 1 GB PC2-5300 (models 12U 12F 12S 12L 12D 12Y 12G 12M 12A 12Q 12T 12K 12R 12E 12J 13G 14U 14F 14S 14L 14D 14Y 11G)	46U1017		
4	Memory, 2 GB PC2-5300 (option) (models)	46U1018		
4	Memory, 4 GB PC2-5300 (option) (models)	46U1019		
5	Adaptec 8K-L (all models)	25R8079		
5	Adapter 8K w/ Battery (all models)	25R8076		
6	System board, RD120 (models 12U 12F 12S 12L 12D 12Y 12G 12M 12A 12Q 12T 12K 12R 12E 12J 13G 14U 14F 14S 14L 14D 14Y 11G)			46M7131
7	Heat-sink retention module (all models)		39M6783	
8	VRM 11 (all models)		24R2694	
9	Microprocessor, 1.60 GHz, dual core, 2M (models)			41Y4275
9	Microprocessor, 1.87 GHz, dual core, 2M (models)			41Y4276
9	Microprocessor, 2.0 GHz, dual core, 2M (models)			41Y4277
9	Microprocessor, 2.33 GHz, dual core, 2M (models)			41Y4278
9	Microprocessor, 2.67 GHz, dual core, 2M (models)			41Y4279
9	Microprocessor, 3.0 GHz, dual core, 2M (models)			41Y4280
9	Microprocessor, 3.0 GHz, dual core, 2M (models)			41Y8905
9	Microprocessor, 3.2 GHz, dual core, 2M (models)			41Y8904
9	Microprocessor, 1.60 GHz, quad core, 8MB (models)			43W5174
9	Microprocessor, 1.86 GHz, quad core, 8MB (models)			43W5175
9	Microprocessor, 1.60 GHz, quad core, 8MB (models)			43W5915
9	Microprocessor, 1.86 GHz, quad core, 8MB (models)			43W5916
9	Microprocessor, 2.0 GHz, quad core, 8MB (models)			43W5182
9	Microprocessor, 2.33 GHz, quad core, 8MB (models)			43W5183
9	Microprocessor, 2.66 GHz, 8MB (models)			43W5184
9	Microprocessor, quad core, 3.00GHz/1333 (models)			44E5040
9	Microprocessor, Intel Xeon X5460 Quad-Core 3.16 GHz/1333 MHz (12 MB L2 cache) Processor (120 W) (models)			44E5066
9	Microprocessor, Intel Xeon X5450 Quad-Core 3.00 GHz/1333 MHz (12 MB L2 cache) Processor (120 W) (models)			44E5117
9	Microprocessor, Intel Xeon L5420 2.5 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44E5144

Table 9. View 2 parts listing, Types 6445 (continued)

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
9	Microprocessor, Dual Core, 1.86G/1066 (models)			44E5145
9	Microprocessor, HPT 2.00G (models)			44R5644
9	Microprocessor, Intel Xeon E5420 Quad-Core 2.50 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44R5646
9	Microprocessor, Intel Xeon E5430 Quad-Core 2.66 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44R5647
9	Microprocessor, Intel Xeon E5440 Quad-Core 2.83 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44R5648
9	Microprocessor, Intel Xeon E5450 Quad-Core 3.0 GHz/1333 MHz (12 MB L2 cache) Processor (80 W) (models)			44R5649
9	Microprocessor, Dual-Core, WDCR2.33GLV (models)			42D3788
9	Microprocessor, 2.33GHz/12 M (models)			44R5645
10	Heat-sink filler (all models)		39M6800	
11	Heat sink (all models)		40K7438	
13	Low-profile adapter (all models)	varies		
	Battery, Adapter 8K battery (all models)		25R8088	

Table 10. View 2 parts listing, Types 6446

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
1	PCI Express riser-card assembly (all models)		39Y6788	
1	PCI-X riser-card assembly (optional) (all models)		43W5861	
2	Full-length adapter (all models)	varies		
3	DIMMs air baffle (all models)	part of 41Y8727		
4	Memory, 1 GB PC2-5300 (models 15U 15f 15s 15l 15D 15Y 15G 15M 15A 15Q 15T 15K 15R 15E 15J 11U 11F 11S 11L 11D 11Y 11M 11A 11Q 11T 11K 11R 11E 11J 13M 13A 13Q 13T 13K 13R 13E 13J)	46U1017		
4	Memory, 2 GB PC2-5300 (option) (models 12U 12F 12S 12L 12D 12Y 14M 14A 14Q 14T 14K 14R 14E 14J)	46U1018		
4	Memory, 4 GB PC2-5300 (option) (models)	46U1019		
5	Adaptec 8K-L (all models)	25R8079		
5	Adapter 8K w/ Battery (all models)	25R8076		
6	System board, RD120 (models 15U 15f 15s 15l 15D 15Y 15G 15M 15A 15Q 15T 15K 15R 15E 15J 11U 11F 11S 11L 11D 11Y 11M 11A 11Q 11T 11K 11R 11E 11J 12U 12F 12S 12L 12D 12Y 13M 13A 13Q 13T 13K 13R 13E 13J 14M 14A 14Q 14T 14K 14R 14E 14J)			46M7131
7	Heat-sink retention module (all models)		39M6783	
8	VRM 11 (all models)		24R2694	
9	Microprocessor, 1.60 GHz, dual core, 2M (models 11U 11F 11S 11L 11D 11Y 11M 11A 11Q 11T 11K 11R 11E 11J)			41Y4275
9	Microprocessor, 1.87 GHz, dual core, 2M (models)			41Y4276
9	Microprocessor, 2.0 GHz, dual core, 2M (models)			41Y4277
9	Microprocessor, 2.33 GHz, dual core, 2M (models)			41Y4278
9	Microprocessor, 2.67 GHz, dual core, 2M (models)			41Y4279
9	Microprocessor, 3.0 GHz, dual core, 2M (models)			41Y4280
9	Microprocessor, 3.0 GHz, dual core, 2M (models)			41Y8905
9	Microprocessor, 3.2 GHz, dual core, 2M (models)			41Y8904
9	Microprocessor, 1.60 GHz, quad core, 8MB (models)			43W5174
9	Microprocessor, 1.86 GHz, quad core, 8MB (models)			43W5175
9	Microprocessor, 1.60 GHz, quad core, 8MB (models)			43W5915
9	Microprocessor, 1.86 GHz, quad core, 8MB (models)			43W5916
9	Microprocessor, 2.0 GHz, quad core, 8MB (models 12U 12F 12S 12L 12D 12Y)			43W5182
9	Microprocessor, 2.33 GHz, quad core, 8MB (models)			43W5183
9	Microprocessor, 2.66 GHz, 8MB (models)			43W5184
9	Microprocessor, quad-core 3.00GHz/1333 (models)			44E5040

Table 10. View 2 parts listing, Types 6446 (continued)

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
9	Microprocessor, Intel Xeon X5460 Quad-Core 3.16 GHz/1333 MHz (12 MB L2 cache) Processor (120 W) (models)			44E5066
9	Microprocessor, Intel Xeon X5450 Quad-Core 3.00 GHz/1333 MHz (12 MB L2 cache) Processor (120 W) (models)			44E5117
9	Microprocessor, Intel Xeon L5420 Quad-Core 2.5 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44E5144
9	Microprocessor, Dual Core, 1.86G/1066 (models)			44E5145
9	Microprocessor, 2.00GHz/12MB(models)			44R5644
9	Microprocessor, Intel Xeon E5420 Quad-Core 2.50 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44R5646
9	Microprocessor, Intel Xeon E5430 Quad-Core 2.66 GHz/1333 MHz (12 MB L2 cache) Processor (models 14M 14A 14Q 14T 14K 14R 14E 14J)			44R5647
9	Microprocessor, Intel Xeon E5440 Quad-Core 2.83 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44R5648
9	Microprocessor, Intel Xeon E5450 Quad-Core 3.0 GHz/1333 MHz (12 MB L2 cache) Processor (80 W) (models)			44R5649
9	Microprocessor, Dual-Core, 2.33 GHz/1333 MHz (models)			42D3788
9	Microprocessor, 2.33GHz/12MB (models)			44R5645
10	Heat-sink filler (all models)		39M6800	
11	Heat sink (all models)		40K7438	
13	Low-profile adapter (all models)	varies		
	Adapter 8K battery(all models)		25R8088	

Table 11. View 2 parts listing, Types 6447

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
1	PCI Express riser-card assembly (all models)		39Y6788	
1	PCI-X riser-card assembly (optional) (all models)		43W5861	
2	Full-length adapter (all models)	varies		
3	DIMMs air baffle (models)	part of 41Y8727		
4	Memory, 1 GB PC2-5300 (models 18U 18F 18S 18L 18D 18Y 18M 18A 18Q 18T 18H 18K 18R 18E 18J 19G 26G 26M 26A 26Q 26T 26K 26J 11U 11F 11S 11L 11D 11Y 11G 11B 11H 11V 12M 12A 12Q 12T 12K 12R 12E 12J 13G)	46U1017		
4	Memory, 2 GB PC2-5300 (option) (models 22G 23U 23F 23S 23L 23D 23Y 23M 23A 23Q 23T 23H 23K 23R 23E 23J 24G 24M 24A 24Q 24T 24K 24R 24E 24J 25H 27G 27M 27A 27Q 27T 27H 27K 27J 14U 14F 14S 14L 14D 14Y 14G 14B 14H 14V 15U 15F 15S 15L 15D 15Y 15G 15B 15H 15V 16G 17U 17F 17S 17L 17D 17Y 17G 17B 17H 17V)	46U1018		
4	Memory, 4 GB PC2-5300 (option) (models)	46U1019		
5	Adaptec 8K-L KEYLARGOCARD (all models)		25R8079	
5	Adaptec 8K w/ Battery KEYBISCAYNE (all models)		25R8076	
6	System board shuttle assembly (models 18U 18F 18S 18L 18D 18Y 18M 18A 18Q 18T 18H 18K 18R 18E 18J 19G 21U 21F 21S 21L 21D 21Y 21G 21M 21A 21Q 21T 21H 21K 21R 21E 21J 22G 23U 23F 23S 23L 23D 23Y 23M 23A 23Q 23T 23H 23K 23R 23E 23J 24G 24M 24A 24Q 24T 24K 24R 24E 24J 25H 26G 26M 26A 26Q 26T 26K 26J 27G 27M 27A 27Q 27T 27H 27K 27J 11U 11F 11S 11L 11D 11Y 11G 11B 11H 11V 12M 12A 12Q 12T 12K 12R 12E 12J 13G 14U 14F 14S 14L 14D 14Y 14G 14B 14H 14V 15U 15F 15S 15L 15D 15Y 15G 15B 15H 15V 16G 17U 17F 17S 17L 17D 17Y 17G 17B 17H 17V)			46M7131
7	Heat-sink retention module (all models)		39M6783	
8	VRM 11 (all models)		24R2694	
9	Microprocessor, 1.60 GHz, dual core, 2M (models 11U 11F 11S 11L 11D 11Y 11G 11B 11H 11V 12M 12A 12Q 12T 12K 12R 12E 12J)			41Y4275
9	Microprocessor, 1.87 GHz, dual core, 2M (models)			41Y4276
9	Microprocessor, 2.0 GHz, dual core, 2M (models)			41Y4277
9	Microprocessor, 2.33 GHz, dual core, 2M (models)			41Y4278
9	Microprocessor, 2.67 GHz, dual core, 2M (models)			41Y4279
9	Microprocessor, 3.0 GHz, dual core, 2M (models)			41Y4280
9	Microprocessor, 3.0 GHz, dual core, 2M (models)			41Y8905
9	Microprocessor, 3.2 GHz, dual core, 2M (models)			41Y8904
9	Microprocessor, 1.60 GHz, quad core, 8MB (models)			43W5174
9	Microprocessor, 1.86 GHz, quad core, 8MB (models)			43W5175

Table 11. View 2 parts listing, Types 6447 (continued)

Index	Description	CRU part number (Self-service)	CRU part number (Optional-service)	FRU part number
9	Microprocessor, 1.60 GHz, quad core, 8MB (models)			43W5915
9	Microprocessor, 1.86 GHz, quad core, 8MB (models)			43W5916
9	Microprocessor, 2.0 GHz, quad core, 8MB (models 13G 14U 14F 14S 14L 14D 14Y 14G 14B 14H 14V)			43W5182
9	Microprocessor, 2.33 GHz, quad core, 8MB (models)			43W5183
9	Microprocessor, 2.66 GHz, 8MB (models)			43W5184
9	Microprocessor, quad core 3.00GHz/1333 (models)			44E5040
9	Microprocessor, Intel Xeon X5460 Quad-Core 3.16 GHz/1333 MHz (12 MB L2 cache) Processor (120 W) (models)			44E5066
9	Microprocessor, Intel Xeon X5450 Quad-Core 3.00 GHz/1333 MHz (12 MB L2 cache) Processor (120 W) (models)			44E5117
9	Microprocessor, Intel Xeon L5420 Quad-Core 2.5 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44E5144
9	Microprocessor, dual core, 1.86G/1066 (models)			44E5145
9	Microprocessor, Intel Xeon 2.00GHz/1333MHz-12MB (models)			44R5644
9	Microprocessor, Intel Xeon E5420 Quad-Core 2.50 GHz/1333 MHz (12 MB L2 cache) Processor (models 19G 22G 27G 27M 27A 27Q 27T 27H 27K 27J)			44R5646
9	Microprocessor, Intel Xeon E5430 Quad-Core 2.66 GHz/1333 MHz (12 MB L2 cache) Processor (models 25H 21U 21F 21S 21L 21D 21Y 21G 21M 21A 21Q 21T 21H 21K 21R 21E 21J16G 17U 17F 17S 17L 17D 17Y 17G 17B 17H 17V)			44R5647
9	Microprocessor, Intel Xeon E5440 Quad-Core 2.83 GHz/1333 MHz (12 MB L2 cache) Processor (models)			44R5648
9	Microprocessor, Intel Xeon E5450 Quad-Core 3.0 GHz/1333 MHz (12 MB L2 cache) Processor (80 W) (models 23U 23F 23S 23L 23D 23Y 23M 23A 23Q 23T 23H 23K 23R 23E 23J 24G 24M 24A 24Q 24T24K 24R 24E 24J)			44R5649
9	Microprocessor, Dual-Core 2.33 GHz/1333 MHz (models)			42D3788
9	Microprocessor, Intel Xeon 2.33GHz/1333MHz-12MB (models)			44R5645
10	Heat-sink filler (all models)		39M6800	
11	Heat sink (all models)		40K7438	
13	Low-profile adapter (all models)	varies		
	Adaptec 8K battery KEY BISCAYNE RAID Card (all models)		25R8088	

Power cords

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies for power-cord information. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

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

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

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

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

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

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

Table 12. Power cords, Type 6444

Lenovo power cord part number (available in the updated parts listing on the Lenovo Support Web site)	Used in these countries and regions
39M5206	China (models)
39M5102	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea (models 12M)

Table 12. Power cords, Type 6444 (continued)

Lenovo power cord part number (available in the updated parts listing on the Lenovo Support Web site)	Used in these countries and regions
39M5123	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire (models)
39M5130	Denmark (models 11G 13G 13A 12G 12A)
39M5144	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda (models 11G 13G 13A 12G 12M)
39M5151	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe (models 11G 13G 13A 12A)
39M5158	Liechtenstein, Switzerland (models 11G 13G 12G)
39M5165	Chile, Italy, Libyan Arab Jamahiriya (models)
39M5172	Israel (models 11G 13G 12G)
39M5179	Europe (models 11G 13G 12G)
39M5095	220 - 240 V Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela (models)

Table 12. Power cords, Type 6444 (continued)

Lenovo power cord part number (available in the updated parts listing on the Lenovo Support Web site)	Used in these countries and regions
39M5081	110 - 120 V Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela (models 13U 13A 12A 12T)
39M5219	Korea (Democratic People's Republic of), Korea (Republic of) (models 12K 12R)
39M5199	Japan (models 12E 12J)
39M5068	Argentina, Paraguay, Uruguay (models)
39M5226	India (models 12Q)
39M5233	Brazil (models)
39M5247	Taiwan (models)

Table 13. Power cords, Type 6445

Lenovo power cord part number (available in the updated parts listing on the Lenovo Support Web site)	Used in these countries and regions
39M5206	China (models)
39M5102	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea (models 12M)
39M5123	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire (models)
39M5130	Denmark (models 12G 12A 13G)
39M5144	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda (models 11G 12G 12M 12A 13G)
39M5151	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe (models 11G 12G 13G)
39M5158	Liechtenstein, Switzerland (models 11G 12G 13G)
39M5165	Chile, Italy, Libyan Arab Jamahiriya (models 12S 12L 12Y 14S 14L)
39M5172	Israel (models 11G 12G 13G)
39M5179	Europe (models 11G 12G 13G)

Table 13. Power cords, Type 6445 (continued)

Lenovo power cord part number (available in the updated parts listing on the Lenovo Support Web site)	Used in these countries and regions
39M5095	220 - 240 V Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela (models)
39M5081	110 - 120 V Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela (models 12U 12F 12S 12L 12D 12A 12T 14U 14F 14S 14L 14D)
39M5219	Korea (Democratic People's Republic of), Korea (Republic of) (models 12K 12R)
39M5199	Japan (models 12E 12J)
39M5068	Argentina, Paraguay, Uruguay (models 12L 12Y 14Y)
39M5226	India (models 12Q)
39M5233	Brazil (models)
39M5247	Taiwan (models)

Table 14. Power cords, Type 6446

Lenovo power cord part number (available in the updated parts listing on the Lenovo Support Web site)	Used in these countries and regions
39M5206	China (models)
39M5102	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea (models 15M 11M 13M 14M)
39M5123	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire (models)
39M5130	Denmark (models 15G)
39M5144	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda (models 15G 15M 15A 11M 13M 14M)
39M5151	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe (models 15A)
39M5158	Liechtenstein, Switzerland (models 15G)
39M5165	Chile, Italy, Libyan Arab Jamahiriya (models 15Y 15G)
39M5172	Israel (models 15G)
39M5179	Europe (models)
39M5095	220 - 240 V Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela (models)

Table 14. Power cords, Type 6446 (continued)

Lenovo power cord part number (available in the updated parts listing on the Lenovo Support Web site)	Used in these countries and regions
39M5081	110 - 120 V Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela (models 15U 15F 15S 15L 15D 15A 15T 11U 11F 11S 11L 11D 11A 11T 12U 12F 12S 12L 12D 13A 13T 14A 14T)
39M5219	Korea (Democratic People's Republic of), Korea (Republic of) (models 15K 15R 11K 13K 14K)
39M5199	Japan (models 15J 1513J 14J)
39M5068	Argentina, Paraguay, Uruguay (models 15L 15Y 11L 11Y 12L 12Y)
39M5226	India (models 15Q 11Q)
39M5233	Brazil (models)
39M5247	Taiwan (models)

Table 15. Power cords, Type 6447

Lenovo power cord part number (available in the updated parts listing on the Lenovo Support Web site)	Used in these countries and regions
39M5206	China (models)
39M5102	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea (models 18M 21M 23M 26M 27M 24M 12M)
39M5123	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire (models 19G 21G 22G 24G 26G 27G 11G 13G 14G 16G)
39M5130	Denmark (models 19G 21G 22G 26G 27G 11G 13G 14G 16G)
39M5144	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda (models 18M 18A 19G 21G 21A 22G 24G 23M 23A 24M 27M 24A 26G 27G 26M 26A 27A 11G 13G 14G 16G 12M 12A)
39M5151	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe (models 19G 21G 22G 24G 26G 27 11G 13G 14G 16G)
39M5158	Liechtenstein, Switzerland (models 19G 21G 22G 24G 27G 11G 13G 14G 16G)
39M5165	Chile, Italy, Libyan Arab Jamahiriya (models 18S 18L 19G 21S 21L 21Y 21G 22G 23L 23Y 24G 26G 27G 11S 11L 11Y 14S 14L 14Y 15S 15L 15Y 17S 17L 17Y 11G 13G 14G 16G)
39M5172	Israel (models 19G 21G 22G 24G 27G 11G 13G 14G 16G)
39M5179	Europe (models 19G 21G 22G 24G 27G 11G 13G 14G 16G)

Table 15. Power cords, Type 6447 (continued)

Lenovo power cord part number (available in the updated parts listing on the Lenovo Support Web site)	Used in these countries and regions
39M5095	220 - 240 V Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela (models)
39M5081	110 - 120 V Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela (models 18U 18F 18S 18L 18D 18Y 18A 18T 18H 21U 21F 21S 21L 21D 21Y 21A 21T 23U 23F 23S 23L 23D 23Y 23A 23T 23H 24A 24T 25H 26A 26T 27A 27T 27H 11U 11F 11S 11L 11D 12A 12T 14U 14F 14S 14L 14D 15U 15F 15S 15L 15D 15Y 17U 17F 17S 17L 17D 17Y)
39M5219	Korea (Democratic People's Republic of), Korea (Republic of) (models 18K 18R 23K 23R 24K 24R 26K 27K 12K 12R)
39M5199	Japan (models 18E 18J 23E 23J 24E 24J 26J 27J 12E 12J)
39M5068	Argentina, Paraguay, Uruguay (models 18L 18Y 21L 21Y 23L 23Y 11L 11Y 14L 14Y 15L 15Y 17L 17Y)
39M5226	India (models 18Q 21Q 23Q 24Q 26Q 27Q 12Q)
39M5233	Brazil (models)
39M5247	Taiwan (models 11V 14V 15V 17V)

Chapter 4. Removing and replacing server components

Replaceable components are of three types:

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

See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine whether a component is a self-service CRU, optional-service CRU, or FRU.

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

Installation guidelines

Before you remove or replace a component, read the following information:

- Read the safety information that begins on page vii, and the guidelines in "Handling static-sensitive devices" on page 55. This information will help you work safely.
- 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. You can use the ThinkServer EasyUpdate software, if applicable, to download the latest firmware updates. You can also download firmware updates from the Lenovo Support Web site.

  Note: Changes are made periodically to the Lenovo Web site. The actual procedure might vary slightly from what is described in this document.

  1. Go to: http://www.lenovo.com/support.
  2. Enter your product number (machine type and model number) or select **Servers** from the **Select your product** list.
  3. Select **Servers** from the **Brand** list.
  4. From **Family** list, select **ThinkServer RD120**, and click **Continue**.
  5. Click **Downloads and drivers** to download firmware updates.

- Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see Chapter 5, "Diagnostics," on page 125 for diagnostic information.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- If you must start the server while the cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.

- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you can stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- You do not have to turn off the server to install or replace hot-swap fans, redundant hot-swap ac power supplies, or hot-plug Universal Serial Bus (USB) devices. However, you must turn off the server before performing any steps that involve removing or installing adapter cables or non-hot-swap optional devices or components.

  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported optional-devices for the server, see http://www.lenovo.com/ support/.

System reliability guidelines

To help ensure proper cooling and system reliability, make sure that:

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- If the server has redundant power, each of the power-supply bays has a power supply installed in it.

  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2.0 in.) 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, replace 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.

- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap drive within 2 minutes of removal.
- You do not operate the server without the air baffles installed. Operating the server without the air baffles might cause the microprocessor to overheat.

Working inside the server with the power on

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

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

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

Handling static-sensitive devices

Attention: Static electricity can damage the server and other electronic devices. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of damage from electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available. Always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal surface on the outside of the server for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the server without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the server cover or on a metal surface.

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

Returning a device or component

If you are instructed to return a device or component, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Removing and replacing Self-service CRUs

Replacement of self-service CRUs is your responsibility. If Lenovo installs a self-service 1 CRU at your request, you will be charged for the installation.

The illustrations in this document might differ slightly from your hardware.

Removing the cover

To remove the cover, complete the following steps.

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. If you are planning to install or remove a microprocessor, memory module, PCI adapter, battery, or other non-hot-swap optional device, turn off the server and all attached devices and disconnect all external cables and power cords.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Press down on the left and right side latches and pull the server out of the rack enclosure until both slide rails lock.

   Note: You can reach the cables on the back of the server when the server is in the locked position.
4. Lift the cover-release latch **1** . Lift the cover off the server and set the cover aside.

   Attention: For proper cooling and airflow, replace the cover before turning on the server. Operating the server for extended periods of time (over 30 minutes) with the cover removed might damage server components.
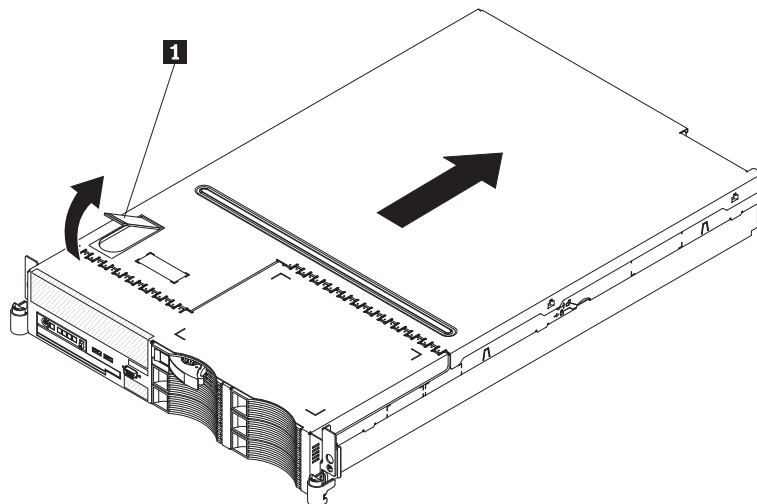
5. If you are instructed to return the cover, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the cover

To install the cover, complete the following steps.

1. Make sure that all internal cables are correctly routed.
2. Place the cover-release latch in the open (up) position.
3. Insert the bottom tabs of the top cover into the matching slots in the server chassis.
4. Press down on the cover-release latch **1** to lock the cover in place.
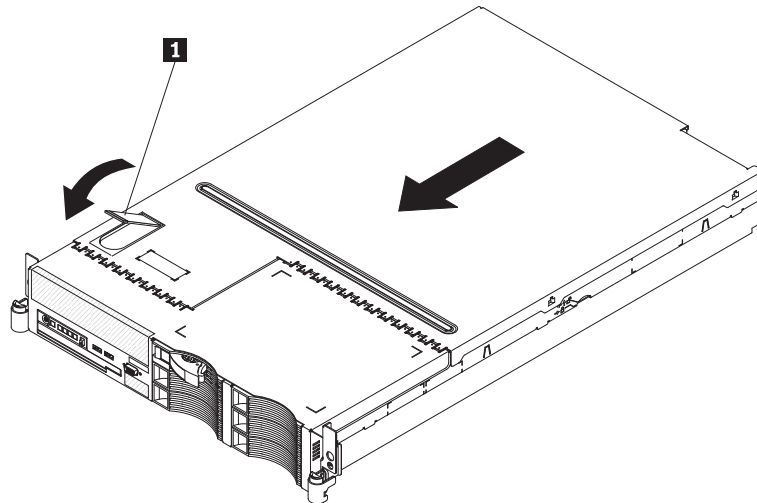
5. Slide the server into the rack.

Removing the microprocessor air baffle

When you work with some optional devices, you must first remove the microprocessor air baffle to access certain components or connectors on the system board.

To remove the microprocessor air baffle, complete the following steps.
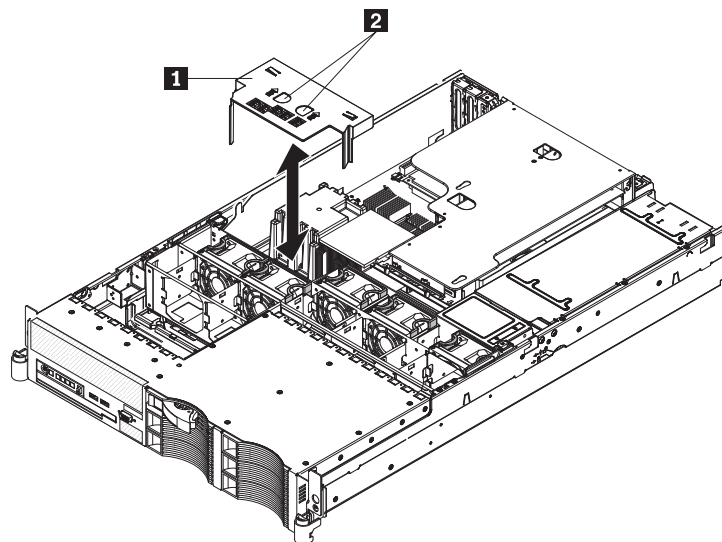
1	Microprocessor air baffle
2	Finger holes

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see "Removing the cover" on page 56).
4. Place your fingers into the two handles on the top of the air baffle and lift the air baffle out of the server.

   Attention: For proper cooling and airflow, replace the air baffle before turning on the server. Operating the server with the air baffle removed might damage server components.
5. If you are instructed to return the microprocessor air baffle, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the microprocessor air baffle

To install the microprocessor air baffle, complete the following steps.
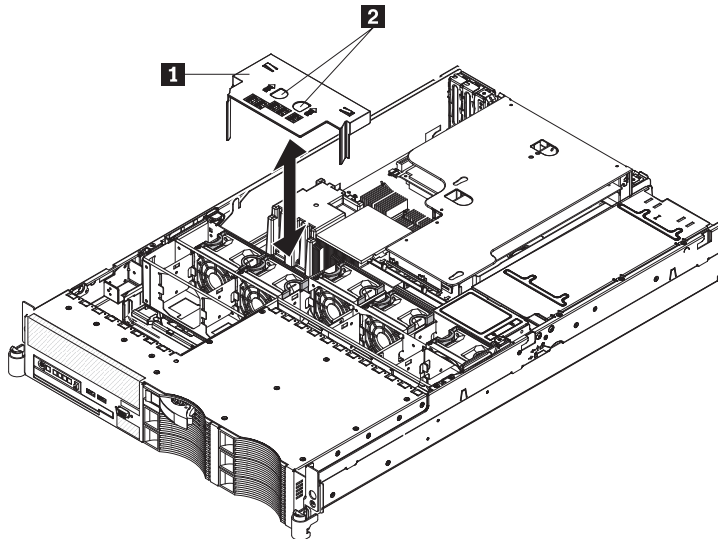
1	Microprocessor air baffle
2	Finger holes

1. Place your fingers into the two openings on the top of the air baffle.
2. Align the tab on the left side of the air baffle with the slot in the left side of the chassis.
3. Lower the air baffle into the server.

   Attention: For proper cooling and airflow, replace the air baffle before you turn on the server. Operating the server with an air baffle removed might damage server components.
4. Install the cover (see "Installing the cover" on page 57).

5. Slide the server into the rack.
6. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Removing the DIMM air baffle

When you work with some optional devices, you must first remove the DIMM air baffle to access certain components or connectors on the system board.

To remove the DIMM air baffle, complete the following steps.
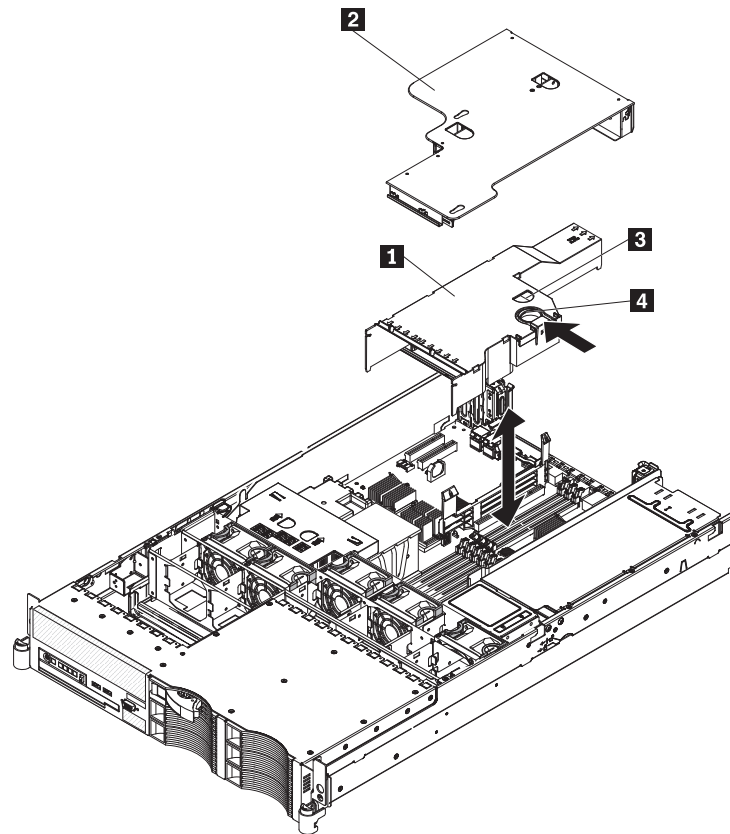
1	DIMM air baffle	3	Finger hole
2	Riser card assembly	4	Release ring

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see "Removing the cover" on page 56).

4. Remove the riser-card assembly (see "Removing the riser-card assembly" on page 63).
5. Place your fingers into the handle and opening on the top of the air baffle.
6. Press the handle toward the opening and lift the air baffle out of the server.

   Attention: For proper cooling and airflow, replace the air baffle before you turn on the server. Operating the server with an air baffle removed might damage server components.

Removing the fan-bracket assembly

To replace some components, such as the CD-RW/DVD drive, you must remove the fan-bracket assembly; to route some cables, you might have to remove the fan-bracket assembly.

Note: To remove or install a fan, it is not necessary to remove the fan-bracket assembly. See "Removing a hot-swap fan" on page 91 and "Installing a hot-swap fan" on page 92.

To remove the fan-bracket assembly, complete the following steps.
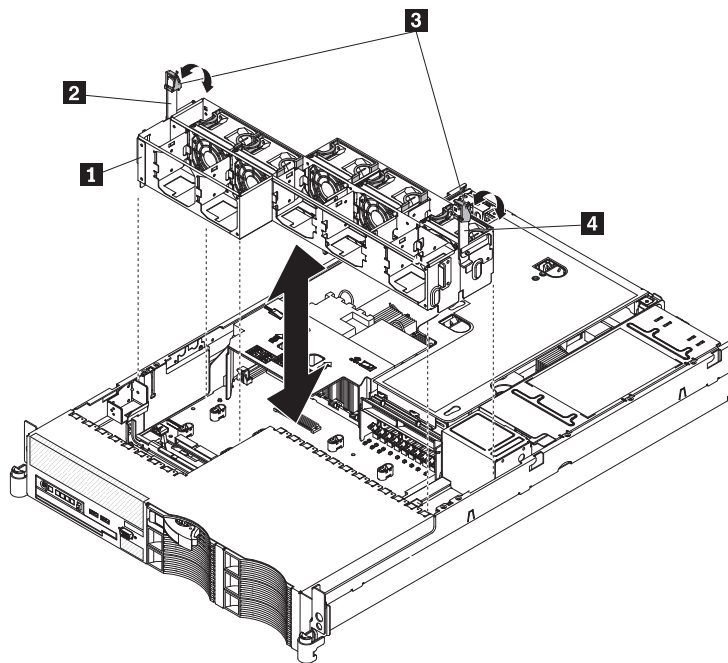
| **1** | Fan bracket | **3** | Fan-bracket latches |
| **2** | Lever | **4** | Lever |

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see "Removing the cover" on page 56).

4. Place your thumbs on the metal tabs of the fan-bracket-assembly levers and pinch the tab and blue release latch together; then, raise the levers, raising the fan-bracket assembly.

5. Grasp the levers and lift the fan-bracket assembly out of the server.

6. If you are instructed to return the fan-bracket assembly, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the fan-bracket assembly

To install the fan-bracket assembly, complete the following steps.
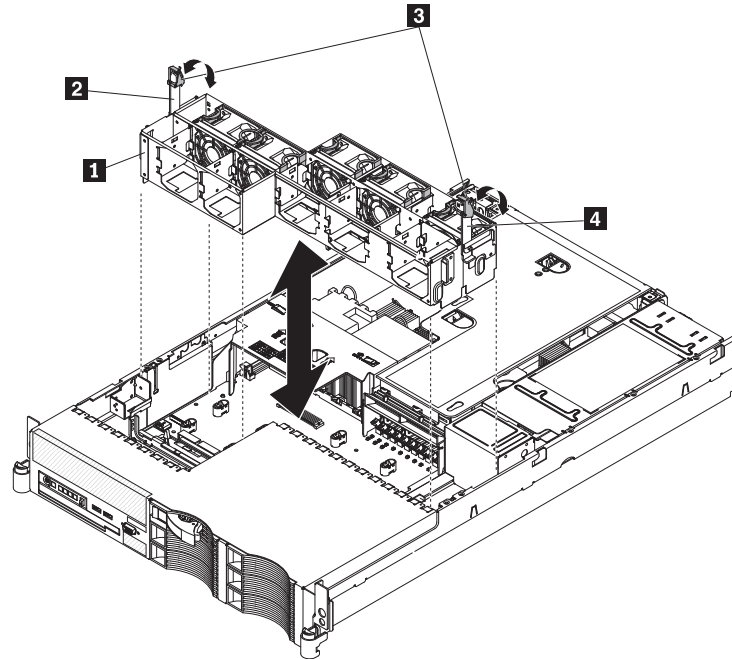
1	Fan bracket	**3**	Fan-bracket latches
2	Lever	**4**	Lever

1. Align the guides on the left and right sides of the assembly with the slots in the sides of the chassis.

2. Lower the fan-bracket assembly into the chassis.

3. Push the fan-bracket-assembly levers toward the rear of the server until they stop; pinch the release latches and metal tabs together and push the levers down into place.

4. Press down on the lever metal tabs and on the fans to make sure that the fan-bracket assembly is fully seated.

5. Install the cover (see "Installing the cover" on page 57).

6. Slide the server into the rack.

7. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Installing the DIMM air baffle

To install the DIMM air baffle, complete the following steps.
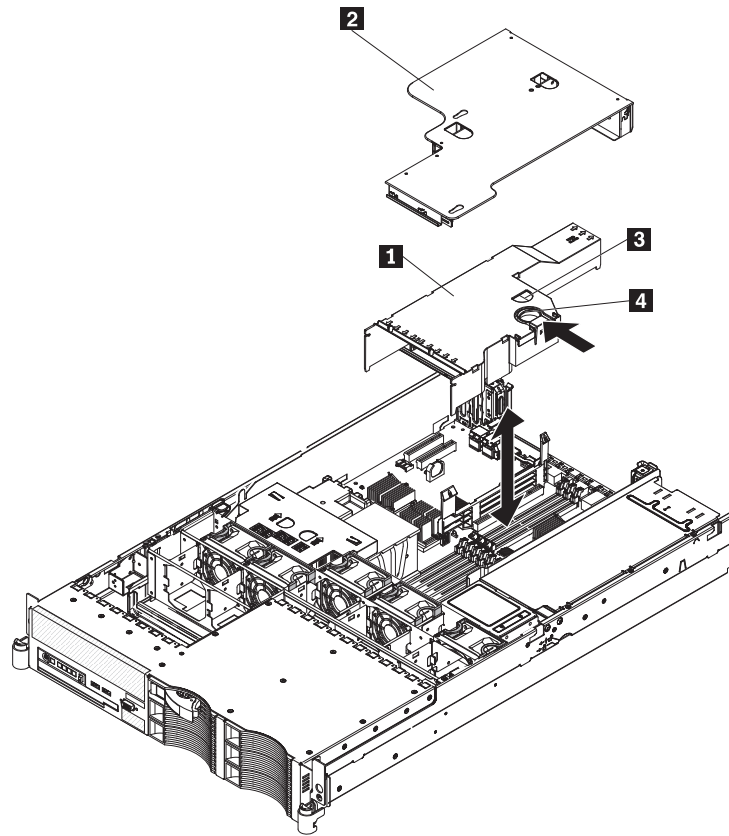
1	DIMM air baffle	**3**	Finger hole
2	Riser card assembly	**4**	Release ring

1. Align the tabs on the sides of the air baffle with the slots on the power-supply cage.
2. Place your fingers into the handle and opening on the top of the DIMM air baffle.
3. Press the handle toward the opening and lower the air baffle so that the lip on the right side of the baffle covers the lip on the side of the power-supply cage.
4. Press the DIMM air baffle into place.
5. Install the cover (see "Installing the cover" on page 57).
6. Slide the server into the rack.
7. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Attention: For proper cooling and airflow, replace the air baffle before turning on the server. Operating the server with an air baffle removed might damage server components.

Removing the riser-card assembly

The server comes with one riser-card assembly that contains two PCI Express x8 connectors. You can replace the riser-card assembly with one that contains two PCI-X 64-bit 133 MHz connectors that support single-width IXA adapters.

To remove the riser-card assembly, complete the following steps.
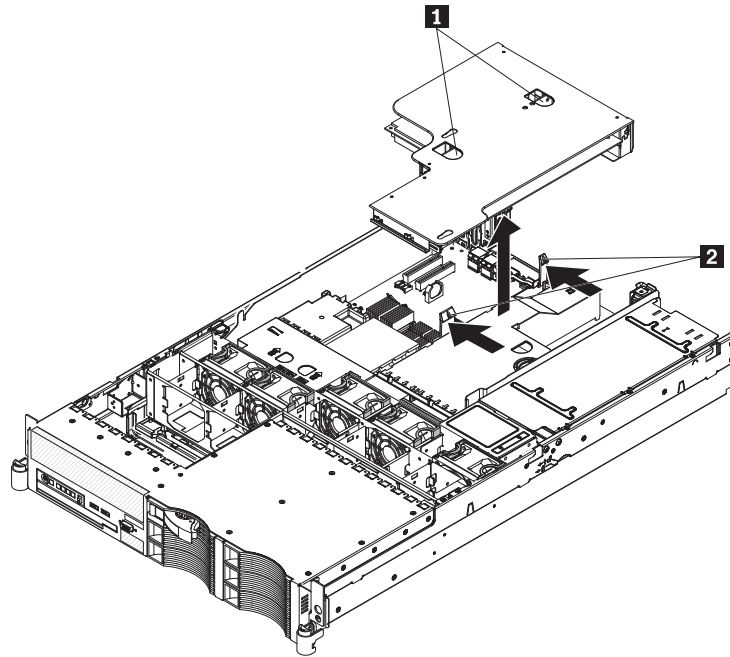
| 1 | Access holes |
| 2 | Release tabs |

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Pull the server out of the rack.
4. Remove the cover (see "Removing the cover" on page 56).
5. Push the two retention latches on the riser-card assembly toward the low-profile PCI slots; then, grasp the assembly at the rear and side edges and lift it to remove it from the server. Place the riser-card assembly on a flat, static-protective surface.

Installing the riser-card assembly

To install the riser-card assembly, complete the following steps.
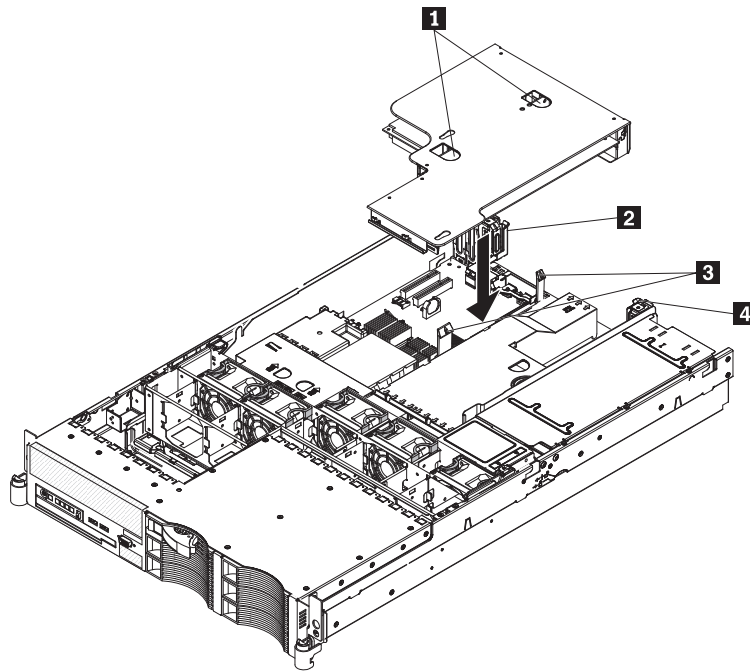
1	Hard disk drive cable connector 4 - 7	**3**	Battery
2	Hard disk drive cable connector 0 - 3	**4**	ServeRAID-MR10i SAS/SATA controller

1. Reinstall any adapters and reconnect any internal cables you might have removed in other procedures.
2. Carefully align the riser-card assembly with the release tab posts, the guides on the rear of the server, and the riser-card connector on the system board; then, press down on the assembly. Make sure that the riser-card assembly is fully seated in the riser-card connector on the system board.
3. Install the cover (see "Installing the cover" on page 57).
4. Slide the server into the rack.
5. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Removing an adapter

This topic describes removing an adapter from a PCI slot. To remove a Remote Supervisor Adapter II SlimLine, go to "Removing a Remote Supervisor Adapter II SlimLine" on page 67. To remove the ServeRAID SAS controller, go to "Removing the ServeRAID SAS controller" on page 69.

To remove an adapter from a PCI slot, complete the following steps.
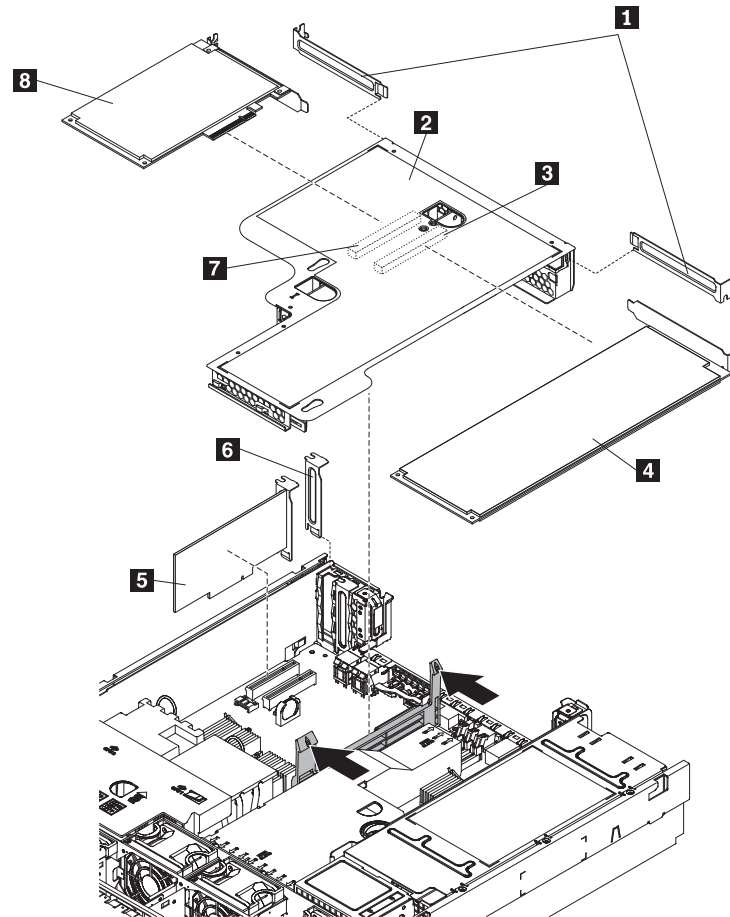
1	Expansion slot cover	**5**	Low-profile PCI Express adapter
2	Raiser-card assembly	**6**	Expansion slot cover
3	Expansion slot 1	**7**	Expansion slot 2
4	Adapter	**8**	Adapter

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Pull the server out of the rack; then, remove the cover (see "Removing the cover" on page 56).
4. If the adapter is on the riser card, remove the riser-card assembly from the server (see "Removing the riser-card assembly" on page 63).
5. Disconnect any cables from the adapter.
6. Carefully grasp the adapter by its top edge or upper corners, and pull the adapter from the PCI slot.
7. If you are instructed to return the adapter, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing an adapter

This topic describes installing an adapter in a PCI slot. To install a Remote Supervisor Adapter II SlimLine, go to "Installing a Remote Supervisor Adapter II SlimLine" on page 68. To install a ServeRAID SAS controller, go to "Installing a ServeRAID SAS controller" on page 71.
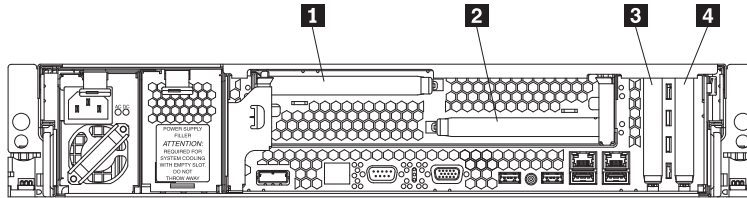
| **1** | PCI slot 1 | **3** | PCI slot 3 |
| **2** | PCI slot 2 | **4** | PCI slot 4 |

To install an adapter, complete the following steps.
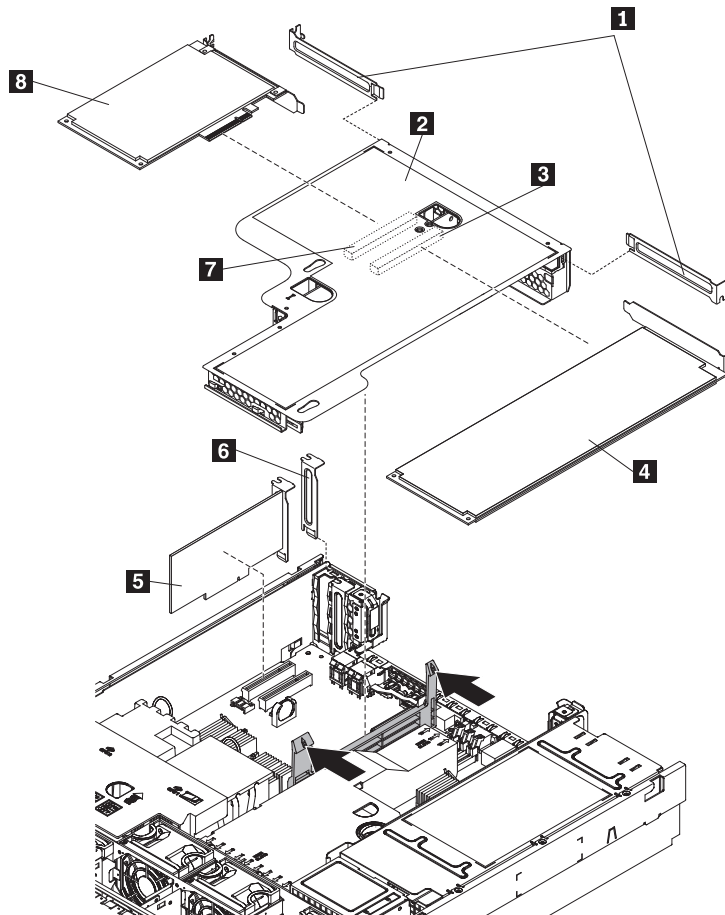
1	Expansion slot cover	**5**	Low-profile PCI Express adapter
2	Raiser-card assembly	**6**	Expansion slot cover
3	Expansion slot 1	**7**	Expansion slot 2
4	Adapter	**8**	Adapter

1. Install the adapter in the expansion slot. The following illustration shows how to install an adapter in a PCI slot on the riser card.

   Note: For clarity, the riser-card assembly ▉1 is inverted in this illustration.
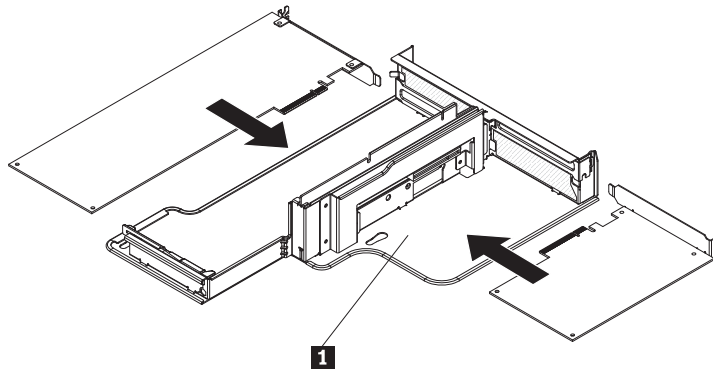
2. If you removed the PCI riser-card assembly to install the adapter, install the PCI riser-card assembly (see "Installing the riser-card assembly" on page 64).

3. Connect any required cables to the adapter.

   Attention:

   • When you route cables, do not block any connectors or the ventilated space around any of the fans.

   • Make sure that cables are not routed on top of components under the PCI riser-card assembly.

   • Make sure that cables are not pinched by the server components.

4. Perform any configuration tasks that are required for the adapter.

5. Install the cover (see "Installing the cover" on page 57).

6. Slide the server into the rack.

7. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Removing a Remote Supervisor Adapter II SlimLine

Note: Before removing a Remote Supervisor Adapter II SlimLine, create a backup copy of the configuration so that if you are replacing the adapter, you can restore the configuration.

To remove the Remote Supervisor Adapter II SlimLine, complete the following steps.

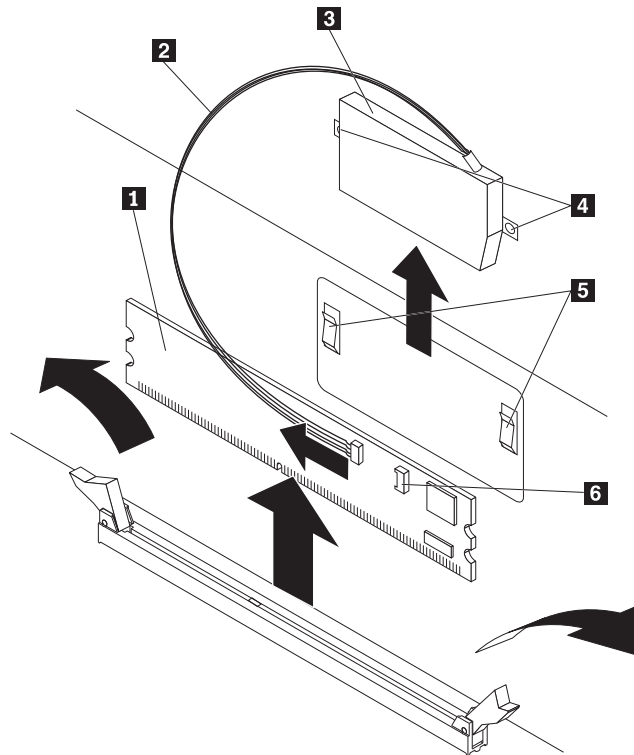|			
1	Retainer bracket	**3**	Latch bracket tabs
2	Remote Supervisor Adapter II SlimLine		

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the server cover (see "Removing the cover" on page 56).
4. Remove the PCI riser-card assembly (see "Removing the riser-card assembly" on page 63).
5. Spread the tabs of the latch bracket apart and lift the end of the Remote Supervisor Adapter II SlimLine, until the tabs release the adapter; then, slide the other end of the Remote Supervisor Adapter II SlimLine out of the retainer bracket.
6. Lift the Remote Supervisor Adapter II SlimLine out of the server.
7. If you are instructed to return the Remote Supervisor Adapter II SlimLine, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a Remote Supervisor Adapter II SlimLine

An optional Remote Supervisor Adapter II SlimLine can be installed only in a dedicated slot on the system board. See "System-board optional-device connectors" on page 9 for the location of the connector. After the Remote Supervisor Adapter II SlimLine is installed, the system-management Ethernet port on the rear of the server is active.

Note: Earlier versions of the Remote Supervisor Adapter II SlimLine might not work in this server. See http://www.lenovo.com/support/ for the supported Remote Supervisor Adapter II SlimLine.

To install the Remote Supervisor Adapter II SlimLine, complete the following steps.
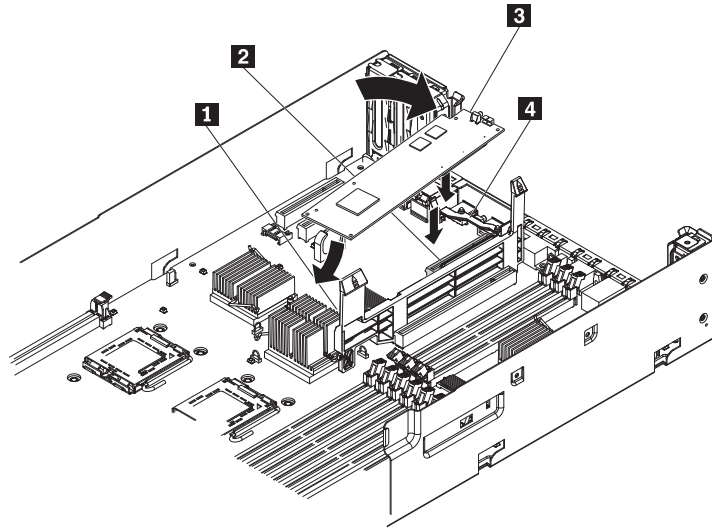
1	Retainer bracket	**3**	Remote Supervisor Adapter II SlimLine
2	Connector	**4**	Latch bracket

1. Turn the Remote Supervisor Adapter II SlimLine so that the keys on the connector align correctly with the connector on the system board.

2. Slip the free end of the Remote Supervisor Adapter II SlimLine under the tab on the retainer bracket, aligning the holes in the adapter with the posts on the retainer bracket and latch bracket; then, press the adapter into the connector on the system board and make sure that all tabs on the latch bracket secure the adapter in place.

3. Replace the PCI riser-card assembly.

4. Install the cover (see "Installing the cover" on page 57).

5. Slide the server into the rack.

6. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Restore the backup copy of the configuration to the Remote Supervisor Adapter II SlimLine. If you do not have a backup copy of the configuration, see the documentation that comes with the Remote Supervisor Adapter II SlimLine for information about installing the firmware and configuring the optional device.

Removing the ServeRAID SAS controller

Attention: To avoid breaking the retaining clips or damaging the connectors, handle the clips gently.

To remove a ServeRAID SAS controller, complete the following steps.

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.

2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Remove the cover (see "Removing the cover" on page 56).

4. Remove the riser-card assembly and the air baffle over the DIMMs (see "Removing the DIMM air baffle" on page 59).

5. Locate the ServeRAID SAS controller on the system board.

   Note: The following illustration shows removing a ServeRAID-8k SAS controller; the ServeRAID-8k-l SAS controller does not have a battery.

1	RAID controller		4	Battery mounting tabs
2	Battery cable		5	Battery mounting clips
3	Battery		6	Battery cable connector

6. If the controller is a ServeRAID-8k SAS Controller, disconnect the battery from the controller; then, lift the battery out of the battery-mounting clips on the server wall and remove the battery from the server.

7. Open the retaining clip on each end of the connector.

8. Lift the ServeRAID SAS controller out of the connector.

9. If you are instructed to return the ServeRAID SAS controller, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a ServeRAID SAS controller

To install the ServeRAID-8k-l SAS Controller or the ServeRAID-8k SAS Controller, complete the following steps.

Note: The following illustration shows installing a ServeRAID-8k SAS controller; the ServeRAID-8k-I SAS controller does not have a battery.
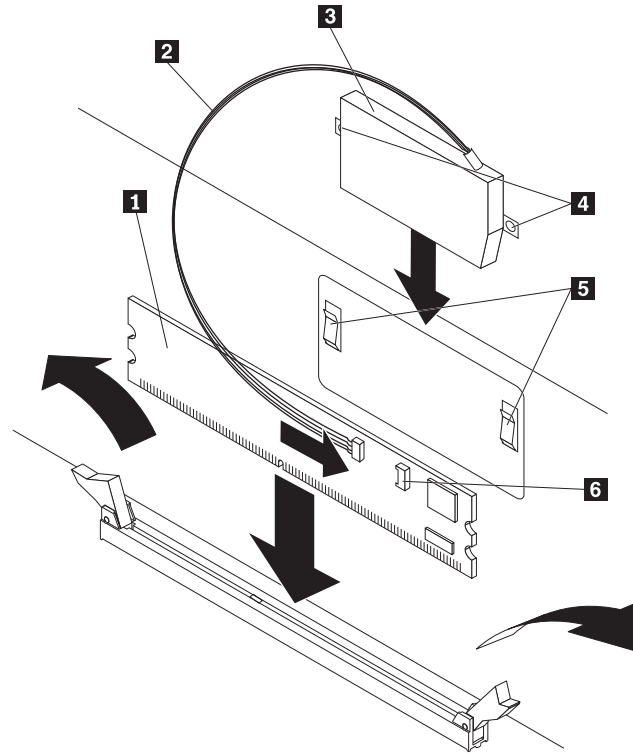
1	RAID controller	4	Battery mounting tabs
2	Battery cable	5	Battery mounting clips
3	Battery	6	Battery cable connector

1. Touch the static-protective package that contains the new ServeRAID SAS controller to any unpainted metal surface on the server. Then, remove the ServeRAID SAS controller from the package.
2. Turn the new ServeRAID SAS controller so that the keys on the bottom edge align correctly with the connector.
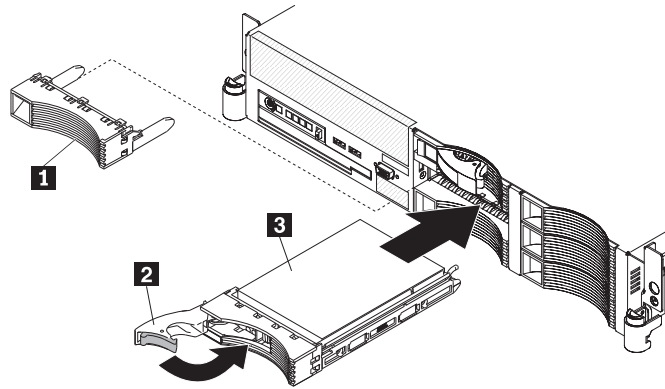3. Firmly press the ServeRAID SAS controller straight down into the connector by applying pressure on both ends of the controller simultaneously. The retaining clips snap into the locked position when the controller is firmly seated in the connector.

   Note: If there is a gap between the controller and the retaining clips, the controller has not been correctly installed. In this case, open the retaining clips and remove the controller; then, reinsert the controller.
4. If you are installing a ServeRAID-8k SAS Controller, complete the following steps:
   a. Remove the battery from the ServeRAID-8k SAS controller package.
   b. Slide the battery mounting tabs into the battery mounting clips on the server wall next to the connector.

    c. Connect the ServeRAID-8k SAS controller battery to the ServeRAID SAS controller.

5. Replace the air baffle over the DIMMs (see "Installing the DIMM air baffle" on page 62).

6. Replace the riser-card assembly.

7. Install the cover (see "Installing the cover" on page 57).

8. Slide the server into the rack.

9. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Notes:

1. When you restart the server for the first time after you install a ServeRAID-8k SAS controller, the monitor screen remains blank while the controller initializes the battery. This might take a few minutes, after which the startup process continues. This is a one-time occurrence.

   Important: You must allow the initialization process to be completed. If you do not, the battery pack will not work, and the server might not start.

   The battery comes partially charged, at 30% or less of capacity. Run the server for 4 to 6 hours to fully charge the controller battery. The LED just above the battery on the controller remains lit until the battery is fully charged.

   Until the battery is fully charged, the controller firmware sets the controller cache to write-through mode; after the battery is fully charged, the controller firmware re-enables write-back mode.

2. When you restart the server, you will be given the opportunity to import the existing RAID configuration to the new ServeRAID SAS controller.

Removing a hard disk drive

To remove a hard disk drive from a hot-swap bay, complete the following steps.
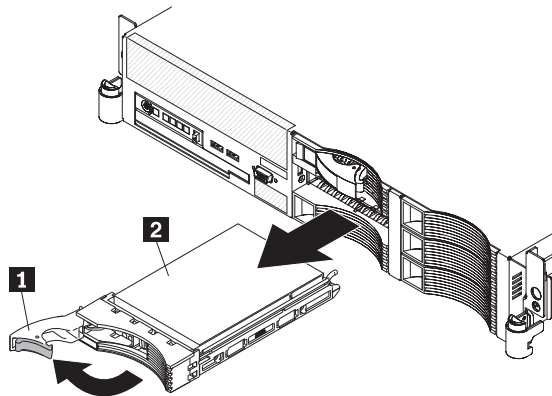
3.5-inch drives

1	Tray handle
2	Hard disk drive

2.5-inch drives

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Move the handle on the drive to the open position (perpendicular to the drive).
3. Pull the hot-swap drive assembly from the bay.
4. If you are instructed to return the hot-swap drive, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a hard disk drive

Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this section.

For information about the type of hard disk drive that the server supports and other information that you must consider when installing a hard disk drive, see the *User Guide* on the *ThinkServer Documentation DVD*.

Important: Do not install a SCSI hard disk drive in this server; install only SAS hard disk drives.

To install a drive in a hot-swap bay, complete the following steps.

3.5-inch drives

1	Filler panel	**3**	Hard disk drive
2	Tray handle		

2.5-inch drives

Attention: To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed in each bay.

1. Install the hard disk drive in the hot-swap bay:

   a. Make sure that the tray handle is open (that is, perpendicular to the drive).

   b. Align the drive assembly with the guide rails in the bay.

   c. Gently push the drive assembly into the bay until the drive stops.

   d. Push the tray handle to the closed (locked) position.

2. Check the hard disk drive status LED to verify that the hard disk drive is operating correctly.

   If the amber hard disk drive status LED for a drive is lit continuously, that drive is faulty and must be replaced. If the green hard disk drive activity LED is flashing, the drive is being accessed.

Note: You might have to reconfigure the disk arrays after you install hard disk drives. See the RAID documentation on the IBM *ServeRAID Support* CD for information about RAID controllers.

Removing a CD-RW/DVD drive

To remove the CD-RW/DVD drive, complete the following steps.

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
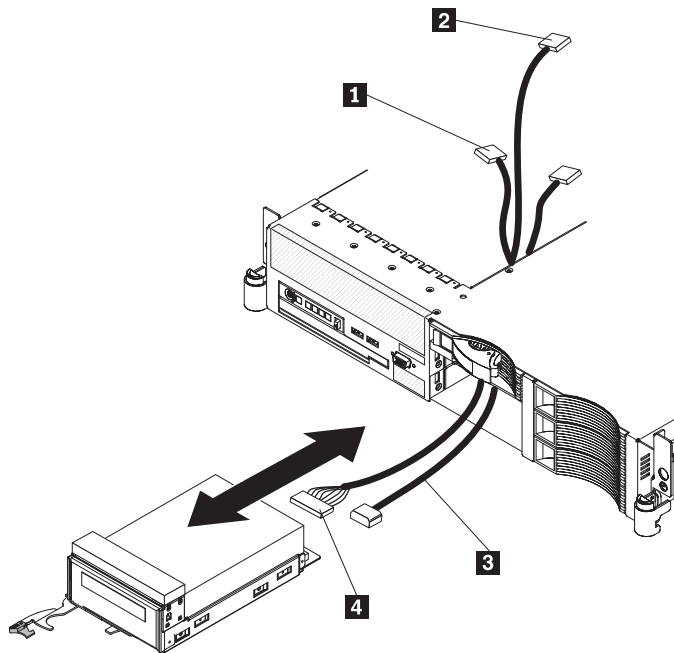3. Pull the server out of the rack; then, remove the cover (see "Removing the cover" on page 56).
4. Press the release tab **1** down to release the drive **2** ; then, while pressing the tab, push the drive toward the front of the server.
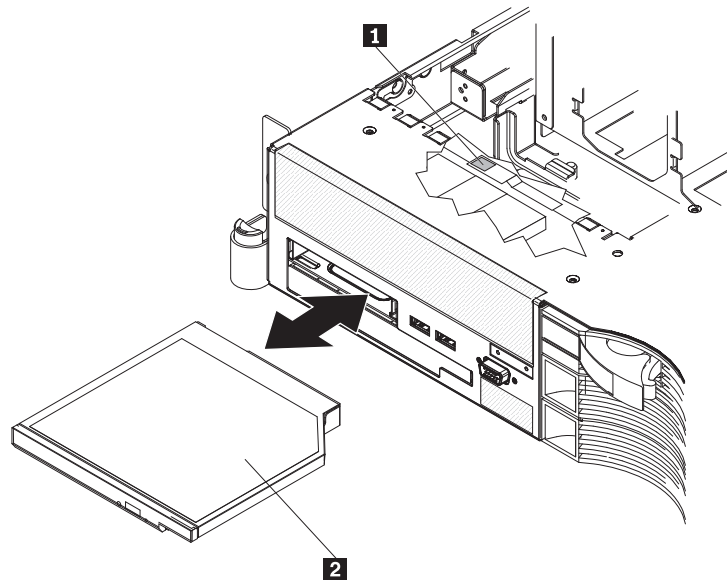
5. From the front of the server, pull the drive out of the bay.
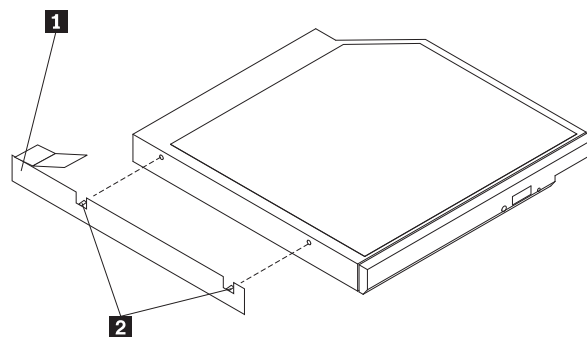
1	Drive retention clip
2	Alignment pins

6. Remove the retention clip from the drive.
7. If you are instructed to return the CD-RW/DVD drive, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a CD-RW/DVD drive

To install the replacement CD-RW/DVD drive, complete the following steps.
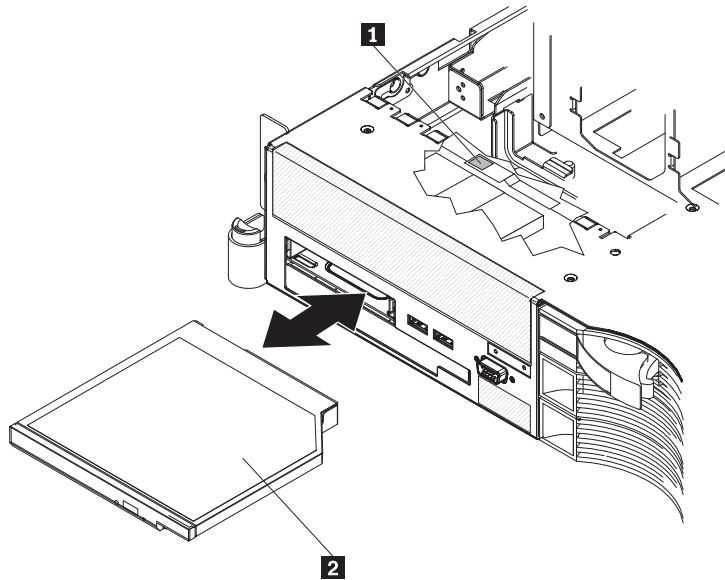
| 1 | Release tab |
| 2 | CD/DVD drive |

1. Follow the instructions that come with the drive to set any jumpers or switches.
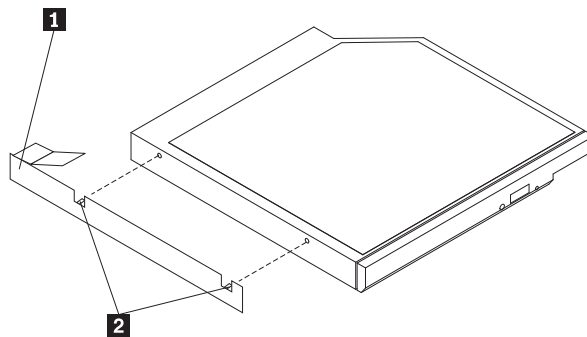
| 1 | Drive retention clip |
| 2 | Alignment pins |

2. Attach the drive-retention clip to the side of the drive.
3. Slide the drive into the CD/DVD drive bay until the drive clicks into place.
4. Install the cover (see "Installing the cover" on page 57).
5. Slide the server into the rack.
6. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Removing an optional SATA tape drive

To remove a tape drive from the server, complete the following steps. The following illustration shows removing a SATA tape drive from a 3.5-inch server model.
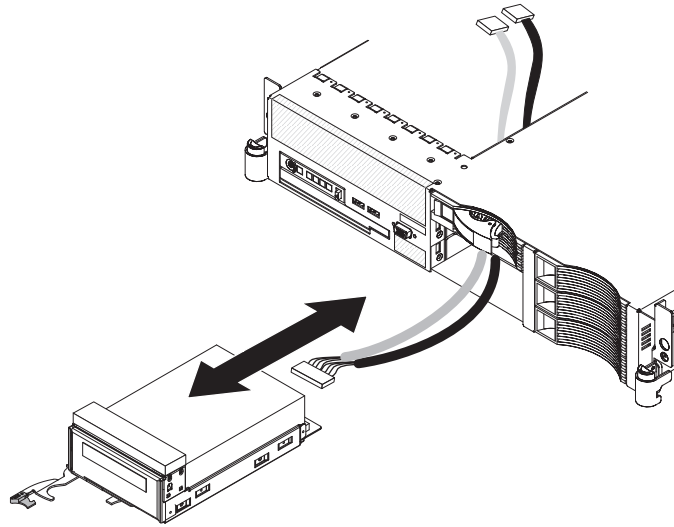
1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover from the server.
4. Remove the fan-bracket assembly (see "Removing the fan-bracket assembly" on page 60).
5. Disconnect the tape drive cables from the connectors on the system board.
6. Open the tape drive tray release latch.
7. Gently pull the drive and cables out of the bay.

   Note: On a 3.5-inch model server, gently pull the drive cables through the slot in the left side of the bay and out the front of the server.
8. If you are not installing another drive in the bay right away, install a filler panel or panels in the bay.
9. If you are instructed to return the drive, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Removing an optional SCSI tape drive

To remove a SCSI tape drive from the server, complete the following steps. The following illustration shows removing a SCSI tape drive from a 3.5-inch server model.

1	Terminator	**3**	Power cable
2	SCSI adapter connector	**4**	Tape drive connector

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover from the server.
4. Remove the fan-bracket assembly (see "Removing the fan-bracket assembly" on page 60).
5. On a 2.5-inch model server, reach into the rear of the tape-drive bay and disconnect the power and signal cables from the tape drive; then, go to step 7.
6. On a 3.5-inch model server, detach the SCSI terminator from the top of the CD/DVD bay; then, disconnect the tape power cable and loosen the SCSI signal cable so that you can slide the drive out of the bay:

   a. Remove the fan-bracket assembly (see "Removing the fan-bracket assembly" on page 60).

   b. Disconnect the tape-drive power cable from the connector on the system board.

   c. Remove the DIMM air baffle (see "Removing the DIMM air baffle" on page 59).

   d. Temporarily disconnect the hard disk drive backplane signal cable from the system board (see the illustration on page "System-board internal cable connectors" on page 11 for the location of the hard disk drive backplane signal connector).

     e. Remove the hard disk drive backplane signal cable and SCSI cable from the cable clamp. See the illustration on page 84 for the location of the cable clamp.

7. Open the tape drive tray release latch.

8. Gently pull the drive out of the bay.

9. On a 3.5-inch model server, gently pull the drive cables through the slot in the left side of the bay and out the front about 5 to 8 cm (2 to 3 in.). Then, disconnect the SCSI cable and tape power cable from the rear of the tape drive.

10. If you are not installing another drive in the bay right away, install a filler panel or panels in the bay, and reinstall the hard disk drive backplane cable, DIMM air baffle, and riser-card assembly (see "Installing the DIMM air baffle" on page 62 and "Installing the riser-card assembly" on page 64).

11. If you are instructed to return the drive, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing an optional tape drive

Prepare the drive according to the instructions that come with the drive, setting any switches or jumpers, then see the appropriate procedure:

- "Installing a SATA tape drive in a 3.5-inch model server"
- "Installing a SATA tape drive in a 2.5-inch model server" on page 81
- "Installing a SCSI tape drive in a 3.5-inch model server" on page 82
- "Installing a SCSI tape drive in a 2.5-inch model server" on page 86

Installing a SATA tape drive in a 3.5-inch model server

Install the tape drive in the two bottom-left hard disk drive bays.

To install a tape drive in a 3.5-inch model server, complete the following steps.
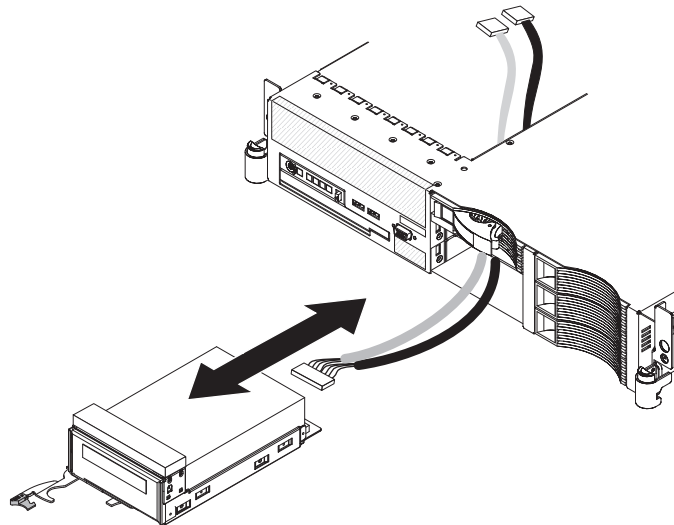
1. Remove the tape drive from the static-protective package.

2. If you have not attached the space filler from the tape enablement kit to the tape-drive assembly, do so now.

3. From the inside of the server, thread the tape-drive end of the cables through the slot in the left side of the hard disk drive cage and out the front of the server.

4. Connect the cables to the back of the tape drive.

5. Push the tape-drive assembly into the bays, gently pulling the cables farther into the server as you do so, until the tape-drive assembly stops.
6. Push the tray handle to the closed (locked) position.
7. Connect the cable connectors to the following system-board connectors (see "System-board internal cable connectors" on page 11 for the location of the connectors):
   - Signal connector: SATA tape drive signal connector, J102
   - Power connector: tape-drive power connector, J100

The following illustration shows the routing of the SATA tape drive signal cable.

**Important:** Make sure that the cables avoid any fan connectors.
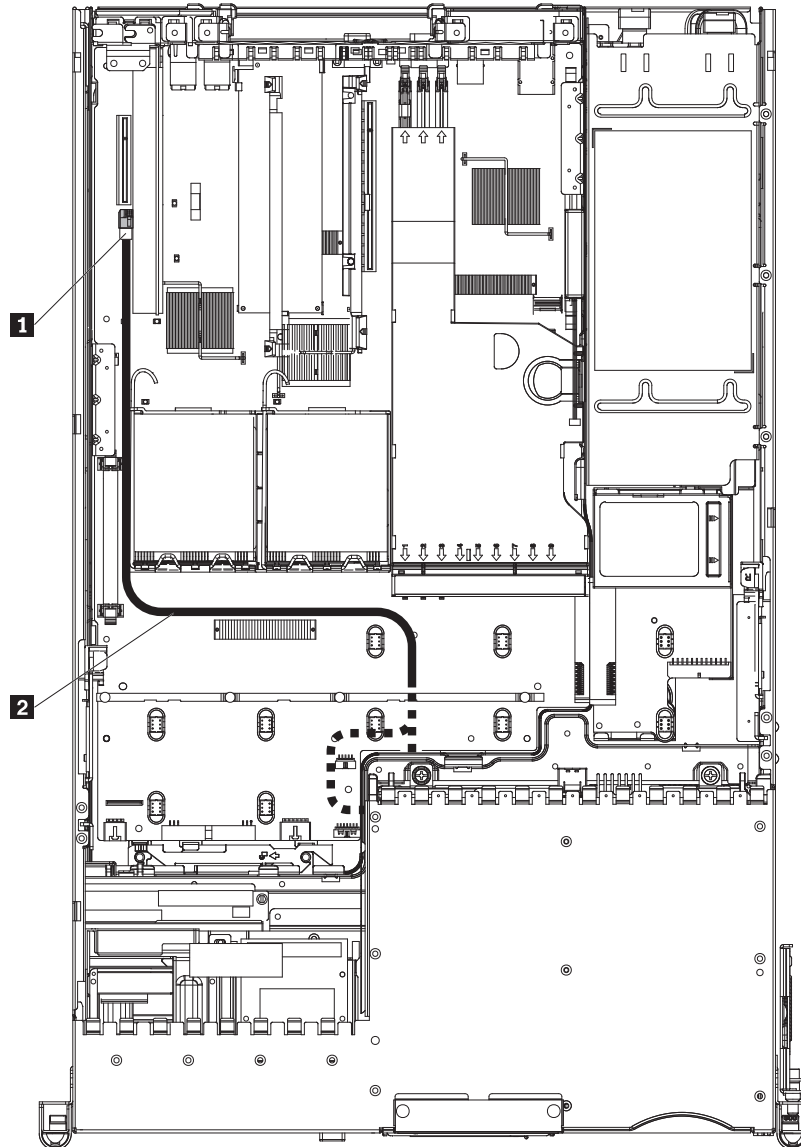
| 1 | SATA tape cable connector |
| 2 | SATA tape cable |

8. Install the fan-bracket assembly.
9. Install the cover (see "Installing the cover" on page 57).
10. Slide the server into the rack.

11. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Installing a SATA tape drive in a 2.5-inch model server

To install a tape drive in a 2.5-inch model server, complete the following steps.
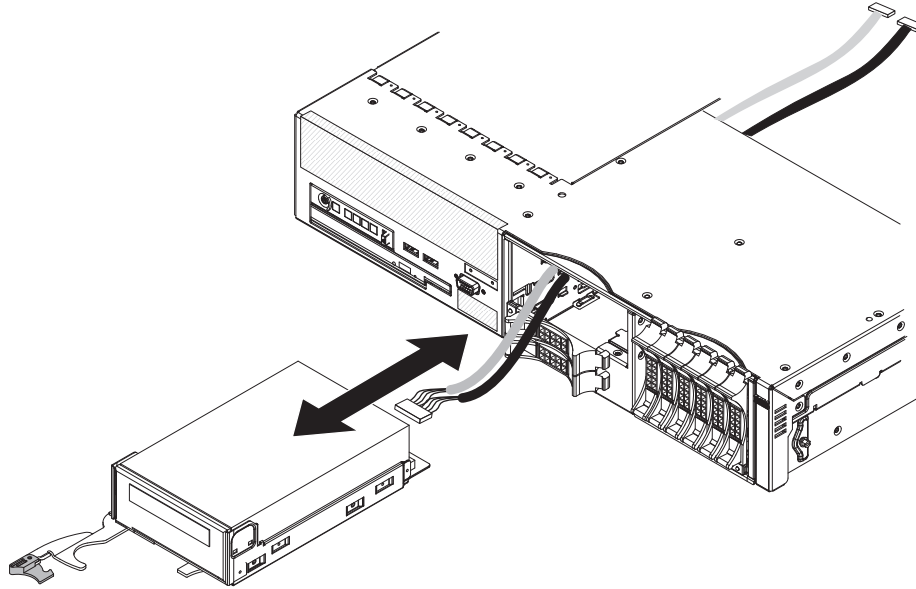
1. Remove the fan-bracket assembly.
2. Remove the filler panel from the tape-drive bay.
3. If the tape-drive assembly has a space filler on top of the drive, remove it now.
4. From the inside of the server, thread the tape-drive end of the cables for your tape drive through the rear of the tape-drive bay and out the front of the server.
5. Connect the cable or cables to the back of the tape drive.
6. Push the tape-drive assembly into the tape-drive bay, gently pulling the cables farther into the server as you do so, until the tape-drive assembly stops.
7. Push the tray handle to the closed (locked) position.
8. Connect the cable connectors to the following system-board connectors (see "System-board internal cable connectors" on page 11 for the location of the connectors):
   - Signal connector: SATA tape drive signal connector, J102
   - Power connector: tape-drive power connector, J100

   The following illustration shows the routing of the SATA tape drive signal cable.

   Important: Make sure that the cables avoid any fan connectors.
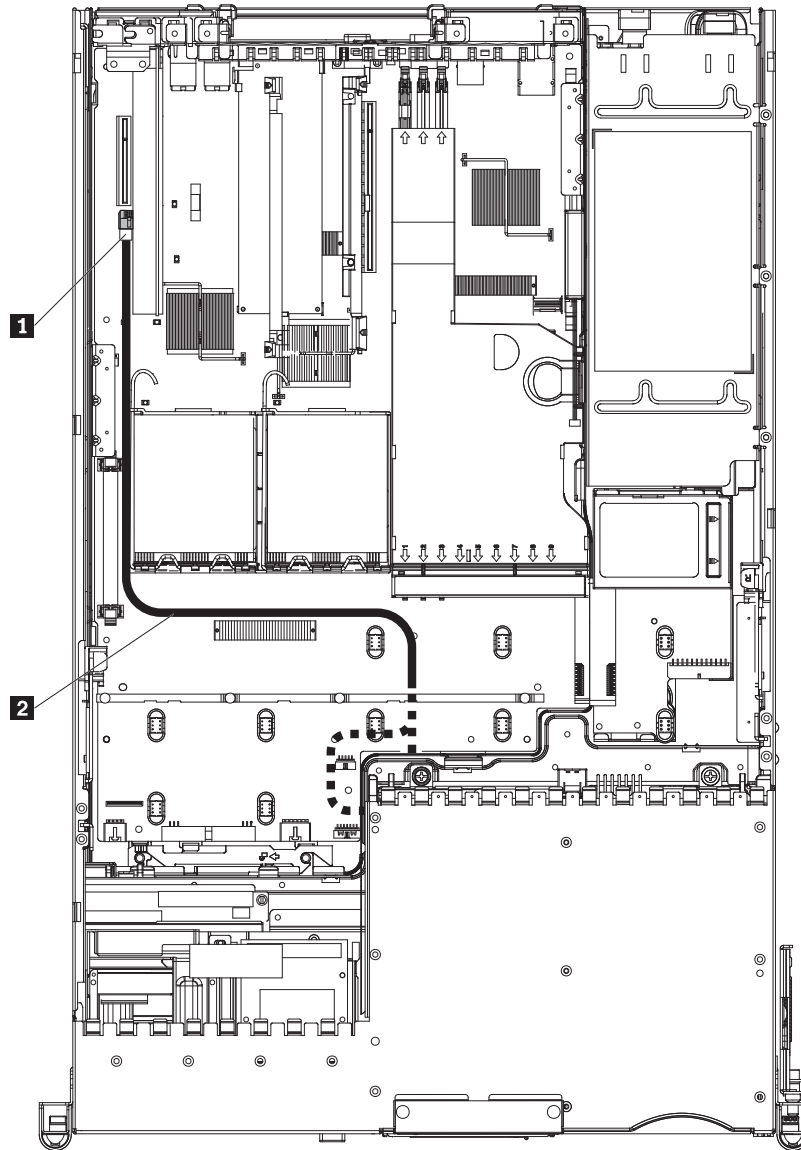
| 1 | SATA tape cable connector |
| 2 | SATA tape cable |

9. Install the fan-bracket assembly.
10. Install the cover (see "Installing the cover" on page 57).
11. Slide the server into the rack.
12. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Installing a SCSI tape drive in a 3.5-inch model server

Install the tape drive in the two bottom-left hard disk drive bays. See the documentation that comes with the enablement kit for the original tape drive for instructions for mounting the tape drive on the tape-drive tray.
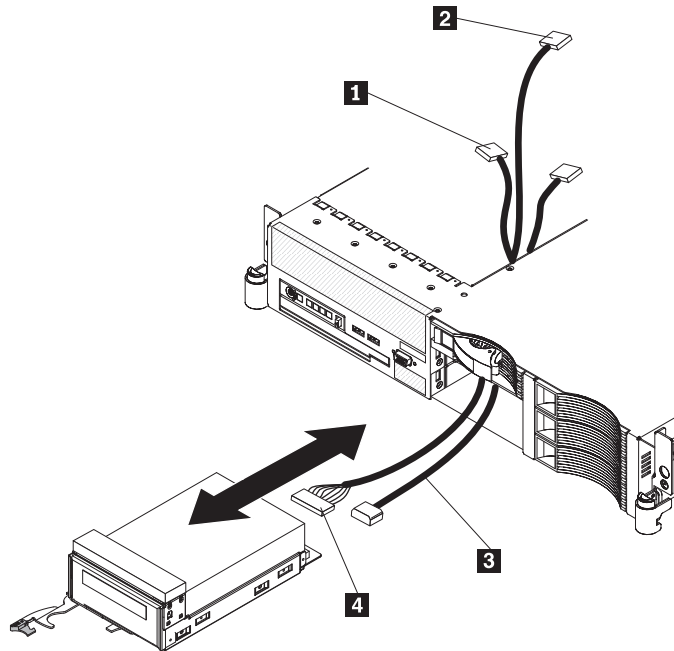
1	Terminator	**3**	Power cable
2	SCSI adapter connector	**4**	Tape drive connector

To install a replacement SCSI tape drive in a 3.5-inch model server, complete the following steps:

1. If you have not attached the space filler from the tape enablement kit to the tape-drive assembly, do so now.
2. Remove the fan-bracket assembly.
3. Gently pull the tape drive SCSI and power cables out the front of the tape-drive bay approximately 5 to 8 cm (2 to 3 in.).
4. Connect the cables to the back of the tape drive.
5. Push the tape-drive assembly into the bays, gently pulling the cables farther into the server as you do so, until the tape-drive assembly stops.
6. Push the tray handle to the closed (locked) position.
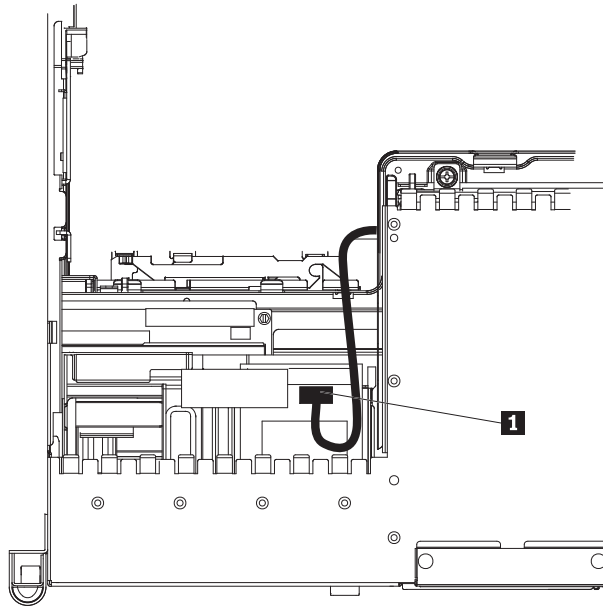
7. Make sure that the hook-and-loop fastener on the SCSI cable terminator **1** is attached to the hook-and-loop fastener on top of the CD/DVD drive bay.

8. Make sure that the SCSI signal cable **1** is routed to the supported SCSI adapter that is installed in slot 1 of the PCI-X riser-card assembly, as shown in the following illustration. Make sure that the cable passes through the cable clamp **2** .

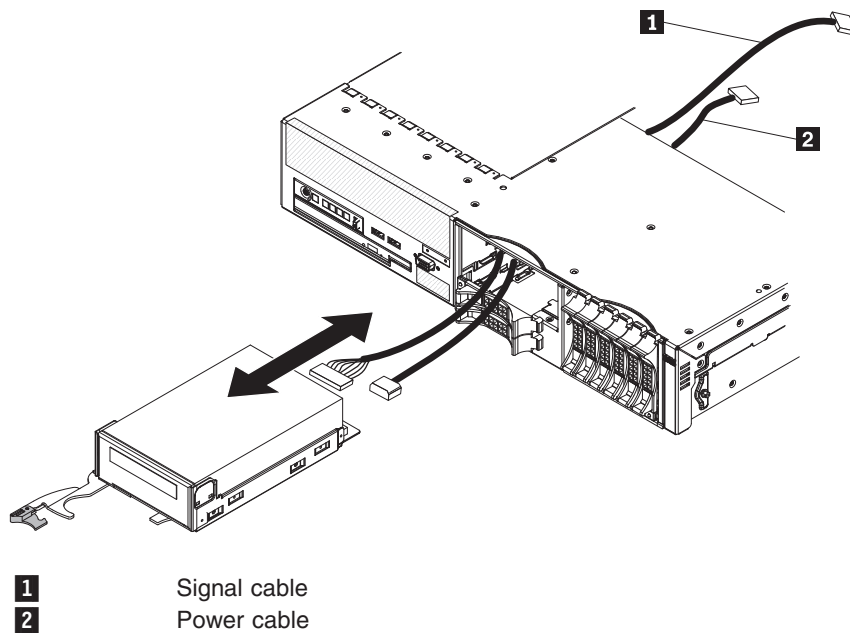   **Important:** Make sure that the cables avoid any fan connectors.
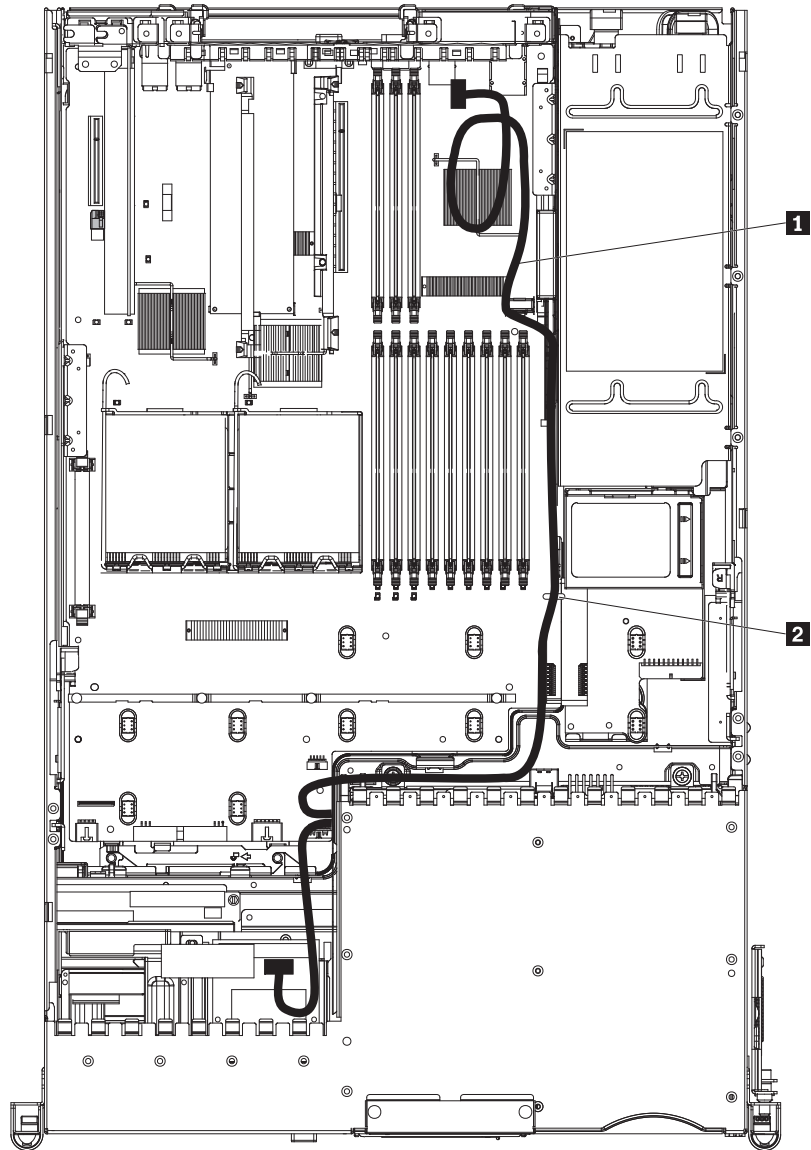
9. Make sure that the tape-drive power cable is connected to the tape-drive power connector, J100 (see "System-board internal cable connectors" on page 11 for the location of the power connector).

10. Replace the hard disk drive backplane signal cable; make sure that it is positioned on top of the SCSI signal cable and that both cables pass through the cable clamp. Close the cable clamp.

11. Reconnect the hard disk drive backplane signal cable to the connector (J92) on the system board (see "System-board internal cable connectors" on page 11 for the location of the hard disk drive backplane signal connector).

12. Reinstall the DIMM air baffle. Make sure that it clicks into place. You might have to apply extra downward pressure to make sure that it is securely in place.

13. Make sure that the SCSI signal cable is connected to the connector on the SCSI adapter in slot 1 of the riser-card assembly.

14. Install the riser-card assembly. Arrange the excess length of the SCSI signal cable to avoid blocking airflow to the heat sink in the area.

15. Make sure that all cables avoid the fan connectors and the power-backplane system-board connector (see "Power-backplane-board connectors" on page 10 and "System-board internal cable connectors" on page 11).

16. Install the fan-bracket assembly.

17. Install the cover (see "Installing the cover" on page 57).

18. Slide the server into the rack.

19. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Installing a SCSI tape drive in a 2.5-inch model server

The tape drive installs in the tape-drive bay. See the documentation that comes with the tape enablement kit for the original tape drive for instructions for mounting the tape drive on the tape-drive tray.

1	Signal cable
2	Power cable

To install a SCSI tape drive in a 2.5-inch model server, complete the following steps:

1. If you installed the space filler from the tape enablement kit onto the tape-drive assembly, remove it now.

2. Remove the fan-bracket assembly.

3. Connect the tape drive signal and power cables to the back of the tape drive.

4. Make sure that the SCSI terminator is attached to the inside top of the tape-drive bay as shown in the following illustration. If necessary, press the terminator onto the corresponding hook-and-loop fastener on the inside top of the bay.
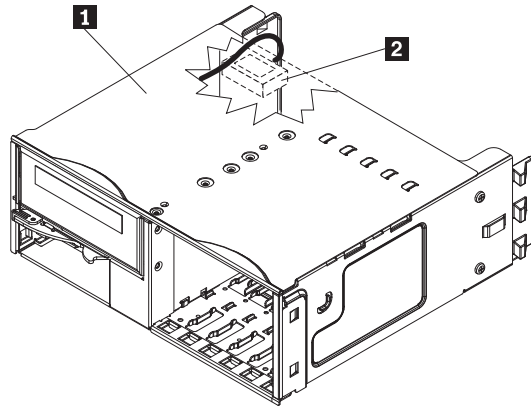
1	Drive cage
2	SCSI terminator

5. Make sure that the tape-drive power cable is connected to the tape-drive power connector, J100 (see "System-board internal cable connectors" on page 11 for the location of the power connector).

6. Install the fan-bracket assembly.

7. Install the cover (see "Installing the cover" on page 57).

8. Slide the server into the rack.

9. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Removing a memory module (DIMM)

To remove a DIMM, complete the following steps.
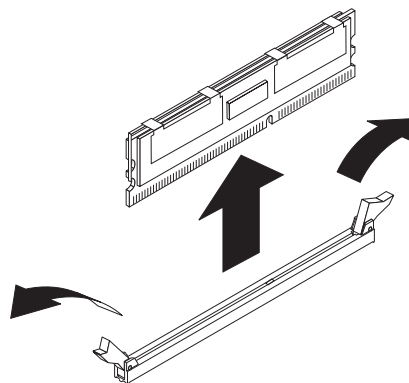
1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.

2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

> **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Remove the cover (see "Removing the cover" on page 56).
4. Remove the riser-card assembly (see "Removing the riser-card assembly" on page 63).
5. Remove the air baffle over the DIMMs (see "Removing the DIMM air baffle" on page 59).

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.

6. Open the retaining clip on each end of the DIMM connector and lift the DIMM from the connector.
7. Replace the DIMM or remove the second DIMM of the pair.
8. If you are instructed to return the DIMM, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a memory module

For information about the types of dual inline memory modules (DIMMs) that the server supports and other information that you must consider when installing DIMMs, see the *User's Guide* on the IBM *System x Documentation* CD.

- The server comes with a minimum of two 512 MB DIMMs, installed in slots 1 and 4. When you install additional DIMMs, you must install two identical DIMMS at a time, in the order shown in the following table, to maintain performance.

Table 16. DIMM installation sequence

Pair	DIMM connectors
1	1 and 4
2	7 and 10
3	2 and 5
4	8 and 11
5	3 and 6
6	9 and 12

> **Note:** When only one pair of DIMMs is installed in the server and the BIOS code level is version 1.04 (GGE127A) or later, you can improve performance by installing the DIMMs in connectors 1 and 7 instead of 1 and 4. However, because the connectors in the pair are not on the same memory branch (see the following illustration), Advanced ECC memory protection is disabled.

DIMM 12 ⎤
DIMM 11 ⎬ Channel 3
DIMM 10 ⎦

Branch 1

DIMM 9 ⎤
DIMM 8 ⎬ Channel 2
DIMM 7 ⎦
DIMM 6 ⎤
DIMM 5 ⎬ Channel 1
DIMM 4 ⎦   Branch 0
DIMM 3 ⎤
DIMM 2 ⎬ Channel 0
DIMM 1 ⎦
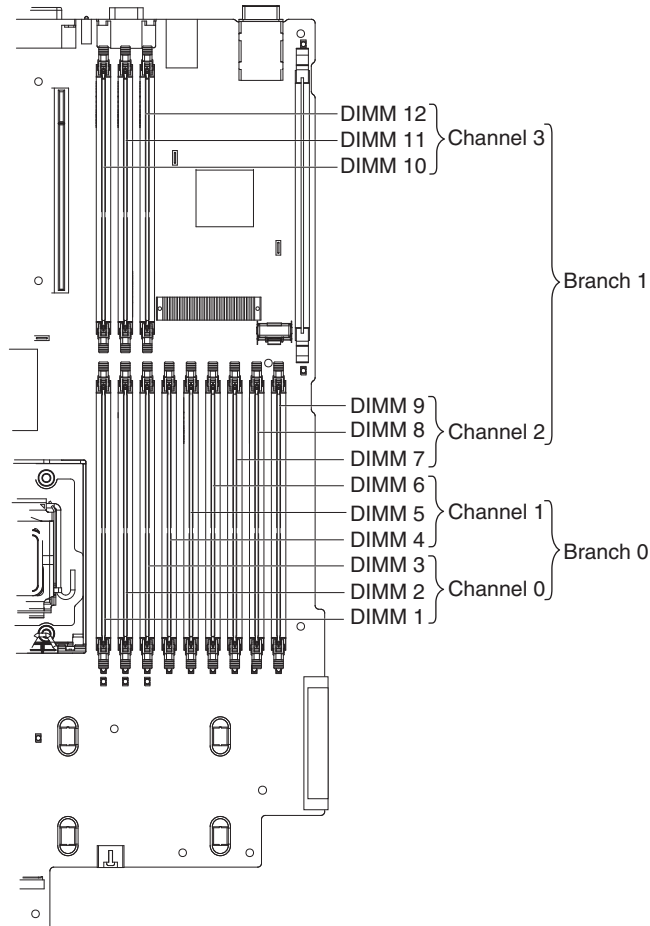
- When you use memory mirroring, you must install two pairs of DIMMs at a time. The four DIMMs in each group must be identical. See Table 17 for the DIMM connectors that are in each group.

Table 17. Memory mirroring DIMM installation sequence

Group	DIMM connectors
1	1, 4, 7, and 10
2	2, 5, 8, and 11
3	3, 6, 9, and 12

Table 18. Memory mirroring DIMM functions

Group	Active DIMMs	Mirroring DIMMs
1	1, 4	7, 10
2	2, 5	8, 11
3	3, 6	9, 12

- Several online-spare memory configurations are supported. The online-spare DIMM pairs must be the same speed, type, and the same size as, or larger than, the largest active DIMM pairs. Online-spare configurations are supported for each branch. See Table 19 on page 90 and Table 20 on page 90 for the online-spare DIMM connector assignments.

Note: POST gives a warning message when online-sparing cannot be enabled on both branches. However, no warning message is given when online-sparing is enabled on one branch and disabled on the other.

In the configuration that you use, install the largest DIMMs first.

Table 19. Online-spare DIMM configurations, basic scheme

Number of DIMMs	DIMM connectors	Results
4	1 and 4 (largest DIMMs) 2 and 5	Online-sparing on branch 0
6	1 and 4 (largest DIMMs) 2 and 5 3 and 6	Online-sparing on branch 0
8	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 (dual-rank DIMMs only)	Online-sparing on branch 0 Online-sparing on dual-rank DIMMs on branch 1
10	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 8 and 11	Online-sparing on branch 0 Online-sparing on branch 1
12	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 8 and 11 9 and 12	Online-sparing on branch 0 Online-sparing on branch 1

Table 20. Online-spare DIMM configurations, alternative scheme (requires BIOS code version 1.04 or later)

Number of DIMMs	DIMM connectors	Results
4	7 and 10 (largest DIMMs) 8 and 11	Online-sparing on branch 1
6	7 and 10 (largest DIMMs) 8 and 11 9 and 12	Online-sparing on branch 1
8	7 and 10 (largest DIMMs) 8 and 11 9 and 12 1 and 4 (dual-rank DIMMs only)	Online-sparing on branch 1 Online-sparing on dual-rank DIMMs on branch 0
10	1 and 4 (largest DIMMs) 2 and 5 7 and 10 8 and 11 9 and 12	Online-sparing on branch 0 Online-sparing on branch 1
12	N/A	N/A

To install a DIMM, complete the following steps.
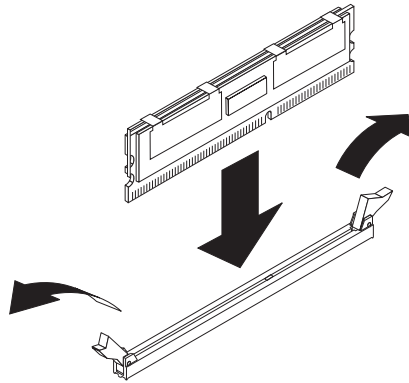
1. Open the retaining clip on each end of the DIMM connector.
2. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the server. Then, remove the DIMM from the package.
3. Turn the DIMM so that the DIMM keys align correctly with the connector.
4. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.
5. Repeat steps 1 through 4 until all the new or replacement DIMMs are installed.
6. Replace the air baffle over the DIMMs (see "Installing the DIMM air baffle" on page 62).
7. Replace the riser-card assembly (see "Installing the riser-card assembly" on page 64).
8. Install the cover (see "Installing the cover" on page 57).
9. Slide the server into the rack.
10. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Removing a hot-swap fan

Attention: To ensure proper server operation and cooling, if you remove a fan you must install a replacement fan as soon as possible.

To remove any of the 10 replaceable fans, complete the following steps.
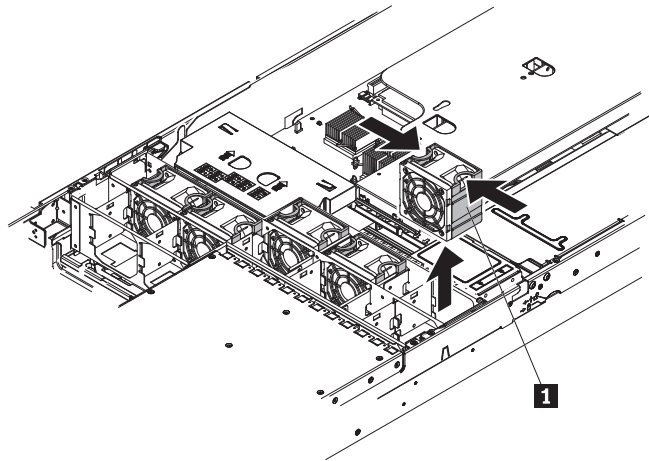
1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Slide the server out of the rack and remove the cover (see "Removing the cover" on page 56). The LED on the failing fan will be lit.

   Attention: To ensure proper system cooling, do not remove the top cover for more than 30 minutes during this procedure.
3. Remove the failed fan **1** from the server:
   a. Place your fingers into the two handles on the top of the failing fan.
   b. Pull the handles toward each other and lift the fan out of the server.
4. If you are instructed to return the fan, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a hot-swap fan

For proper cooling, the server requires that five fans be installed for each power supply that is installed.

The server comes with five replaceable fans. If you install a second power supply, you must install the complete set of five fans that come with the power-supply.

Important: Only the configurations that are shown in the following table are supported. The fan numbers are printed on the microprocessor air baffle.

Installed power supplies	Required fans
Power supply 1	Fans in locations 3, 4, 8, 9, and 10
Power supplies 1 and 2	All 10 fans

Attention: To ensure proper server operation, if a fan fails, replace it as soon as possible.

To install any of the 10 replaceable fans, complete the following steps.
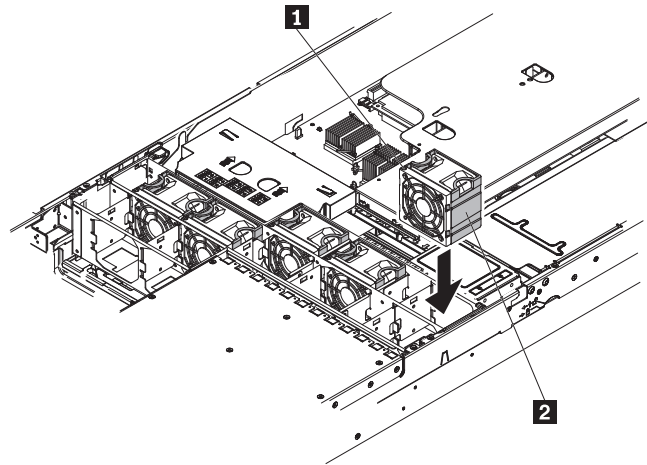
| 1 | LED |
| 2 | Hot-swap fan |

1. Orient the new fan over its position in the fan assembly bracket so that the LED on top of the fan is toward the left side of the server.
2. Push the fan into the fan bracket assembly until it clicks into place.
3. Repeat until all the new or replacement fans are installed.
4. Install the cover (see "Installing the cover" on page 57).
5. Slide the server into the rack.

Removing a hot-swap power supply

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

Important: If the server has two power supplies and you remove either of them, the server will not have redundant power; if the server power load then exceeds 835 W, the server might not start or might not function correctly.

To remove a power supply, complete the following steps.
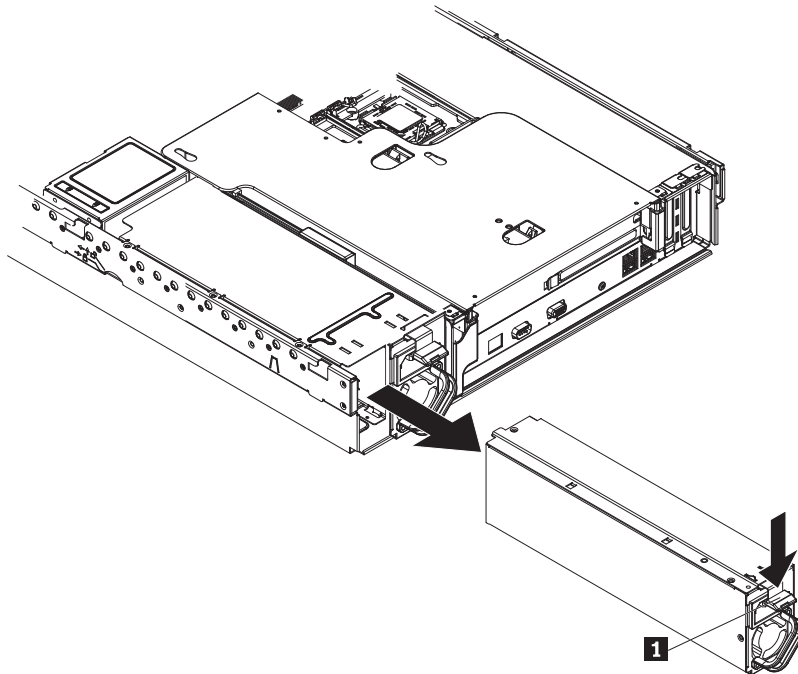
1   Release lever

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. If only one power supply is installed, turn off the server and peripheral devices.
3. Remove the cover (see "Removing the cover" on page 56).
4. Disconnect the power cord from the power supply that you are removing.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
5. Grasp the power-supply handle.
6. Press the orange release latch down and hold it down.
7. Pull the power supply part of the way out of the bay.
8. Release the release latch; then, support the power supply and pull it the rest of the way out of the bay.
9. If you are instructed to return the power supply, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Note: It is not necessary to remove any fans when you remove a power supply. However, all 10 fans must be installed when both power supplies are installed.

Installing a hot-swap power supply

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

The server supports a maximum of two hot-swap power supplies.

Important: Only the configurations that are shown in the following table are supported. The fan numbers are printed on the microprocessor air baffle.

Installed power supplies	Required fans
Power supply 1	Fans in locations 3, 4, 8, 9, and 10
Power supplies 1 and 2	All 10 fans

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.
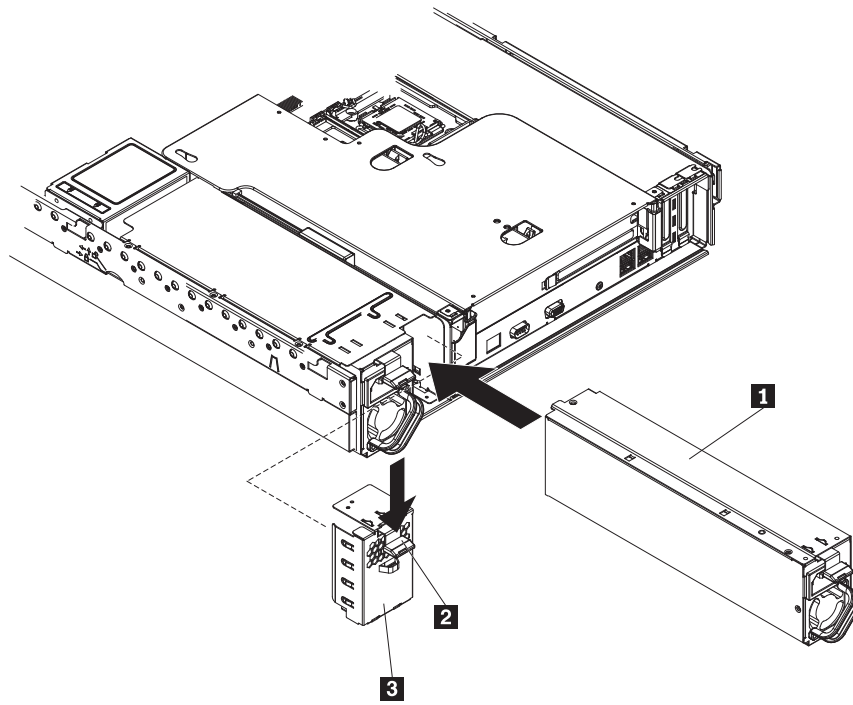
1	Hot-swap power supply 2	**3**	Power supply filler
2	Power supply filler release lever		

Attention: During normal operation, each power-supply bay must have either a power supply or power-supply blank installed for proper cooling.

To install a power supply, complete the following steps:

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

1. Slide the power supply into the bay until the retention latch clicks into place.
2. Remove the server cover and install the five cooling fans that come with the power supply (see "Installing a hot-swap fan" on page 92); then, install the cover.

    Important: When power supply 1 is installed, the five fans for power supply 1 occupy the rear row only (fans 3, 4, 8, 9, and 10); when both power supplies are installed, all 10 fans must be installed. See the fan numbers on the microprocessor air baffle.
3. Connect the power cord for the new power supply to the power-cord connector on the power supply.

    Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

    The following illustration shows the power-supply connectors on the back of the server.
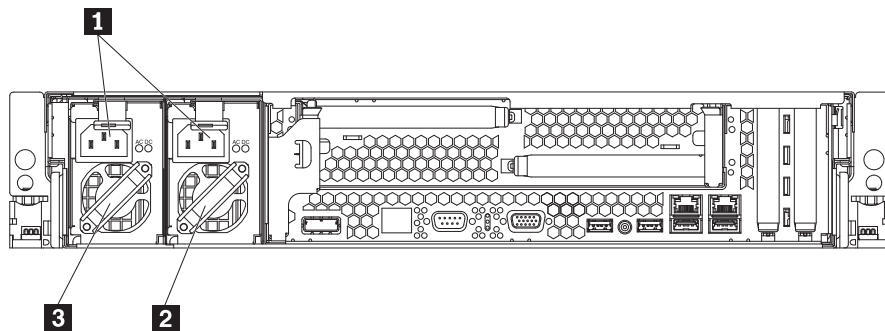
| **1** | Power cord connectors | **3** | Power supply 1 |
| **2** | Power supply 2 | | |

4. Route the power cord through the power-supply handle and through any cable clamps on the rear of the server, to prevent the power cord from being accidentally pulled out when you slide the server in and out of the rack.
5. Connect the power cord to a properly grounded electrical outlet.
6. Make sure that the dc power LED and ac power LED on the power supply are lit, indicating that the power supply is operating correctly.

Removing the battery

The following notes describe information that you must consider when replacing the battery:

- You must replace the battery with a lithium battery of the same type from the same manufacturer.
- To order replacement batteries in U.S. and Canada, call Lenovo Service and Support. Outside the U.S. and Canada, call your Lenovo marketing representative or authorized reseller.
- After you replace the battery, you must reconfigure the server and reset the system date and time.
- To avoid possible danger, read and follow the following safety statement.
- If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

Statement 2:

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

Do not
- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

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

To remove the battery, complete the following steps:
1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Follow any special handling and installation instructions that come with the battery.
3. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
4. Pull the server out of the rack.
5. Remove the cover (see "Removing the cover" on page 56).
6. Disconnect any internal cables, as necessary.
7. Remove any adapters as necessary.
8. Locate the battery **1** on the system board.
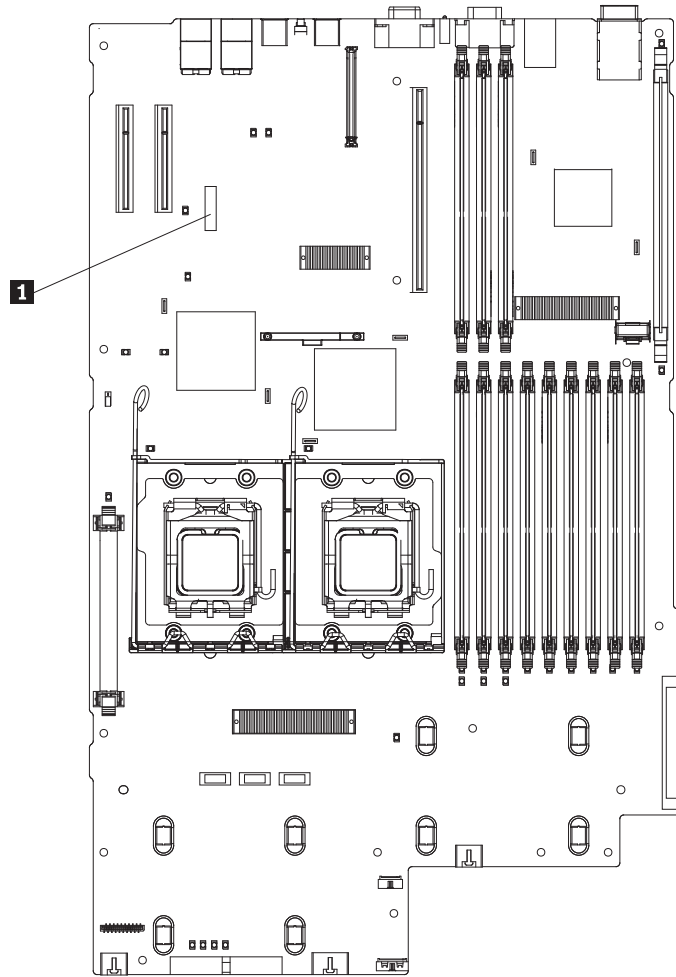
9. Remove the battery:

    a. Use one finger to push the battery horizontally out of its housing.

    b. Lift the battery from the socket.
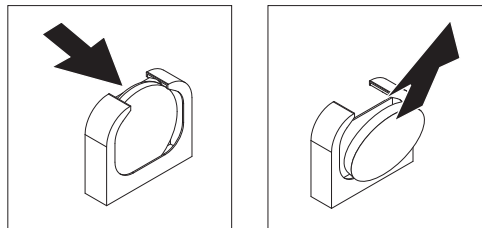
10. Dispose of the battery as required by local ordinances or regulations. See "Battery return program" on page 204 for more information.

Installing the battery

The following notes describe information that you must consider when replacing the battery in the server.

- After you replace the battery, you must reconfigure the server and reset the system date and time.
- To avoid possible danger, read and follow the following safety statement.

Statement 2:

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

Do not
- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

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

See "Battery return program" on page 204 for more information.

To install the replacement battery, complete the following steps:

1. Follow any special handling and installation instructions that come with the replacement battery.
2. Insert the new battery:
   a. Hold the battery in a vertical orientation so that the smaller side is facing the housing.
   b. Place the battery into its socket, and press the battery toward the housing until it snaps into place.
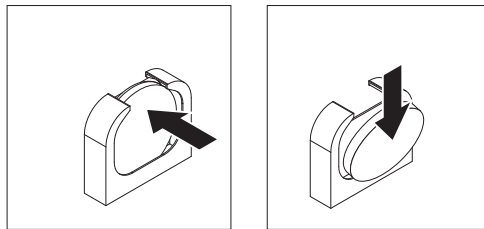
3. Reinstall any adapters that you removed.
4. Reconnect the internal cables that you disconnected.
5. Make sure that the riser-card assembly is fully seated in the connector on the system board.
6. Install the cover (see "Installing the cover" on page 57).
7. Slide the server into the rack.

8. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

   Note: You must wait approximately 20 seconds after you connect the power cord of the server to an electrical outlet before the power-control button becomes active.

9. Start the Configuration/Setup Utility program and reset the configuration.
   - Set the system date and time.
   - Set the power-on password.
   - Reconfigure the server.

   See "Using the Configuration/Setup Utility program" on page 20 for details.

Removing and replacing Optional-service CRUs

You may install an optional-service CRU yourself or request Lenovo to install it, at no additional charge, under the type of warranty service that is designated for your server.

The illustrations in this document might differ slightly from your hardware.

Removing the operator information panel assembly

To remove the operator information panel assembly, complete the following steps.
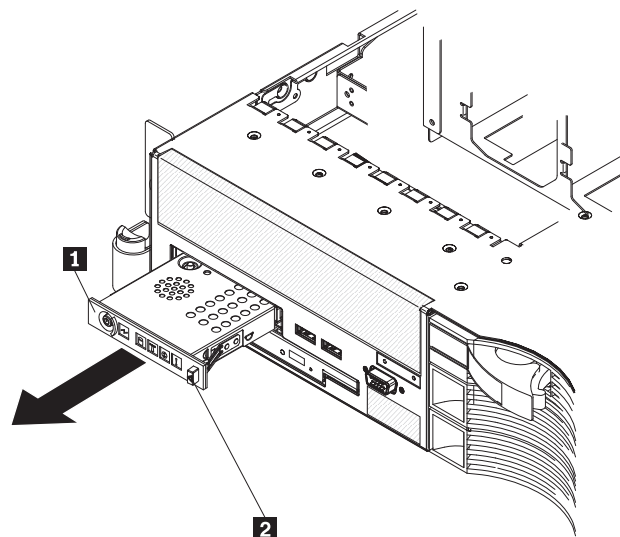
1	Operator information panel
2	Release latch

| 1 | Ribbon cable | 3 | Operator information panel |
| 2 | Release tabs | | |

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.
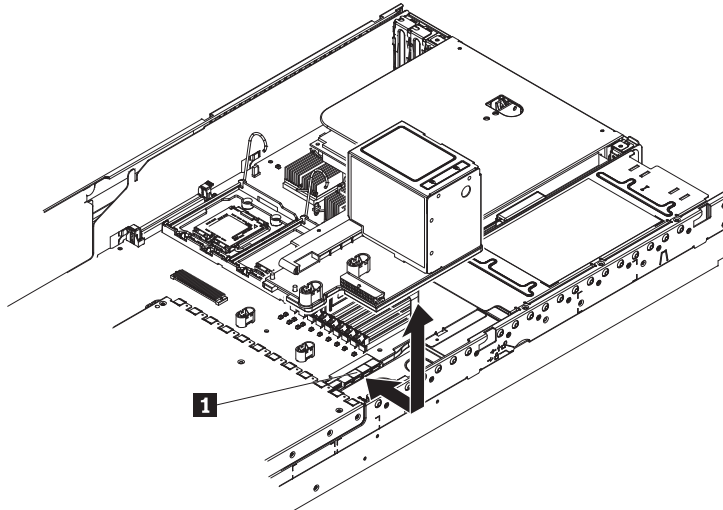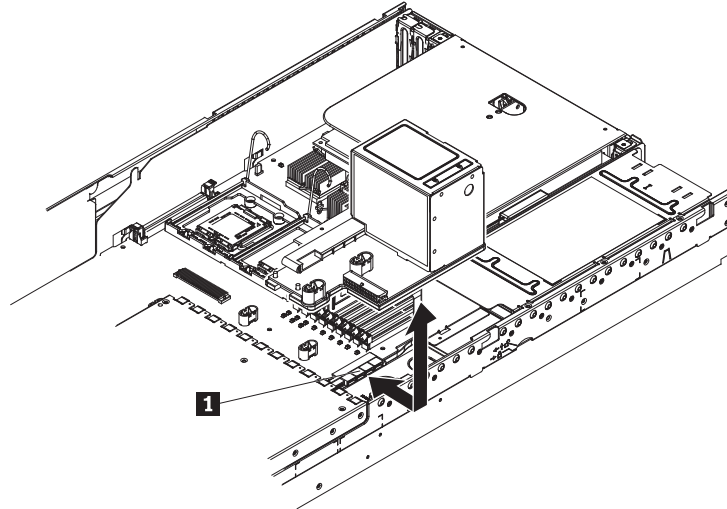
   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see "Removing the cover" on page 56).
4. Remove the fan bracket assembly (see "Removing the fan-bracket assembly" on page 60).
5. Disconnect the operator-information-panel ribbon cable from the system board.
6. Separate the hook-and-loop fastener that holds the ribbon cable to the panel housing.
7. Slide the operator-information-panel release latch to the left and pull the panel out of the server as far as it will go.
8. Reach inside the server and press the release tabs; then, pull the panel away from the rails and carefully pull the ribbon cable out of the server.
9. If you are instructed to return the operator information panel assembly, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the operator information panel assembly

To install the replacement operator information panel assembly, complete the following steps.

1	Ribbon cable	**3**	Operator information panel
2	Release tabs		

1	Operator information panel
2	Release latch

1. From the front of the server, thread the operator-information-panel ribbon cable through the panel housing in the server; then, connect the ribbon cable to the operator-panel connector (J50) on the system board (see "System-board internal cable connectors" on page 11 for the location of the connector).

2. Slide the panel into the server until it clicks into place.

3. Inside the server, secure the ribbon cable to the top of the panel enclosure, using the hook-and-loop fastener.

4. Install the cover (see "Installing the cover" on page 57).

5. Slide the server into the rack.

6. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
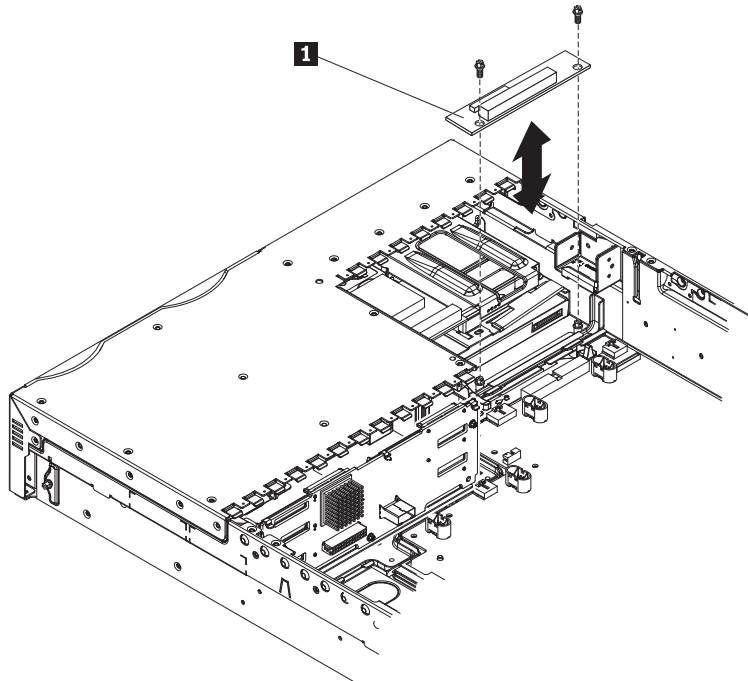
Removing the power backplane

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

To remove the power backplane, complete the following steps.

| 1 | Power backplane connector |

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.

    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see "Removing the cover" on page 56).
4. Remove the power supplies from the power-supply bays (see "Removing a hot-swap power supply" on page 93).

    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
5. Remove the cover (see "Removing the cover" on page 56).
6. Remove the fan-bracket assembly (see "Removing the fan-bracket assembly" on page 60).
7. Grasp the power backplane and slide it toward the right side of the server.
8. Disconnect the power cable from the hard disk drive backplane.
9. Lift the power backplane out of the server.

10. If you are instructed to return the backplane, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the power backplane

To install the power backplane, complete the following steps.

1   Power backplane connector

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

1. Align the edge-connector of the power backplane with the power-backplane edge-connector on the system board.
2. Slide the power backplane toward the left side of the server until the edge-connectors are fully connected.
3. Connect the power cable from the hard disk drive backplane to the power backplane.
4. Install the fan-bracket assembly (see "Installing the fan-bracket assembly" on page 61).
5. Install the cover (see "Installing the cover" on page 57).
6. Install the power supplies into the power-supply bays (see "Installing a hot-swap power supply" on page 95).

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply, and to install and remove a dc power supply. See the documentation that comes with each dc power supply.

7. Slide the server into the rack.
8. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Removing the CD/DVD media backplane

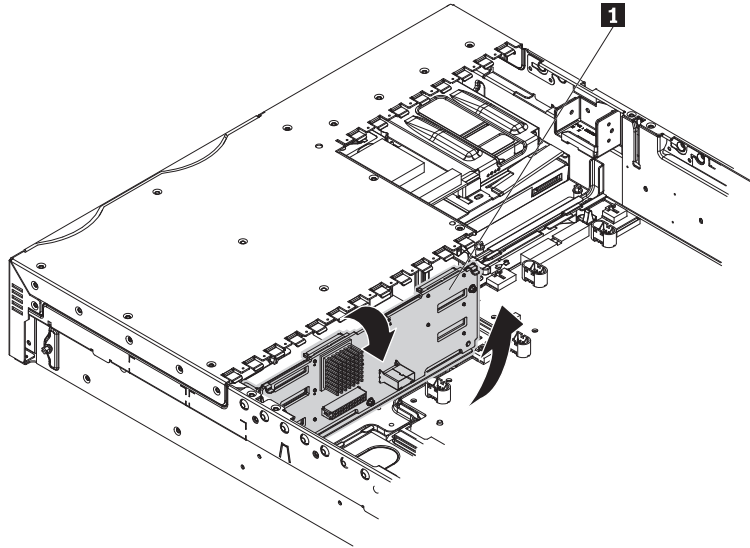To remove the CD/DVD media backplane ▮1▮, complete the following steps.

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server, and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see "Removing the cover" on page 56).
4. Remove the fan bracket assembly (see "Removing the fan-bracket assembly" on page 60).
5. Disconnect the operator-information-panel cable from the system board.
6. Release the CD-RW/DVD drive and pull it out of the bay slightly (see "Removing a CD-RW/DVD drive" on page 75).
7. Disconnect the CD/DVD power and signal cables from the connectors on the media backplane.
8. Remove the two screws that secure the media backplane to the chassis.
9. Lift the media backplane out of the server.
10. If you are instructed to return the media backplane, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the CD/DVD media backplane

To install the CD/DVD media backplane **1**, complete the following steps.
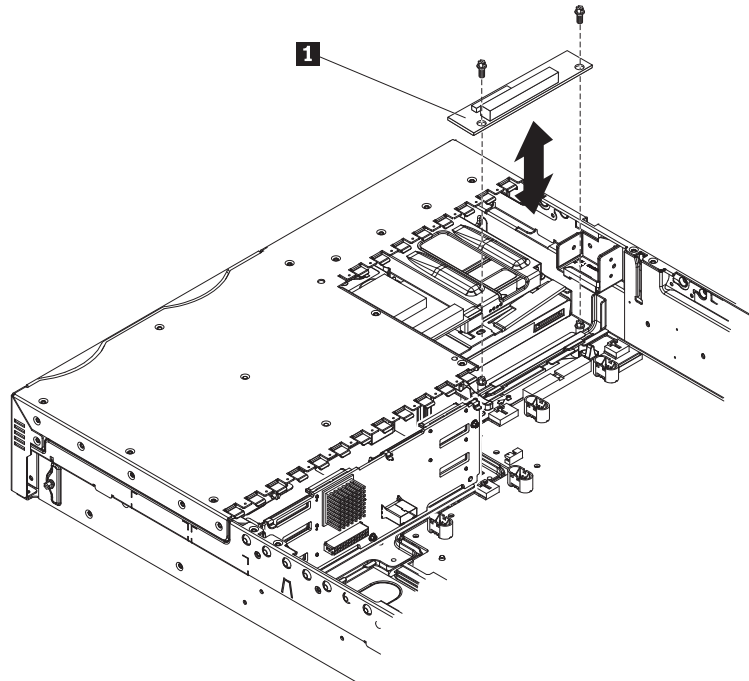
1. Align the CD/DVD media backplane at the rear of the CD/DVD bay.
2. Install the two screws that secure the media backplane to the chassis.
3. Reconnect the CD/DVD power and signal cables to the two connectors on the media backplane.
4. Reconnect the operator-information-panel cable to the connector on the system board (J50) (see "System-board internal cable connectors" on page 11 for the location of the connector).
5. Slide the CD-RW/DVD drive into the bay until it clicks (see "Installing a CD-RW/DVD drive" on page 76).
6. Replace the fan-bracket assembly (see "Installing the fan-bracket assembly" on page 61).
7. Install the cover (see "Installing the cover" on page 57).
8. Slide the server into the rack.
9. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Installing and removing the hard disk drive backplane

The procedure to use for installing or removing the Serial Attached SCSI (SAS) backplane depends on the server model.

- For a 3.5-inch hard disk drive model, see "Removing the 3.5-inch-drive hard disk drive backplane" on page 108 and "Installing the 3.5-inch-drive hard disk drive backplane" on page 109.

- For a 2.5-inch hard disk drive model, see "Removing the 2.5-inch-drive backplane" on page 110 and "Installing the 2.5-inch-drive backplane" on page 111.

Removing the 3.5-inch-drive hard disk drive backplane

To remove the 3.5-inch hard disk drive backplane **1**, complete the following steps.

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the server from the rack and place it on a flat, static-protective surface.
4. Pull the hard disk drives out of the server slightly to disengage them from the backplane.
5. Remove the cover (see "Removing the cover" on page 56).
6. Remove the fan-bracket assembly (see "Removing the fan-bracket assembly" on page 60).
7. Disconnect the backplane cables.
8. Press down on the blue release latches that are on each side of the hard disk drive enclosure. The hard disk drive backplane pops out.
9. Lift the backplane out of the server.
10. If you are instructed to return the backplane, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the 3.5-inch-drive hard disk drive backplane

To install the replacement 3.5-inch-drive backplane , complete the following steps.
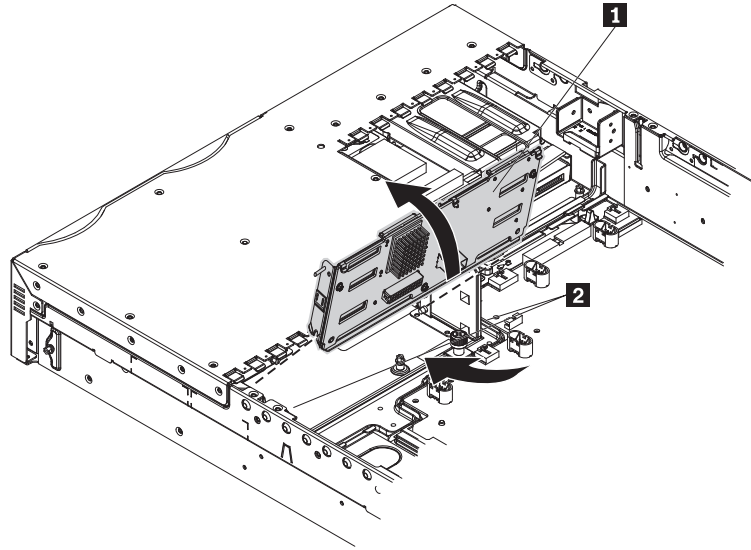
1. Orient the replacement hard disk drive backplane **1** so that the connectors for the hard disk drives face the front of the server.
2. Place the notches that are at the bottom of the backplane frame onto the mounting pins **2** that are on the lower outside of the hard disk drive enclosure.
3. Push the top of the hard disk drive backplane toward the front of the server until it clicks into place. Make sure that the release latches hold the backplane securely in place.
4. Connect the power and signal cables to the backplane.
5. Replace the fan bracket assembly (see "Installing the fan-bracket assembly" on page 61).
6. Install the cover (see "Installing the cover" on page 57).
7. Slide the server into the rack.
8. Insert the hard disk drives into the bays.
9. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Removing the 2.5-inch-drive backplane

To remove the 2.5-inch-drive hard disk drive backplane, complete the following steps.
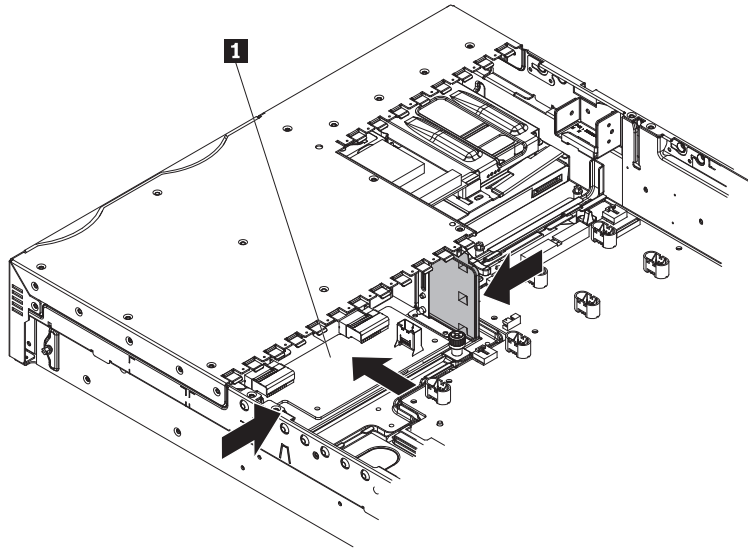
1   2.5-inch hard disk drive cage assembly

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the server from the rack and place it on a flat, static-protective surface.
4. Remove the cover (see "Removing the cover" on page 56).
5. Pull the hard disk drives out of the server slightly to disengage them from the backplane.
6. Remove the fan-bracket assembly (see "Removing the fan-bracket assembly" on page 60).
7. Disconnect the backplane cables.
8. Press the large blue release tabs at the rear of the drive cage toward each other; then, push the drive-cage assembly out through the front of the server.
9. If you are instructed to return the backplane, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the 2.5-inch-drive backplane

To install the replacement 2.5-inch-drive hard disk drive backplane, complete the following steps.
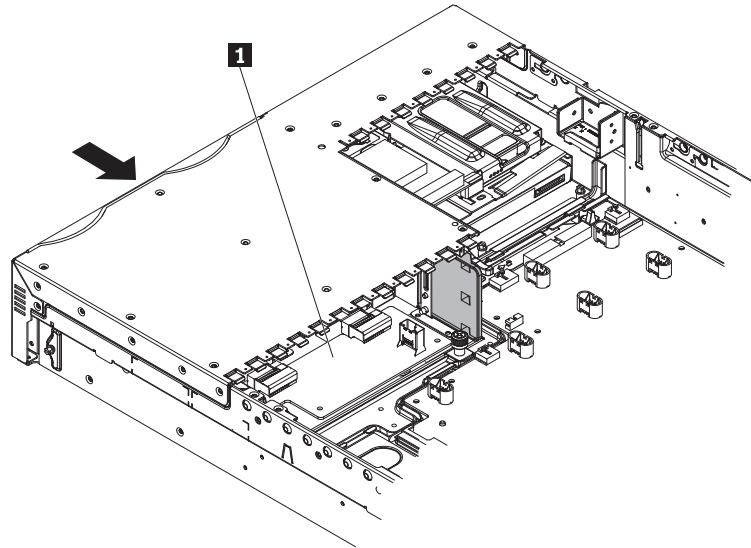
1. Align the replacement backplane cage assembly **1** with the opening in the front of the server.
2. Slide the drive-cage assembly into the front of the server until it clicks into place. Make sure that the release latches hold the backplane securely in place.
3. Connect the power and signal cables to the backplane.
4. Replace the fan bracket assembly (see "Installing the fan-bracket assembly" on page 61).
5. Install the cover (see "Installing the cover" on page 57).
6. Slide the server into the rack.
7. Insert the hard disk drives into the bays.
8. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Removing and replacing FRUs

FRUs must be installed only by trained service technicians.

The illustrations in this document might differ slightly from the hardware.

Removing a microprocessor

Attention:
- Do not allow the thermal grease on the microprocessor and heat sink to come in contact with anything. Contact with any surface can compromise the thermal grease and the microprocessor socket.
- Dropping the microprocessor during installation or removal can damage the contacts.
- Do not touch the microprocessor contacts; handle the microprocessor by the edges only. Contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

To remove a microprocessor, complete the following steps:
1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.
   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see "Removing the cover" on page 56).
4. Remove the microprocessor air baffle (see "Removing the microprocessor air baffle" on page 57).
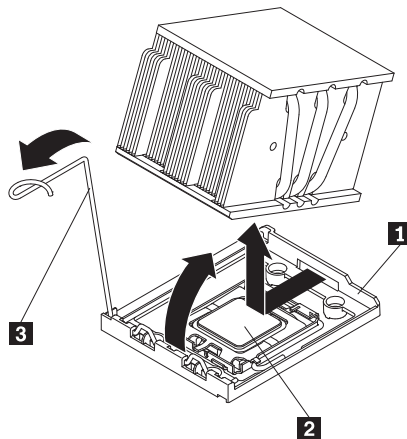
| 1 | Retainer bracket | 3 | Heat sink release lever |
| 2 | Microprocessor | | |

5. Open the heat-sink release lever to the fully open position.
6. Lift the heat sink out of the server.
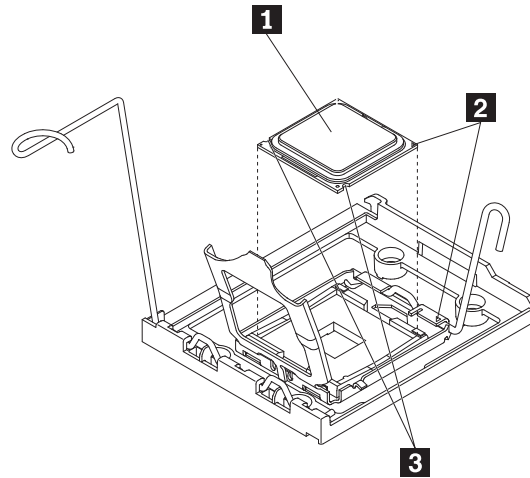
1	Microprocessor	**3**	Notches
2	Alignment marks		

7. Open the microprocessor release latch to the fully-open position.
8. Open the microprocessor bracket frame.
9. Carefully remove the microprocessor.
10. If you are instructed to return the microprocessor, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a microprocessor

For information about the type of microprocessor that the server supports and other information that you must consider when installing a microprocessor, see the *User Guide* on the *ThinkServer Documentation DVD*.

Important: Dual-core and quad-core microprocessors are not interchangeable and cannot be used in the same server. For example, if the server has a dual-core microprocessor, you cannot install a quad-core microprocessor as the second microprocessor. Use the Configuration/Setup Utility program to determine the type and speed of the microprocessor that is currently installed in the server.

Read the documentation that comes with the microprocessor to determine whether you must update the basic input/output system (BIOS) code. To download the most current level of BIOS code, use the EasyUpdate program or go to: http://www.lenovo.com/support/

Attention:

- A startup (boot) microprocessor must always be installed in microprocessor connector 1 on the system board.
- To ensure correct server operation, use microprocessors that have the same cache size and type, front-side bus frequency, and clock speed. Microprocessor internal and external clock frequencies must be identical.
- If you are installing a microprocessor that has been removed, make sure that it is paired with its original heat sink or a new replacement heat sink. Do not reuse a heat sink from another microprocessor; the thermal grease distribution might be different and might affect conductivity.

To install a new or replacement microprocessor, complete the following steps. The following illustration shows how to install microprocessor 2 on the system board. A VRM is required only if microprocessor 2 is installed.

Note: For simplicity, certain components are not shown in this illustration.

| 1 | Heat sink | 3 | Microprocessor |
| 2 | Heat sink filler | 4 | Microprocessor socket dust cover |
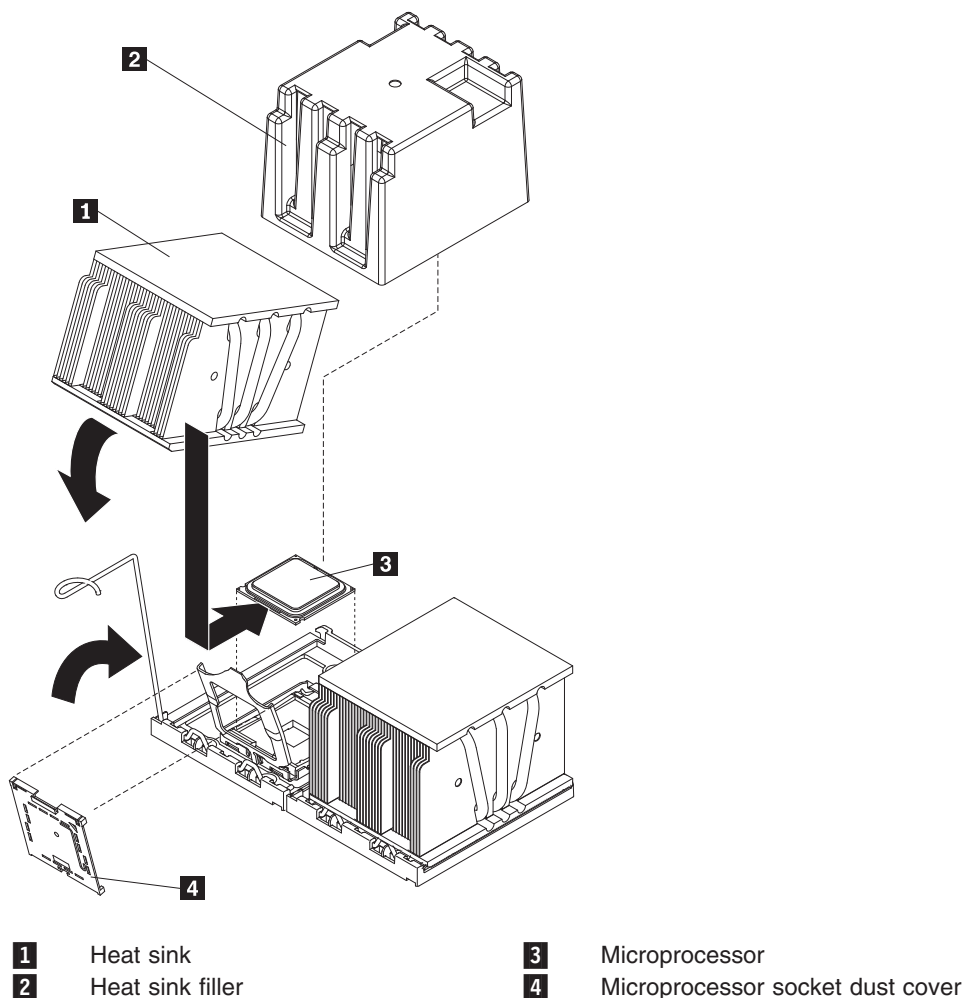
1. If you are installing microprocessor 2, and are replacing the VRM, install the new VRM in the VRM connector (J72).
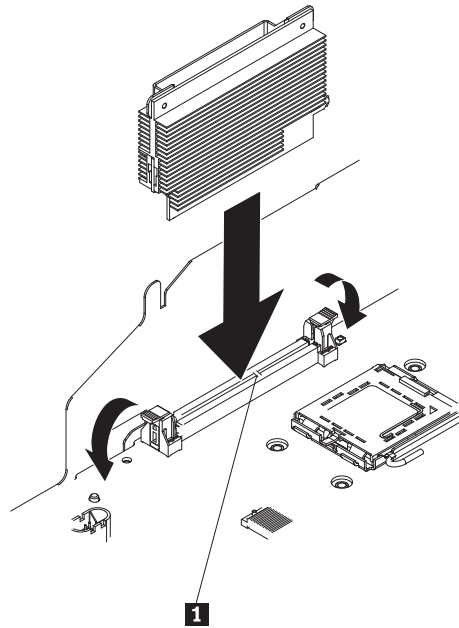
[1]   Alignment key

  a. Touch the static-protective package containing the VRM to any unpainted metal surface on the outside of the server. Then, remove the VRM from the package.

  b. Turn the VRM so that the keys align correctly with the VRM connector.

  c. Firmly press the VRM straight down into the connector by applying pressure on both ends of the VRM simultaneously.

  d. Make sure that the retaining clips are in the locked position when the VRM is firmly seated in the connector.

2. Touch the static-protective package containing the microprocessor to any unpainted metal surface on the server. Then, remove the microprocessor from the package.

3. Remove the protective dust cover, tape, or label from the surface of the microprocessor socket, if present.

4. Rotate the microprocessor release lever on the socket from its closed and locked position until it stops in the fully open position.

Attention:

- Handle the microprocessor carefully. Dropping the microprocessor during installation or removal can damage the contacts. Also, contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.
- Do not use excessive force when you press the microprocessor into the socket.
- Make sure that the microprocessor is oriented and aligned and positioned in the socket before you try to close the lever.
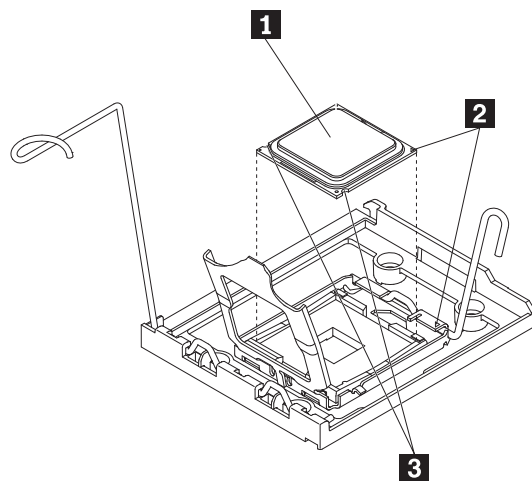
5. Align the microprocessor **1** with the socket (note the alignment marks **2** and the position of the notches **3**); then, carefully place the microprocessor on the socket. Close the microprocessor bracket frame.

   Note: The microprocessor fits only one way on the socket.

6. Carefully close the microprocessor release lever to secure the microprocessor in the socket.

7. Install a heat sink on the microprocessor.

   Attention: Do not touch the thermal grease **1** on the bottom of the heat sink **2** or set down the heat sink after you remove the plastic cover. Touching the thermal grease will contaminate it.
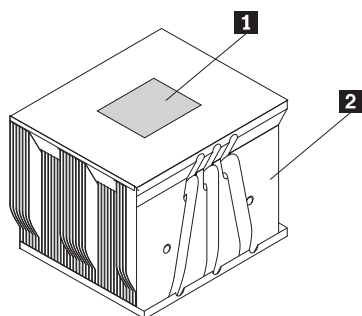
   a. Make sure that the heat-sink release lever is in the open position.
   b. Remove the plastic protective cover from the bottom of the heat sink.
   c. Align the heat sink above the microprocessor with the thermal grease side down.
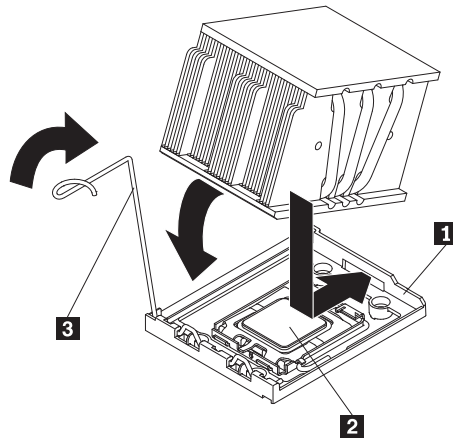
1	Retainer bracket	**3**		Heat sink release lever
2	Microprocessor			

    d. Slide the rear flange of the heat sink into the opening in the retainer bracket.

    e. Press down firmly on the front of the heat sink until it is seated securely.

    f. Rotate the heat-sink release lever to the closed position and hook it underneath the lock tab.

8. Replace the microprocessor air baffle (see "Installing the microprocessor air baffle" on page 58).

9. Install the cover (see "Installing the cover" on page 57).

10. Slide the server into the rack.

11. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Removing a heat-sink retention module

To remove a heat-sink retention module, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.

2. Turn off the server, and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Remove the cover (see "Removing the cover" on page 56).

   Attention: In the following step, keep each heat sink paired with its microprocessor for reinstallation.

4. Remove the microprocessor air baffle (see "Removing the microprocessor air baffle" on page 57); then, remove the heat sinks and microprocessors (see "Removing a microprocessor" on page 112).
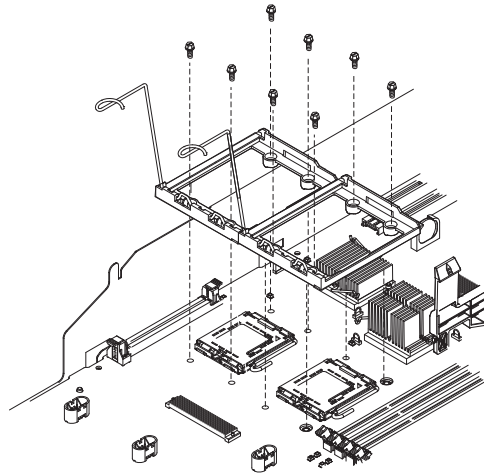
5. Remove the eight screws that secure the heat-sink retention module to the system board; then, lift the heat-sink retention module from the system board.

6. If you are instructed to return the heat-sink retention module, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a heat-sink retention module

To install a heat-sink retention module, complete the following steps:

1. Place the heat-sink retention module in the microprocessor location on the system board.
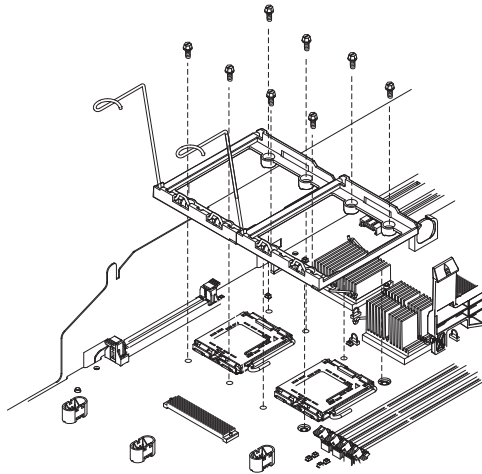
2. Install the eight screws that secure the module to the system board.

   Attention: Make sure that you install each heat sink with its paired microprocessor (see steps 3 and 4 on page 118).

3. Install the microprocessors, heat sinks, and microprocessor air baffle (see "Installing a microprocessor" on page 113).

4. Install the cover (see "Installing the cover" on page 57).

5. Slide the server into the rack.

6. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Removing the system board and shuttle

The system board is attached to a shuttle for easy replacement.

To remove the system board and shuttle, complete the following steps.
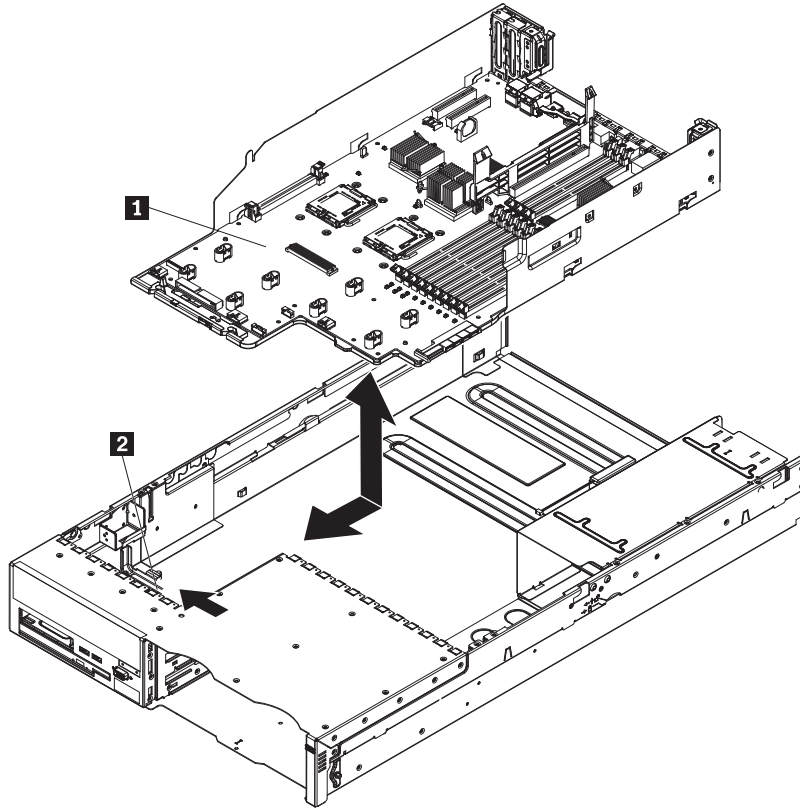
1	Shuttle assembly
2	Shuttle release latch

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server, and disconnect all power cords and external cables.

    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the server cover (see "Removing the cover" on page 56).

    Note: When you replace the system board, you must either update the server with the latest firmware or restore the pre-existing firmware that the customer provides on a diskette or CD image. Make sure that you have the latest firmware or a copy of the pre-existing firmware before you proceed.
4. Remove the air baffles (see "Removing the microprocessor air baffle" on page 57).
5. Remove the following components and place them on a static-protective surface for reinstallation:
    *   The riser-card assembly with adapters (see "Removing the riser-card assembly" on page 63)
    *   All other adapters (see "Removing an adapter" on page 64)
    *   The Remote Supervisor Adapter II SlimLine (see "Removing a Remote Supervisor Adapter II SlimLine" on page 67)

- The ServeRAID SAS controller (see "Removing the ServeRAID SAS controller" on page 69)

   Important: Note which DIMMs are in which connectors, before you remove the DIMMs. You must install them in the same configuration on the replacement system board.

6. Remove all DIMMs, and place them on a static-protective surface for reinstallation (see "Removing a memory module (DIMM)" on page 87).

7. Disconnect all cables from the system board.

8. Slide the power supplies out of the bays slightly or remove them entirely (see "Removing a hot-swap power supply" on page 93).
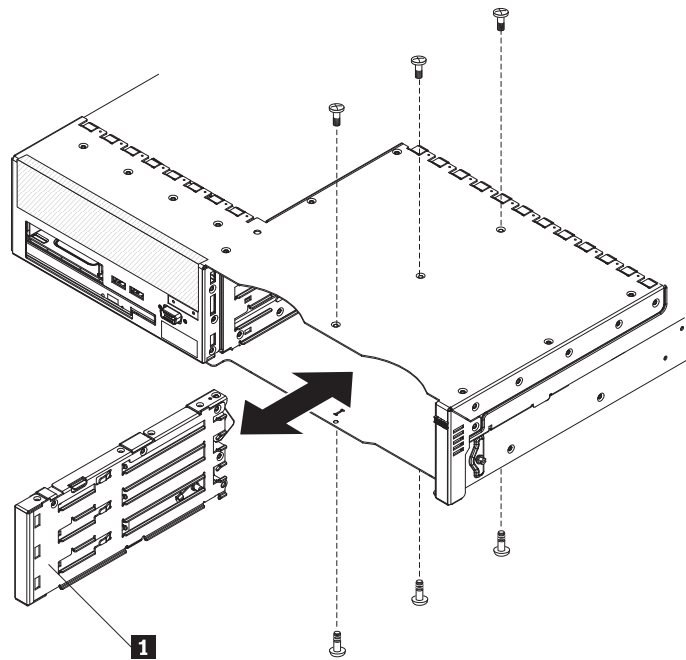
   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

9. Slide the power backplane toward the right side of the server (see "Removing the power backplane" on page 104).

   Attention: In the following step, do not allow the thermal grease to come in contact with anything, and keep each heat sink paired with its microprocessor for reinstallation. Contact with any surface can compromise the thermal grease and the microprocessor socket; a mismatch between the microprocessor and its original heat sink can require the installation of a new heat sink instead.

10. Remove the VRM and each microprocessor heat sink and microprocessor; then, place them on a static-protective surface for reinstallation (see "Removing a microprocessor" on page 112).

11. Slide the shuttle release latch toward the left side of the server, and push the shuttle toward the rear of the server approximately 12.7 mm (0.5 inch).

12. Lift the shuttle out of the server.

13. If you are instructed to return the system board and shuttle assembly, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the system board and shuttle

Notes:

1. When you reassemble the components in the server, be sure to route all cables carefully so that they are not exposed to excessive pressure.

2. When you replace the system board, you must either update the server with the latest firmware or restore the pre-existing firmware that the customer provides on a diskette or CD image.

To reinstall the system board and shuttle, complete the following steps.
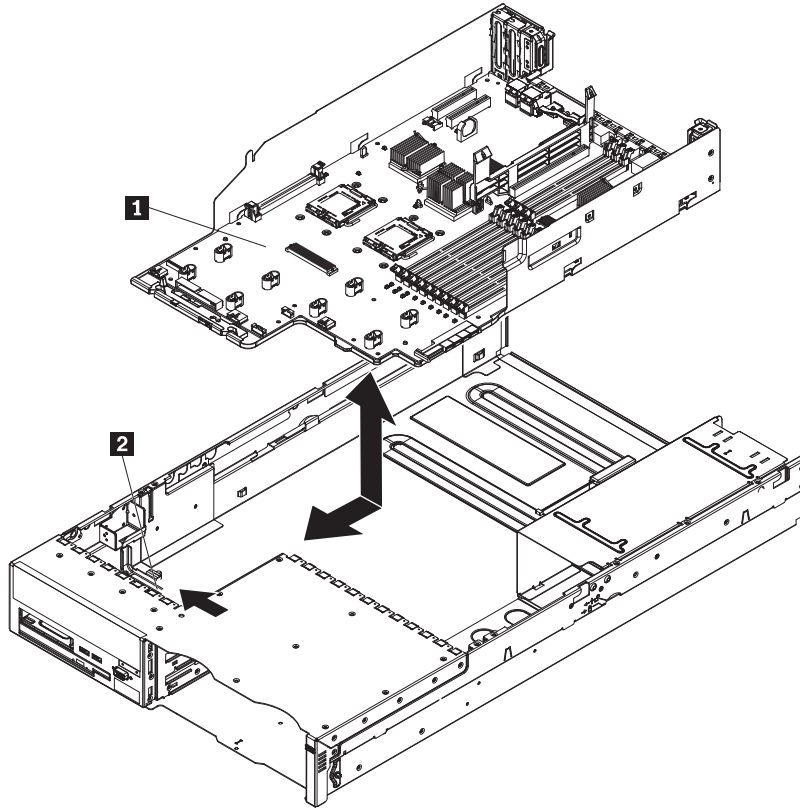
1	Shuttle assembly
2	Shuttle release latch

1. Align the openings in the sides of the shuttle with the protrusions in the sides of the server, and lower the shuttle into the server; then, slide the shuttle toward the front of the server until it clicks into place. Make sure that the shuttle locking latch holds the shuttle securely in place.

2. Slide the power backplane toward the system board until the connectors mate (see "Installing the power backplane" on page 105).

3. Install the power supplies (see "Installing a hot-swap power supply" on page 95).

    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

4. Reconnect to the system board the cables that you disconnected in step 7 of "Removing the system board and shuttle" on page 119.

5. Install the VRM and each microprocessor with its matching heat sink (see "Installing a microprocessor" on page 113).

6. Install the DIMMs (see "Installing a memory module" on page 88).

7. Install the air baffles.

8. Install the riser-card assembly and all adapters.

9. Install the fan-bracket assembly.

10. Install the cover (see "Installing the cover" on page 57).

11. Slide the server into the rack.

12. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Important: Either update the server with the latest SAS firmware or restore the pre-existing firmware from a diskette or CD image.

Removing the 3.5-inch center bracket

This procedure applies to 3.5-inch model servers only. If the center bracket between the two columns of 3.5-inch hard disk drives becomes damaged, you can replace it.

To remove the center bracket, complete the following steps.

1   3.5-inch cage divider

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Remove the server from the rack and place it on a flat, static-protective surface.
4. Remove the cover (see "Removing the cover" on page 56).
5. Remove the fan-bracket assembly (see "Removing the fan-bracket assembly" on page 60).
6. Remove the hard disk drive backplane (see "Removing the 3.5-inch-drive hard disk drive backplane" on page 108).

7. Remove the top and bottom screws that hold the center bracket in place.

8. Pull the center bracket out the front of the server.

9. If you are instructed to return the center bracket, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing the 3.5-inch center bracket

This procedure applies to 3.5-inch model servers only. If the center bracket between the two columns of 3.5-inch hard disk drives becomes damaged, you can replace it.

To install the center bracket, complete the following steps.
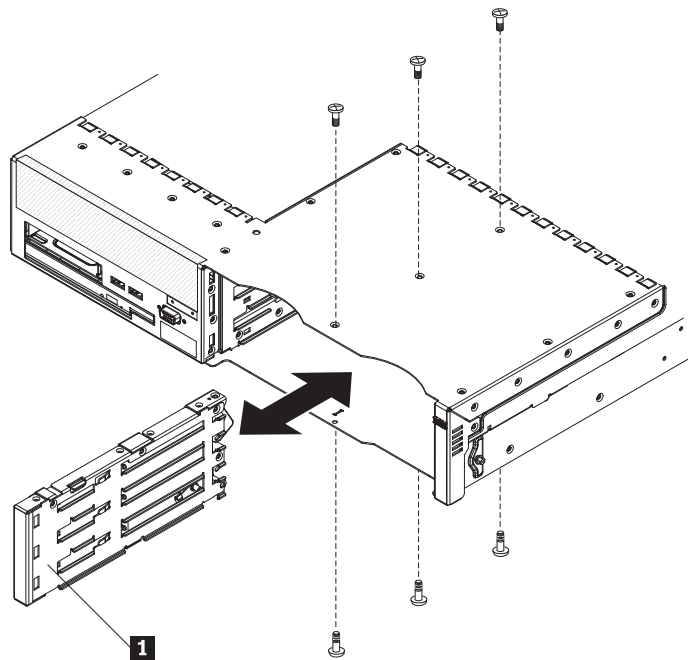
1   3.5-inch cage divider

1. Align the center bracket with the screw holes in the top and bottom of the drive bay area, and push the center bracket into the server.

2. Install the top and bottom screws that hold the center bracket in place.

3. Install the hard disk drive backplane (see "Installing the 3.5-inch-drive hard disk drive backplane" on page 109).

4. Install the fan-bracket assembly (see "Installing the fan-bracket assembly" on page 61).

5. Install the cover (see "Installing the cover" on page 57).

6. Slide the server into the rack.

7. Reconnect the external cables; then, reconnect the power cords and turn on the peripheral devices and the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Chapter 5. Diagnostics

This chapter describes the diagnostic tools that are available to help you solve problems that might occur in the server.

If you cannot locate and correct the problem using the information in this chapter, see Appendix A, "Getting help and technical assistance," on page 197 for more information.

Diagnostic tools

The following tools are available to help you diagnose and solve hardware-related problems:

- **POST beep codes, error messages, and error logs**

  The power-on self-test (POST) generates beep codes and messages to indicate successful test completion or the detection of a problem. See "POST" for more information.

- **Troubleshooting tables**

  These tables list problem symptoms and actions to correct the problems. See "Troubleshooting tables" on page 147.

- **Easy LED Diagnostics**

  Use the Easy LED Diagnostics to diagnose system errors quickly. See "Easy LED Diagnostics" on page 161 for more information.

- **Diagnostic programs, messages, and error codes**

  The diagnostic programs are the primary method of testing the major components of the server. The diagnostic programs are in read-only memory on the server. See "Diagnostic programs, messages, and error codes" on page 168 for more information.

POST

When you turn on the server, it performs a series of tests to check the operation of the server components and some optional devices in the server. This series of tests is called the power-on self-test, or POST.

If a power-on password is set, you must type the password and press Enter, when prompted, for POST to run.

If POST is completed without detecting any problems, a single beep sounds, and the server startup is completed.

If POST detects a problem, more than one beep might sound, or an error message is displayed. See "POST beep codes" and "POST error codes" on page 138 for more information.

POST beep codes

A beep code is a combination of short or long beeps or series of short beeps that are separated by pauses. For example, a "1-2-3" beep code is one short beep, a pause, two short beeps, a pause, and three short beeps. A beep code other than one beep indicates that POST has detected a problem. To determine the meaning of a beep code, see "Beep code descriptions" on page 126. If no beep code sounds, see "No-beep symptoms" on page 134.

Beep code descriptions

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

A single problem might cause more than one error message. When this occurs, correct the cause of the first error message. The other error messages usually will not occur the next time POST runs.

Exception: If there are multiple error codes or Easy LED Diagnostics that indicate a microprocessor error, the error might be in the microprocessor or in the microprocessor socket. See "Microprocessor problems" on page 152 for information about diagnosing microprocessor problems.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action
1-1-2	Microprocessor register test failed.	1. Reseat the following components, one at a time, in the order shown, restarting the server each time: • (Trained service technician only) Microprocessor 2 (if installed) • (Trained service technician only) Microprocessor 1 2. Replace the following components, one at a time, in the order shown, restarting the server each time: • (Trained service technician only) Microprocessor 2 (if installed) • (Trained service technician only) Microprocessor 1 • (Trained service technician only) System board
1-1-3	CMOS write/read test failed.	1. Reseat the battery. 2. Clear CMOS memory. See "System-board switches and jumpers" on page 13 for information about how to clear CMOS memory. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Battery b. (Trained service technician only) System board
1-1-4	BIOS EEPROM checksum failed.	1. Recover the BIOS code (see "Recovering the BIOS code" on page 181). 2. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action
1-2-1	Programmable interval timer failed.	(Trained service technician only) Replace the system board.
1-2-2	DMA initialization failed.	(Trained service technician only) Replace the system board.
1-2-3	DMA page register write/read failed.	(Trained service technician only) Replace the system board.

1-2-4	RAM refresh verification failed.	1. Reseat the DIMMs.
		2. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  a. DIMMs
		  b. (Trained service technician only) System board

1-3-1	1st 64K RAM test failed.	1. Reseat the DIMMs.
		2. Replace the lowest-numbered pair of DIMMs with an identical known good pair of DIMMs; then, restart the server. If the beep code error remains, go to 3b. Return one DIMM at a time from the failed pair to its connector, restarting the server after each DIMM, to identify the failed DIMM.
		3. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  a. DIMMs
		  b. (Trained service technician only) System board

2-1-1	Secondary DMA register failed.	(Trained service technician only) Replace the system board.
2-1-2	Primary DMA register failed.	(Trained service technician only) Replace the system board.
2-1-3	Primary interrupt mask register failed.	(Trained service technician only) Replace the system board.
2-1-4	Secondary interrupt mask register failed.	(Trained service technician only) Replace the system board.
2-2-1	Interrupt vector loading failed.	(Trained service technician only) Replace the system board.
2-2-2	Keyboard controller failed.	Replace the following components, one at a time, in the order shown, restarting the server each time: 1. Keyboard 2. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action

2-2-3	CMOS power failure and checksum checks failed.	1. Reseat the battery.
		2. Clear CMOS memory. See "System-board switches and jumpers" on page 13 for information about how to clear CMOS memory.
		3. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. (Trained service technician only) System board

2-2-4	CMOS configuration information validation failed.	1. Reseat the battery.
		2. Clear CMOS memory. See "System-board switches and jumpers" on page 13 for information about how to clear CMOS memory.
		3. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. (Trained service technician only) System board

2-3-1	Screen initialization failed.	(Trained service technician only) Replace the system board.
2-3-2	Screen memory failed.	(Trained service technician only) Replace the system board.
2-3-3	Screen retrace failed.	(Trained service technician only) Replace the system board.
2-3-4	Search for video ROM failed.	(Trained service technician only) Replace the system board.
2-4-1	Video failed; screen believed operable.	(Trained service technician only) Replace the system board.
3-1-1	Timer tick interrupt failed.	(Trained service technician only) Replace the system board.
3-1-2	Interval timer channel 2 failed.	(Trained service technician only) Replace the system board.

3-1-3	RAM test failed above address OFFFFH	1. Reseat the battery.
		2. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action

3-1-4	Time-of-day clock failed.	1. Reseat the battery.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. (Trained service technician only) System board

3-2-1	Serial port failed.	(Trained service technician only) Replace the system board.
3-2-2	Parallel port failed.	(Trained service technician only) Replace the system board.

3-2-3	Math coprocessor test failed.	1. (Trained service technician only) Reseat the microprocessors.
		2. (Trained service technician only) Remove microprocessor 2 and its VRM and restart the server.
		  • If no beep code occurs, microprocessor 2 might have failed; replace the microprocessor.
		  • If the beep code remains, remove microprocessor 1 and install microprocessor 2 in the connector for microprocessor 1; then, restart the server. If no beep code occurs, microprocessor 1 might have failed; replace the microprocessor.
		3. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  • (Trained service technician only) Microprocessors
		  • (Trained service technician only) System board

3-2-4	Failure comparing CMOS memory size against actual.	1. Reseat the following components, one at a time, in the order shown:
		  a. DIMMs
		  b. Battery
		2. Replace the components listed in step 1, one at a time, in the order shown.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action

3-3-1	Memory size mismatch occurred.	1. Reseat the following components, one at a time, in the order shown:
		  a. DIMMs
		  b. Battery
		2. Replace the components listed in step 1, one at a time, in the order shown.

3-3-2	Critical SMBUS error occurred.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
		1. Disconnect the server power cord from the outlet and wait 30 seconds; then, reconnect the power cord and restart the server.
		2. Reseat the following components, one at a time, in the order shown:
		  a. DIMMs
		  b. Hard disk drive backplane
		  c. Power supply
		    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply.
		3. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  a. DIMMs
		  b. Hard disk drive backplane
		  c. Power supply
		    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply.
		  d. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action

3-3-3	No operational memory in system.	1. Make sure that the server contains the correct number of DIMMs, in the correct order; install or reseat the DIMMS; then, restart the server three times.
		Important: You must restart the server three times to reset the configuration settings to the default configuration (the memory connector or bank of connectors enabled).
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. DIMMs
		  b. (Trained service technician only) System board

4-4-4	Optional system management adapter not installed in Remote Supervisor Adapter II SlimLine connector or not functioning correctly.	1. Make sure that the Remote Supervisor Adapter II SlimLine is installed in the Remote Supervisor Adapter II SlimLine connector.
		2. Reseat the Remote Supervisor Adapter II SlimLine.
		3. Replace the following components one at a time, in the order shown, restarting the server each time:
		  • Remote Supervisor Adapter II SlimLine
		  • (Trained service technician only) System board

Two short beeps	Information only, the configuration has changed	1. Run the diagnostics programs to verify that all components are working. 2. Run the Configuration/Setup Utility program, save the configuration, and restart the server.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action

Three short beeps	Possible memory problem.	1. Reseat the DIMMs.
		2. Locate the failing DIMMs:
		  a. Remove all DIMMs from the server.
		  b. Beginning with the primary bank of DIMMs, return one bank of DIMMs to the server at a time, restarting the server each time, until the beep code error returns.
		  c. Replace one pair of DIMMs at a time in the failing bank with an identical pair of known good DIMMs, restarting the server after each pair, until the beep code error returns.
		  d. Replace one DIMM at a time in the failing pair with an identical known good DIMM, restarting the server after each DIMM, to identify the failed DIMM. If the beep code error remains after you have replaced both DIMMs, go to step 3b.
		  e. Repeat steps 2b through 2d until you have checked all memory banks.
		3. Replace the following components, one at a time, in the order shown:
		  a. DIMMs
		  b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action

One continuous beep	Possible microprocessor problem.	1. Reseat the following components, one at a time, in the order shown, restarting the server each time:
		  • (Trained service technician only) Microprocessor 1
		  • (Trained service technician only) Microprocessor 2 (if installed)
		2. (Trained service technician only) Remove microprocessor 2 and its VRM and restart the server.
		  • If no beep code occurs, microprocessor 2 might have failed; replace the microprocessor.
		  • If the beep code remains, remove microprocessor 1 and install microprocessor 2 in the connector for microprocessor 1; then, restart the server. If no beep code occurs, microprocessor 1 might have failed; replace the microprocessor.
		3. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  • (Trained service technician only) Microprocessor 1
		  • (Trained service technician only) Microprocessor 2 (if installed)
		  • (Trained service technician only) System board

Repeating short beeps	Possible keyboard problem.	1. Reseat the keyboard cable.
		2. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  • Keyboard
		  • (Trained service technician only) System board

One long and one short beep	Possible video controller problem.	1. Reseat the optional video adapter (if installed).
		2. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  • Video adapter (if installed)
		  • (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Beep code	Description	Action

One long and two short beeps	Possible video controller problem.	1. Reseat the optional video adapter (if installed).
		
		2. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  • Video adapter (if installed)
		  • (Trained service technician only) System board

One long and three short beeps	Problem with the monitor or video controller.	1. Reseat the following components, one at a time, in the order shown, restarting the server each time:
		  a. Monitor cable
		  b. Optional video adapter (if installed).
		
		2. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  a. Monitor
		  b. Optional video adapter (if installed)
		  c. (Trained service technician only) System board

Two long and two short beeps	Problem with the optional video adapter.	1. Reseat the optional video adapter. 2. Replace the optional video adapter.

No-beep symptoms

The following table describes situations in which no beep code sounds when POST is completed.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

No-beep symptom	Description	Action

No beeps occur, and the server operates correctly.	Possible problem with the operator information panel.	1. Check the operator information panel cable for damage.
		2. Reseat the operator information panel cable.
		3. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  a. (Trained service technician only) Operator information panel
		  b. (Trained service technician only) System board

No beeps occur after successful completion of POST.	The power-on status is Disabled.	1. Run the Configuration/Setup Utility program and select **Start Options**; then, set **Power-On Status** to **Enable**. 2. Check the operator information panel cable for damage. 3. Reseat the operator information panel cable. 4. (Trained service technician only) Replace the system board
No beeps occur, and there is no video.	Unknown problem.	See "Solving undetermined problems" on page 194.
No beep occurs, and the power-supply ac LED is off	Possible power problem.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply. 1. Make sure that the power cord is connected to the power supply and to a power source. 2. Reseat the power supplies. 3. If two power supplies are installed, swap them to determine whether one is defective. 4. Disconnect the cable from the hard disk drive backplane power connector (J13) on the power backplane. If the ac power LED comes on, see "Solving undetermined problems" on page 194.
No beep occurs, the server does not start, and the power-supply ac LED is lit.	Possible power problem.	See "Power-supply LEDs" on page 167.

Error logs

The POST error log contains the three most recent error codes and messages that were generated during POST. The BMC system event log contains monitored events, such as a threshold that is reached or a device that fails. The system event/error log, which is available only when an optional Remote Supervisor Adapter II SlimLine is installed, contains messages that were generated during POST and all system status messages from the service processor.

The following illustration shows an example of a BMC system event log entry.

```
                 BMC System Event Log
-----------------------------------------------------------
Get Next Entry
Get Previous Entry
Clear BMC SEL



Entry Number=     00005 / 00011
Record ID=        0005
Record Type=      02
Timestamp=        2005/01/25  16:15:17
Entry Details:    Generator ID= 0020
                  Sensor Type= 04
                  Assertion Event
                  Fan
                  Threshold
                  Lower Non-critical - going high

                  Sensor Number= 40
                  Event Direction/Type= 01

                  Event Data= 52 00 1A
```

The BMC system event log is limited in size. When the log is full, new entries will not overwrite existing entries; therefore, you must periodically clear the BMC system event log through the Configuration/Setup Utility program (the menu choices are described in the *User Guide*). When you are troubleshooting an error, be sure to clear the BMC system event log so that you can find current errors more easily.

Entries that are written to the BMC system event log during the early phase of POST show an incorrect date and time as the default time stamp; however, the date and time are corrected as POST continues.

Each system event/error log entry appears on its own page. To move from one entry to the next, use the up-arrow and down-arrow keys.

If you view the BMC system event log through the Web interface of the optional Remote Supervisor Adapter II SlimLine, the messages can be translated.

You can view the contents of the POST error log, the BMC system event log, and the system event/error log from the Configuration/Setup Utility program. You can view the contents of the BMC system event log also from the diagnostic programs.

When you are troubleshooting PCI slots, note that the error logs report the PCI buses numerically. The numerical assignments vary depending on the configuration. You can check the assignments by running the Configuration/Setup Utility program (see the *User Guide* for more information).

Viewing error logs from the Configuration/Setup Utility program

For complete information about using the Configuration/Setup Utility program, see the *User Guide*.

To view the error logs, complete the following steps:

1. Turn on the server.
2. When the prompt `Press F1 for Configuration/Setup` appears, press F1. If you have set both a power-on password and an administrator password, you must type the administrator password to view the error logs.
3. Use one of the following procedures:
   - To view the POST error log, select **Event/Error Logs**, and then select **POST Error Log**.
   - To view the BMC system event log, select **Advanced Setup --> Baseboard Management Controller (BMC) Setting --> System Event Log**.
   - To view the combined system event/error log and POST error log, select **Event/Error logs**, and then select **System Event/Error Log**.

Viewing the BMC system event log from the diagnostic programs

The BMC system event log contains the same information, whether it is viewed from the Configuration/Setup Utility program or from the diagnostic programs.

For information about using the diagnostic programs, see "Running the diagnostic programs" on page 168.

To view the BMC system event log, complete the following steps:

1. If the server is running, turn off the server and all attached devices.
2. Turn on all attached devices; then, turn on the server.
3. When the prompt `F2 for Diagnostics` appears, press F2. If you have set both a power-on password and an administrator password, you must type the administrator password to run the diagnostic programs.
4. From the top of the screen, select **Hardware Info**.
5. From the list, select **BMC Log**.

Clearing the error logs

For complete information about using the Configuration/Setup Utility program, see the *User Guide*.

To clear the error logs, complete the following steps:

1. Turn on the server.
2. When the prompt `Press F1 for Configuration/Setup` appears, press F1. If you have set both a power-on password and an administrator password, you must type the administrator password to view the error logs.
3. Use one of the following procedures:
   - To clear the BMC system event log, select **Advanced Setup --> Baseboard Management Controller (BMC) Setting--> BMC System Event Log**. Select **Clear BMC SEL**.
   - To clear the system event/error log, if one is present, or the POST error log, select **Event/Error Logs**, and then select **Post Error Log** or **System Event/Error Log**. When any log entry is displayed, press Enter (**Clear *xxxx* log** is highlighted on each entry page, where *xxxx* is the name of the log that you are viewing).

Note: The POST error log is automatically cleared with each system restart.

POST error codes

The following table describes the POST error codes and suggested actions to correct the detected problems.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action

062	Three consecutive boot failures using the default configuration.	1. Run the Configuration/Setup Utility program, save the configuration, and restart the server.
		2. Update the system firmware to the latest level (see "Updating the firmware" on page 17).
		3. Reseat the following components, one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. (Trained service technician only) Microprocessor
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. (Trained service technician only) Microprocessor
		  c. (Trained service technician only) System board

101, 102	System and processor error.	(Trained service technician only) Replace the system board.
106	System and processor error.	(Trained service technician only) Replace the system board.

151	Real-time clock error.	1. Reseat the battery.
		2. Clear CMOS memory. See "System-board switches and jumpers" on page 13 for information about how to clear CMOS memory.
		3. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action

161	Real-time clock battery error.	1. Reseat the battery.
		2. Clear CMOS memory. See "System-board switches and jumpers" on page 13 for information about how to clear CMOS memory.
		3. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. (Trained service technician only) System board

162	Device configuration error.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings.
		2. Reseat the following components, one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. Failing device (if the device is a FRU, then it must be reseated by a trained service technician only)
		3. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. Failing device (if the device is a FRU, then it must be replaced by a trained service technician only)
		  c. (Trained service technician only) System board

163	Real-time clock error. (time of day not set)	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, make sure that the date and time are correct, and save the settings.
		2. Reseat the battery.
		3. Clear CMOS memory. See "System-board switches and jumpers" on page 13 for information about how to clear CMOS memory.
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
175	Service processor code on optional service processor adapter corrupted or not loaded.	1. Update the firmware on the optional Remote Supervisor Adapter II SlimLine (see "Updating the firmware" on page 17). 2. Replace the optional Remote Supervisor Adapter II SlimLine.

184	Power-on password damaged.	1. Restart the server and enter the administrator password; then, run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings.
		2. Reseat the battery.
		3. Clear CMOS memory. See "System-board switches and jumpers" on page 13 for information about how to clear CMOS memory.
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		   a. Battery
		   b. (Trained service technician only) System board

187	VPD serial number not set.	1. Run the Configuration/Setup Utility program, set the serial number, and save the configuration. 2. (Trained service technician only) Replace the system board.
189	An attempt was made to access the server with an incorrect password.	Restart the server and enter the administrator password; then, run the Configuration/Setup Utility program and change the power-on password.
289	A DIMM has been disabled by the user or by the system.	1. If the DIMM was disabled by the user, run the Configuration/Setup Utility program and enable the DIMM. 2. Make sure that the DIMM is installed correctly (see "Installing a memory module" on page 88). 3. Reseat the DIMM. 4. Replace the DIMM.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action

301	Keyboard or keyboard controller error.	1. Reseat the keyboard cable in the USB connector.
		2. Move the keyboard cable to a different USB connector.
		3. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Keyboard
		  b. (Only if the problem occurred with a front USB connector) Internal USB cable.
		  c. (Trained service technician only) System board

303	Keyboard controller error.	1. Reseat the keyboard cable in the USB connector.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Keyboard
		  b. (Trained service technician only) System board

1600	Service processor not functioning.	1. Reseat the optional Remote Supervisor Adapter II SlimLine. 2. Replace the optional Remote Supervisor Adapter II SlimLine.

178x	Fixed disk error.
	Note: x is the drive that has the error
		1. Run the hard disk drive diagnostics tests on drive x.
		2. Reseat the following components:
		  a. Hard disk drive
		  b. Cable from the system board to the backplane
		3. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Hard disk drive
		  b. Cable from the system board to the backplane
		  c. Hard disk drive backplane
		  d. (Trained service technician only) System board

1800	Unavailable PCI hardware interrupt.	1. Run the Configuration/Setup Utility program and adjust the adapter settings. 2. Remove each adapter one at a time, restarting the server each time, until the problem is isolated.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
1801	An adapter has requested memory resources that are not available **Note:** The server can allocate only 128 KB of optional-device load space (option ROM space); error code 1801 occurs if the load space required by an optional-device ROM when loading exceeds the available (remaining) load space. Changing the optional-device load order can cause an optional-device ROM that requires more load space to load sooner, when more load space is available; the other optional-device ROMs might still fit in the remaining load space. With some optional devices, some or all of the load space used is released after the ROM code loads and initializes the optional device.	1. If possible, rearrange the order of the adapters in the PCI slots, to change the load order of the optional-device ROM code. 2. Run the Configuration/Setup Utility program, select **Startup Options**, and change the boot sequence, to change the load order of the optional-device ROM code. 3. Run the Configuration/Setup Utility program and disable some other resources, if their functions are not being used, to make more space available. • Select **Startup Options** then **Planar Ethernet (PXE/DHCP)** to disable the onboard Ethernet controller ROM. • Select **Advanced Functions**, then **PCI Bus Control**, then **PCI ROM Control Execution** to disable the ROM of adapters in the PCI slots. • Select **Devices and I/O Ports** to disable any of the onboard devices. 4. If the problem remains, replace the following components one at a time, in the order shown, restarting the server each time: a. Each adapter b. (Trained service technician only) System board
1805	PCI option ROM checksum error.	1. Remove the failing adapter. 2. Reseat each adapter (all PCI slots). 3. Reseat the riser card. 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. Each adapter b. Riser card c. (Trained service technician only) System board
1810	PCI error.	1. Reseat all adapters. 2. Reseat the riser card. 3. Remove both adapters from the riser card. 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. Riser card b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action

1962	A hard disk drive does not contain a valid boot sector.	1. Make sure that a startable operating system is installed.
		2. Run the hard disk drive diagnostic tests.
		3. Reseat the following components:
		  a. Hard disk drive
		  b. Hard disk drive backplane cable
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Cable from hard disk drive backplane to system board
		  b. Hard disk drive
		  c. Hard disk drive backplane
		  d. (Trained service technician only) System board

8603	Pointing-device error.	1. Reseat the pointing device.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Pointing device
		  b. (Trained service technician only) System board

00012000	Processor machine check error.	1. (Trained service technician only) Reseat the microprocessor.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. (Trained service technician only) Microprocessor
		  b. (Trained service technician only) System board

00019701	Processor 1 failed BIST.	1. (Trained service technician only) Reseat the microprocessor.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. (Trained service technician only) Microprocessor
		  b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
01298001	No update data for processor 1.	1. Update the BIOS code again. 2. (Trained service technician only) Replace the microprocessor.
01298101	Bad update data for processor 1.	1. Update the BIOS code again. 2. (Trained service technician only) Replace the microprocessor.

I9990301	Hard disk drive boot sector error.	1. Reseat the following components:
		  a. Hard disk drive
		  b. Hard disk drive backplane cable
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Hard disk drive backplane cable
		  b. Hard disk drive
		  c. Hard disk drive backplane
		  d. (Trained service technician only) System board

I9990305	Operating system not found.	Run the Configuration/Setup Utility program to make sure that a bootable operating system is installed on one or more devices that are listed in the boot order.
I9990650	Power has been restored.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 1. Check the power cables. 2. Check for interruption of the power supply.

Checkout procedure

The checkout procedure is the sequence of tasks that you should follow to diagnose a problem in the server.

About the checkout procedure

Before performing the checkout procedure for diagnosing hardware problems, review the following information:

- Read the safety information that begins on page vii.
- The diagnostic programs provide the primary methods of testing the major components of the server, such as the system board, Ethernet controller, keyboard, mouse (pointing device), serial ports, and hard disk drives. You can also use them to test some external devices. If you are not sure whether a problem is caused by the hardware or by the software, you can use the diagnostic programs to confirm that the hardware is working correctly.
- When you run the diagnostic programs, a single problem might cause more than one error message. When this happens, correct the cause of the first error message. The other error messages usually will not occur the next time you run the diagnostic programs.

  Exception: If there are multiple error codes or LEDs that indicate a microprocessor error, the error might be in the microprocessor or in the microprocessor socket. See "Microprocessor problems" on page 152 for information about diagnosing microprocessor problems.
- Before running the diagnostic programs, you must determine whether the failing server is part of a shared hard disk drive cluster (two or more servers sharing external storage devices). If it is part of a cluster, you can run all diagnostic programs except the ones that test the storage unit (that is, a hard disk drive in the storage unit) or the storage adapter that is attached to the storage unit. The failing server might be part of a cluster if any of the following conditions is true:
    - You have identified the failing server as part of a cluster (two or more servers sharing external storage devices).
    - One or more external storage units are attached to the failing server and at least one of the attached storage units is also attached to another server or unidentifiable device.
    - One or more servers are located near the failing server.

  Important: If the server is part of a shared hard disk drive cluster, run one test at a time. Do not run any suite of tests, such as "quick" or "normal" tests, because this might enable the hard disk drive diagnostic tests.
- If the server is halted and a POST error code is displayed, see "Error logs" on page 136. If the server is halted and no error message is displayed, see "Troubleshooting tables" on page 147 and "Solving undetermined problems" on page 194.
- For information about power-supply problems, see "Solving power problems" on page 192.
- For intermittent problems, check the error log; see "Error logs" on page 136 and "Diagnostic programs, messages, and error codes" on page 168.

Performing the checkout procedure

To perform the checkout procedure, complete the following steps:

1. Complete the following steps:

   a. Check the power supply LEDs, see "Power-supply LEDs" on page 167.

   b. Turn off the server and all external devices.

   c. Check all internal and external devices for compatibility at http://www.lenovo.com/support/.

   d. Make sure the server is cabled correctly.

   e. Check all cables and power cords.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

   f. Set all display controls to the middle positions.

   g. Turn on all external devices.

   h. Turn on the server. If the server does not start, see "Troubleshooting tables" on page 147.

   i. Check the system-error LED on the operator information panel. If it is flashing, check the LEDs on the system board (see "System-board LEDs" on page 15).

   j. Check for the following results:

      • Successful completion of POST (see "POST" on page 125 for more information)

      • Successful completion of startup

2. Did more than one beep sound?

   Note: A single beep indicates successful completion of POST and is not an error.

   • **No:** (No beeps sounded) Find the failure symptom in "Troubleshooting tables" on page 147; if necessary, run the diagnostic programs (see "Running the diagnostic programs" on page 168).

      – If you receive an error, see "Diagnostic error codes" on page 170.

      – If the diagnostic programs were completed successfully and you still suspect a problem, see "Solving undetermined problems" on page 194.

   • **Yes:** Find the beep code in "POST beep codes" on page 125; if necessary, see "Solving undetermined problems" on page 194.

Troubleshooting tables

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

If you cannot find the problem in these tables, see "Running the diagnostic programs" on page 168 for information about testing the server.

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

1. Check the system-error LED on the operator information panel; if it is lit, check the LEDs on the system board (see "System-board LEDs" on page 15).
2. Remove the software or device that you just added.
3. Run the diagnostic tests to determine whether the server is running correctly.
4. Reinstall the new software or new device.

CD or DVD drive problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The CD-RW/DVD drive is not recognized.	1. Make sure that: - The IDE channel to which the CD-RW/DVD drive is attached (primary) is enabled in the Configuration/Setup Utility program. - All cables and jumpers are installed correctly. - The signal cable and connector are not damaged and the connector pins are not bent. - All damaged parts are repaired or replaced. - The correct device driver is installed for the CD-RW/DVD drive. 2. Run the CD-RW/DVD drive diagnostic programs. 3. Reseat the following components: a. CD-RW/DVD drive b. IDE/Ultrabay Enhanced (UBE) interposer card cable 4. Replace the components listed in step 3 one at a time, in the order shown, restarting the server each time.
The CD-RW/DVD drive is not working correctly.	1. Clean the CD or DVD. 2. Run the CD-RW/DVD drive diagnostic programs. 3. Check the connector and signal cable for bent pins or damage. 4. Replace any damaged parts. 5. Reseat the CD-RW/DVD drive. 6. Replace the CD-RW/DVD drive.

•	**Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
•	**See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
•	**If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The CD-RW/DVD drive tray is not working.	1. Make sure that the server is turned on. 2. Insert the end of a straightened paper clip into the manual tray-release opening. 3. Reseat the CD-RW/DVD drive. 4. Replace the CD-RW/DVD drive.

General problems

•	**Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
•	**See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
•	**If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
A cover lock is broken, an LED is not working, or a similar problem has occurred.	If the part is a CRU, replace it. If the part is a FRU, the part must be replaced by a trained service technician.

Hard disk drive problems

•	**Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
•	**See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
•	**If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
Not all drives are recognized by the hard disk drive diagnostic test (the Fixed Disk test).	Remove the drive that is indicated by the diagnostic tests; then, run the hard disk drive diagnostic test again. If the remaining drives are recognized, replace the drive that you removed with a new one.
The server stops responding during the hard disk drive diagnostic test.	Remove the hard disk drive that was being tested when the server stopped responding, and run the diagnostic test again. If the hard disk drive diagnostic test runs successfully, replace the drive that you removed with a new one.
A hard disk drive was not detected while the operating system was being started.	Reseat all hard disk drives and cables; then, run the hard disk drive diagnostic tests again.
A hard disk drive passes the diagnostic Fixed Disk Test, but the problem remains.	Run the diagnostic SCSI Attached Disk Test.

Intermittent problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

A problem occurs only occasionally and is difficult to diagnose.	1. Make sure that:
	  • All cables and cords are connected securely to the rear of the server and attached devices.
	  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
	  • When the server is turned on, air is flowing from the fan grille. If there is no airflow, the fans are not working. This can cause the server to overheat and shut down.
	2. Check the system event/error log or BMC system event log (see "Error logs" on page 136).
	3. See "Solving undetermined problems" on page 194.

The server resets (restarts) occasionally.	1. If the reset occurs during POST and the POST watchdog timer is enabled (click **Advanced Setup --> Baseboard Management Controller (BMC) Setting --> BMC Post Watchdog** in the Configuration/Setup Utility program to see the POST watchdog setting), make sure that sufficient time is allowed in the watchdog timeout value (**BMC POST Watchdog Timeout**). See the *User Guide* for information about the settings in the Configuration/Setup Utility program. If the server continues to reset during POST, see "POST" on page 125 and "Diagnostic programs, messages, and error codes" on page 168. 2. If the reset occurs after the operating system starts, disable any automatic server restart (ASR) utilities that may be installed. **Note:** ASR utilities operate as operating-system utilities and are related to the IPMI device driver. If the reset continues to occur after the operating system starts, the operating system might have a problem; see "Software problems" on page 160. 3. If neither condition applies, check the system event/error log or BMC system event log (see "Error logs" on page 136).

USB keyboard, mouse, or pointing-device problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

All or some keys on the keyboard do not work.	1. If you have installed a USB keyboard, run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup.
	2. See http://www.lenovo.com/accessories/ for keyboard compatibility.
	3. Make sure that:
	  • The keyboard cable is securely connected.
	  • The server and the monitor are turned on.
	4. Move the keyboard cable to a different USB connector.
	5. Replace the following components one at a time, in the order shown, restarting the server each time:
	  a. Keyboard
	  b. (Only if the problem occurred with a front USB connector) Internal USB cable
	  c. (Trained service technician only) System board

The USB mouse or USB pointing device does not work.	1. Make sure that:
	  • The mouse is compatible with the server. See http://www.lenovo.com/accessories/.
	  • The mouse or pointing-device USB cable is securely connected to the server, and the device drivers are installed correctly.
	  • The server and the monitor are turned on.
	2. If a USB hub is in use, disconnect the USB device from the hub and connect it directly to the server.
	3. Move the mouse or pointing device cable to another USB connector.
	4. Replace the following components one at a time, in the order shown, restarting the server each time:
	  a. Mouse or pointing device
	  b. (Only if the problem occurred with a front USB connector) Internal USB cable
	  c. (Trained service technician only) System board

Memory problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

The amount of system memory that is displayed is less than the amount of installed physical memory.	1. Make sure that:
	   • No error LEDs are lit on the operator information panel.
	   • Memory mirroring or memory sparing does not account for the discrepancy.
	   • The memory modules are seated correctly.
	   • You have installed the correct type of memory (see "Installing a memory module" on page 88).
	   • If you changed the memory, you updated the memory configuration in the Configuration/Setup Utility program.
	   • All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled.
	2. Check the POST error log for error message 289:
	   • If a DIMM was disabled by a system-management interrupt (SMI), replace the DIMM.
	   • If a DIMM was disabled by the user or by POST, run the Configuration/Setup Utility program and enable the DIMM.
	3. Run memory diagnostics (see "Running the diagnostic programs" on page 168).
	4. Make sure that there is no memory mismatch when the server is at the minimum memory configuration (two 512 MB DIMMs).
	5. Add one pair of DIMMs at a time, making sure that the DIMMs in each pair are matching. Install the DIMMs in the sequence that is described in "Installing a memory module" on page 88.
	6. Reseat the DIMMs.
	7. Replace the following components one at a time, in the order shown, restarting the server each time:
	   a. DIMMs
	   b. (Trained service technician only) System board

Multiple rows of DIMMs in a branch are identified as failing.	1. Reseat the DIMMs; then, restart the server. 2. Remove the lowest-numbered DIMM pair of those that are identified and replace it with an identical pair of known good DIMMs; then, restart the server. Repeat as necessary. If the failures continue after all identified pairs are replaced, go to step 4. 3. Return the removed DIMMs, one pair at a time, to their original connectors, restarting the server after each pair, until a pair fails. Replace each DIMM in the failed pair with an identical known good DIMM, restarting the server after each DIMM. Replace the failed DIMM. Repeat step 3 until you have tested all removed DIMMs. 4. (Trained service technician only) Replace the system board.

Microprocessor problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

The server emits a continuous beep during POST, indicating that the microprocessor is not working correctly.	1. Correct any errors that are indicated by the LEDs (see "Easy LED Diagnostics" on page 164).
	
	2. Make sure that the server supports all the microprocessors and that the microprocessors match in speed and cache size.
	
	3. Reseat the following components:
	   a. (Trained service technician only) Microprocessors
	   b. VRM, if microprocessor 2 is installed
	
	4. (Trained service technician only) Remove microprocessor 2 and restart the server.
	   • If no beep code occurs, microprocessor 2 might have failed; replace the microprocessor.
	   • If the beep code remains, remove microprocessor 1 and install microprocessor 2 in the connector for microprocessor 1; then, restart the server. If no beep code occurs, microprocessor 1 might have failed; replace the microprocessor.
	
	5. (Trained service technician only) Replace the following components, in the order shown, restarting the server each time:
	   • Microprocessors and VRM
	   • System board

Monitor problems

Some Lenovo monitors have their own self-tests. If you suspect a problem with your monitor, see the documentation that comes with the monitor for instructions for testing and adjusting the monitor. If you cannot diagnose the problem, call for service.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
Testing the monitor.	1. Make sure that the monitor cables are firmly connected. 2. Try using the other video port. 3. Try using a different monitor on the server, or try testing the monitor on a different server. 4. Run the diagnostic programs (see "Running the diagnostic programs" on page 168). If the monitor passes the diagnostic programs, the problem might be a video device driver. 5. Reseat the Remote Supervisor Adapter II SlimLine (if one is present). 6. Replace the following components one at a time, in the order shown, restarting the server each time: a. Remote Supervisor Adapter II SlimLine (if one is present) b. (Trained service technician only) System board
The screen is blank.	1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server. 2. Make sure that: • The server is turned on. If there is no power to the server, see "Power problems" on page 155. • The monitor cables are connected correctly. • The monitor is turned on and the brightness and contrast controls are adjusted correctly. • No beep codes sound when the server is turned on. **Important:** In some memory configurations, the 3-3-3 beep code might sound during POST, followed by a blank monitor screen. If this occurs and the **Boot Fail Count** option in the **Start Options** of the Configuration/Setup Utility program is enabled, you must restart the server three times to reset the configuration settings to the default configuration (the memory connector or bank of connectors enabled). 3. Make sure that the correct server is controlling the monitor, if applicable. 4. Make sure that damaged BIOS code is not affecting the video; see "Recovering the BIOS code" on page 181 for information about recovering from a BIOS failure. 5. See "Solving undetermined problems" on page 194 for information about solving undetermined problems.
The monitor works when you turn on the server, but the screen goes blank when you start some application programs.	1. Make sure that: • The application program is not setting a display mode that is higher than the capability of the monitor. • You installed the necessary device drivers for the application. 2. Run video diagnostics (see "Running the diagnostic programs" on page 168). • If the server passes the video diagnostics, the video is good; see "Solving undetermined problems" on page 194 for information about solving undetermined problems.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.	1. If the monitor self-tests show that the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. **Attention:** Moving a color monitor while it is turned on might cause screen discoloration. Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor. **Notes:** a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.). b. Non-Lenovo monitor cables might cause unpredictable problems. 2. Reseat the following components: a. Monitor cable b. Remote Supervisor Adapter II SlimLine (if one is present) 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Monitor cable b. Monitor c. Remote Supervisor Adapter II SlimLine (if one is present) d. (Trained service technician only) System board
Wrong characters appear on the screen.	1. If the wrong language is displayed, update the BIOS code with the correct language. 2. Reseat the monitor cable. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Monitor b. (Trained service technician only) System board

Optional-device problems

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

A Lenovo optional device that was just installed does not work.	1. Make sure that:
	  • The device is designed for the server (see http://www.lenovo.com/accessories/).
	  • You followed the installation instructions that came with the device and the device is installed correctly.
	  • You have not loosened any other installed devices or cables.
	
	  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
	  • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or any other device is changed, you must update the configuration.
	
	2. Reseat the device that you just installed.
	
	3. Replace the device that you just installed.

A Lenovo optional device that used to work does not work now.	1. Make sure that all of the hardware and cable connections for the device are secure. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 2. If the device comes with test instructions, use those instructions to test the device. 3. Reseat the failing device. 4. Follow the instructions for device maintenance, such as keeping the heads clean, and troubleshooting in the documentation that comes with the device. 5. Replace the failing device.

Power problems

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

The power-control button does not work, and the reset button does not work (the server does not start). **Note:** The power-control button will not function until 20 seconds after the server has been connected to power.	1. Make sure that:
	  • The power cords are correctly connected to the server and to a working electrical outlet.
	    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
	  • The type of memory that is installed is correct.
	  • The LEDs on the power supply do not indicate a problem (see "Power-supply LEDs" on page 167).
	  • The microprocessors are installed in the correct sequence.
	
	2. Make sure that the power-control button and the reset button are working correctly:
	  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
	  a. Disconnect the server power cords.
	  b. Reseat the operator information panel assembly cable.
	  c. Reconnect the power cords.
	  d. Press the power-control button to restart the server. If the button does not work, replace the operator information panel assembly.
	  e. Press the reset button (on the Easy LED Diagnostics panel) to restart the server. If the button does not work, replace the operator information panel assembly.
	
	3. If you just installed an optional device, remove it, and restart the server. If the server now starts, you might have installed more devices than the power supply supports.
	
	4. Reseat the power backplane and restart the server.
	
	5. Replace the power backplane and restart the server.
	
	6. Replace the following components one at a time, in the order shown, restarting the server each time:
	  a. Hot-swap power supplies
	    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove the dc power supply. See the documentation that comes with each dc power supply.
	  b. (Trained service technician only) System board
	
	7. See "Solving power problems" on page 192.
	
	8. See "Solving undetermined problems" on page 194.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action

The OVER SPEC LED on the Easy LED Diagnostics panel is lit, and the power channel A LED on the system board is lit.	1. Remove the following components:
	  • (Trained service technician only) Microprocessor 1
	  • Fans 4, 6, 8, and 9
	2. Restart the server. If the OVER SPEC and power channel LEDs are still lit, see the actions for +12 v critical overvoltage fault in "System event/error log messages" on page 184.
	3. Reinstall the components listed in step 1, one at a time, in the order shown, restarting the server each time. If the power channel A LED is lit, the component that you just reinstalled is defective. Replace the defective component.

The OVER SPEC LED on the Easy LED Diagnostics panel is lit, and the power channel B LED on the system board is lit.	1. Remove the following components:
	  • IDE CD/DVD cable
	  • Fans 1, 2, 3 and 5
	  • (Trained service technician only) Microprocessor 2 and the VRM, together
	2. Restart the server. If the OVER SPEC and power channel LEDs are still lit, see the actions for +12 v critical overvoltage fault in "System event/error log messages" on page 184.
	3. Test the IDE CD/DVD cable and drive:
	  a. Reinstall the IDE CD/DVD cable; then, restart the server.
	  b. If the OVER SPEC and power channel LEDs are still off, replace the CD-RW/DVD drive.
	4. Reinstall the remaining components listed in step 1, one at a time, in the order shown, restarting the server each time. If the power channel B LED is lit, the component that you just reinstalled is defective. Replace the defective component.

The OVER SPEC LED on the Easy LED Diagnostics panel is lit, and the power channel C LED on the system board is lit.	1. Remove the following components:
	  • Tape-drive power cable
	  • DIMMs
	  • ServeRAID SAS controller
	2. Restart the server. If the OVER SPEC and power channel LEDs are still lit, see the actions for +12 v critical overvoltage fault in "System event/error log messages" on page 184.
	3. Test the tape drive and cable:
	  a. Reinstall the tape-drive power cable; then, restart the server.
	  b. If the OVER SPEC and power channel LEDs are still off, replace the tape drive.
	4. Restart the server. If the OVER SPEC and power channel LEDs are off, reinstall the DIMMs, one pair at a time, restarting the server each time. If the power channel C LED is lit, the pair of DIMMs that you just reinstalled is defective. Replace the defective DIMMs.
	5. Reinstall the ServeRAID SAS controller and restart the server. If the OVER SPEC and power channel LEDs are off, replace the ServeRAID SAS controller.

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**	
• **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**	
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	

Symptom	Action
The OVER SPEC LED on the Easy LED Diagnostics panel is lit, and the power channel D LED on the system board is lit.	1. Remove all PCI adapters (the low-profile PCI Express adapters in PCI slots 3 and 4, and the adapters on the PCI riser card in PCI slots 1 and 2). 2. Restart the server. If the OVER SPEC and power channel LEDs are still lit, see the actions for +12 v critical overvoltage fault in "System event/error log messages" on page 184. 3. Reinstall the adapters, one at a time, restarting the server each time. If the power channel D LED is lit, the adapter that you just reinstalled is defective. Replace the defective adapter.
The server does not turn off.	1. Turn off the server by pressing the power-control button for 5 seconds. 2. Restart the server. 3. If the server fails POST and the power-control button does not work, disconnect the power cord for 20 seconds; then, reconnect the power cord and restart the server. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 4. If the problem remains, suspect the system board.
The server unexpectedly shuts down, and the LEDs on the operator information panel are not lit.	See "Solving undetermined problems" on page 194.

Serial port problems

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**	
• **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**	
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	

Symptom	Action
The number of serial ports that are identified by the operating system is less than the number of installed serial ports.	1. Make sure that: • Each port is assigned a unique address in the Configuration/Setup Utility program and none of the serial ports is disabled. • The serial-port adapter (if one is present) is seated correctly. 2. Reseat the serial port adapter, if one is present. 3. Replace the serial port adapter, if one is present.

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**	
• **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**	
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	

Symptom	Action

A serial device does not work.	1. Make sure that:
	 • The device is compatible with the server.
	 • The serial port is enabled and is assigned a unique address.
	 • The device is connected to the correct connector (see "Rear view" on page 7).
	 2. Reseat the following components:
	  a. Failing serial device
	  b. Serial cable
	  c. Remote Supervisor Adapter II SlimLine (if one is present)
	 3. Replace the following components one at a time, in the order shown, restarting the server each time:
	  a. Failing serial device
	  b. Serial cable
	  c. Remote Supervisor Adapter II (if one is present)
	  d. (Trained service technician only) System board

EasyStartup problems

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**	
• **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**	
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	

Symptom	Action
The *ThinkServer EasyStartup DVD* will not start.	1. Make sure that the server supports the EasyStartup program and has a startable (bootable) CD or DVD drive. 2. If the startup (boot) sequence settings have been changed, make sure that the CD or DVD drive is first in the startup sequence. 3. If more than one CD or DVD drive is installed, make sure that only one drive is set as the primary drive. Start the CD from the primary drive.
The ServeRAID Manager program cannot view all installed drives, or the operating system cannot be installed.	1. Make sure that there are no duplicate IRQ assignments. 2. Make sure that the hard disk drive is connected correctly.
The operating-system installation program continuously loops.	Make more space available on the hard disk.
The EasyStartup program will not start the operating-system CD.	Make sure that the operating-system media is supported by the EasyStartup program.

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**	
• **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**	
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	

Symptom	Action
The operating system cannot be installed; the option is not available.	Make sure that the server supports the operating system. If it does, either no logical drive is defined (RAID servers), or the EasyStartup program is not installed. Run theEasyStartup program and make sure that setup is complete.

Software problems

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**	
• **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**	
• **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**	

Symptom	Action
You suspect a software problem.	1. To determine whether the problem is caused by the software, make sure that: • The server has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software. If you have just installed an adapter or memory, the server might have a memory-address conflict. • The software is designed to operate on the server. • Other software works on the server. • The software works on another server. 2. If you received any error messages when using the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem. 3. Contact your place of purchase of the software.

Universal Serial Bus (USB) port problems

•	**Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
•	**See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
•	**If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Symptom	Action
A USB device does not work.	1. Make sure that: • The correct USB device driver is installed. • The operating system supports USB devices. 2. Make sure that the USB configuration options are set correctly in the Configuration/Setup Utility program menu (see the *User's Guide* for more information). 3. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the server. 4. Move the device cable to a different USB connector.

Video problems

See "Monitor problems" on page 152.

Easy LED Diagnostics

Easy LED Diagnostics is a system of LEDs on various external and internal components of the server. When an error occurs, LEDs are lit throughout the server. By viewing the LEDs in a particular order, you can often identify the source of the error.

When LEDs are lit to indicate an error, they remain lit when the server is turned off, provided that the server is still connected to power and the power supply is operating correctly.

Before working inside the server to view Easy LED Diagnostics, read the safety information that begins on page vii and "Handling static-sensitive devices" on page 55.

If an error occurs, view the Easy LED Diagnostics in the following order:

1. Look at the operator information panel on the front of the server.

    • If the information LED is lit, it indicates that information about a suboptimal condition in the server is available in the BMC system event log or in the system event/error log.

    • If the system-error LED is lit, it indicates that an error has occurred; go to step 2 on page 162.

    The following illustration shows the operator information panel.
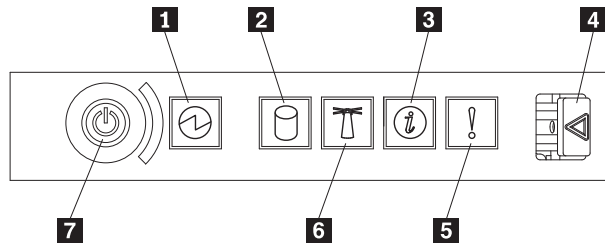
1	Power-on LED	5	System-error LED
2	Hard disk drive activity LED	6	System-locator LED
3	Information LED	7	Power-control button
4	Release latch		

2. To view the Easy LED Diagnostics panel, slide the latch to the left on the front of the operator information panel and pull the panel forward. This reveals the Easy LED Diagnostics panel. Lit LEDs on this panel indicate the type of error that has occurred.

The following illustration shows the Easy LED Diagnostics panel.

Light Path Diagnostics

REMIND (R)

OVER SPEC   PS1   PS2
CPU   VRM   CNFG
MEM   NMI   S ERR
SP   DASD   RAID
FAN   TEMP   BRD
PCI
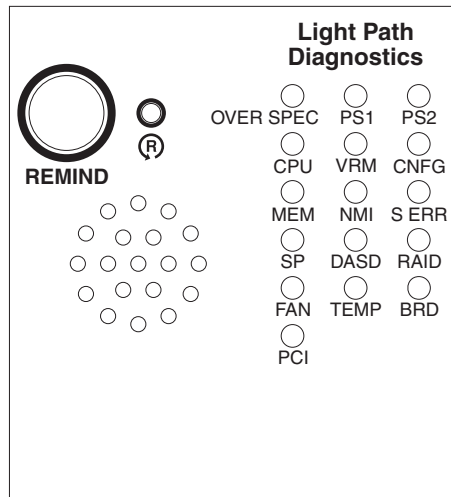
Note any LEDs that are lit, and then push the Easy LED Diagnostics panel back into the server.

Look at the system service label on the top of the server, which gives an overview of internal components that correspond to the LEDs on the Easy LED Diagnostics panel. This information and the information in "Easy LED Diagnostics" on page 164 can often provide enough information to diagnose the error.

3. Remove the server cover and look inside the server for lit LEDs. A lit LED on or beside a component identifies the component that is causing the error.

The following illustration shows the LEDs on the system board.

1	Riser-card-missing error LED	**6**	VRM error LED
2	RAID error LED	**7**	Microprocessor error LED (2)
3	DIMM error LED (12)	**8**	PCI slot error LED (2)
4	BMC heartbeat LED	**9**	Remote Supervisor Adapter II SlimLine error LED
5	Power channel error LED (4)	**10**	3 V battery error LED

Power channel error LEDs indicate an overcurrent condition. Table 21 on page 193 identifies the components associated with each power channel, and the order in which to troubleshoot the components.

The following illustration shows the LEDs on the riser card.
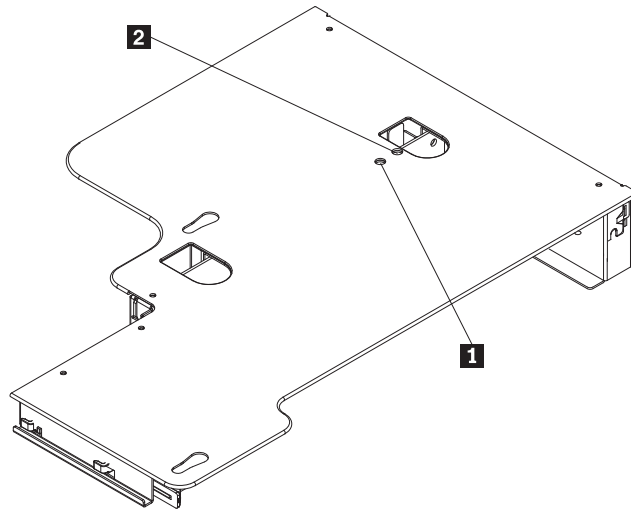
| 1 | PCI slot 1 error LED |
| 2 | PCI slot 2 error LED |

Remind button

You can use the remind button on the Easy LED Diagnostics panel to put the system-error LED on the operator information panel into Remind mode. When you press the remind button, you acknowledge the error but indicate that you will not take immediate action. The system-error LED flashes while it is in Remind mode and stays in Remind mode until one of the following conditions occurs:

- All known errors are corrected.
- The server is restarted.
- A new error occurs, causing the system-error LED to be lit again.

Easy LED Diagnostics

The following table describes the LEDs on the Easy LED Diagnostics panel and suggested actions to correct the detected problems.

Note: Check the system event/error log and BMC system event log for additional information before replacing a FRU.

LED	Problem	Action
None, but the System Error LED is lit.	An error has occurred and cannot be diagnosed, or the Advanced System Management (ASM) processor on the Remote Supervisor Adapter II SlimLine has failed. The error is not represented by a diagnostics LED.	Use the Configuration/Setup utility program to check the system error log for information about the error.
OVER SPEC	The power supplies are using more power than their maximum rating.	1. Remove optional devices from the server. 2. Replace the failing power supply. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply.

LED	Problem	Action
PS 1	The power supply in bay 1 has failed.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply. Make sure that the power supply is correctly seated. If the problem remains, replace the failed power supply.
PS 2	The power supply in bay 2 has failed.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply. Make sure that the power supply is correctly seated. If the problem remains, replace the failed power supply.
CPU	A microprocessor has failed.	1. Make sure that the failing microprocessor, which is indicated by a lit LED on the system board, is installed correctly. See "Installing a microprocessor" on page 113 for information about installing a microprocessor. 2. Make sure that a ServeRAID 8k or 8k-I SAS controller is installed and correctly seated. Make sure that the battery for the ServeRAID 8k SAS controller is installed correctly. 3. If the problem remains, replace the microprocessor (trained service technician only).
VRM	An error occurred on the microprocessor voltage regulator module (VRM).	Replace the VRM. If the problem remains, replace the system board (trained service technician only).
CNFG	A hardware configuration error has occurred.	1. Check the microprocessors just installed to be sure that they are compatible with each other and with the VRM (see the microprocessor section of the *User Guide* for compatibility requirements). 2. (Trained service technician only) Replace an incompatible microprocessor. 3. Check the system error logs for information about the error. Replace any components that are indicated. (Use the Configuration/Setup Utility program to view the error logs.)
MEM	When this LED is lit, a memory error has occurred.	Replace the failing DIMM, which is indicated by the lit LED on the system board.
NMI	A machine check error has occurred.	Check the system error log for information about the error. (Use the Configuration/Setup Utility program to view the error logs.)
S ERR	Reserved.	

LED	Problem	Action
SP	The service processor has failed.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 1. Remove power from the server; then, reconnect the server to power and restart the server. 2. Update the firmware on the BMC. 3. If a Remote Supervisor Adapter II SlimLine is installed, update the firmware; if the problem remains, replace the adapter. 4. (Trained service technician only) If the problem remains, replace the system board .
DASD	A hard disk drive error has occurred.	1. Check the LEDs on the hard disk drives and replace the indicated drive. 2. If the problem remains, replace the hard disk drive backplane.
RAID	A RAID controller error has occurred.	1. Make sure that a RAID controller is installed. **Note:** The server will not start without a RAID controller installed. 2. Check the system-error log for information about the error. (Use the Configuration/Setup Utility program to view the error logs.)
FAN	A fan has failed, is operating too slowly, or has been removed. The TEMP LED might also be lit.	Replace the failing fan, which is indicated by a lit LED on the fan body.
TEMP	The system temperature has exceeded a threshold level. A failing fan can cause the TEMP LED to be lit.	• Determine whether a fan has failed. If it has, replace it. • Make sure that the room temperature is not too high. See "Features and specifications" on page 3 for temperature information. • Make sure that the air vents are not blocked.
BRD	An error has occurred on the system board.	• Check the LEDs on the system board to identify the component that is causing the error. • Check the system error log for information about the error. (Use the Configuration/Setup Utility program to view the error logs.)
PCI	An error has occurred on a PCI bus or on the system board. An additional LED will be lit next to a failing PCI slot.	• Check the LEDs on the PCI slots to identify the component that is causing the error. • Check the system error log for information about the error. (Use the Configuration/Setup Utility program to view the error logs.) • If you cannot isolate the failing adapter through the LEDs and the information in the system error log, remove one adapter at a time from the failing PCI bus, and restart the server after each adapter is removed. If the problem remains, replace the following components, in the order shown, restarting the server each time: • PCI riser card • (Trained service technician only) System board

Power-supply LEDs

Attention: In a dc power environment, see the documentation that comes with the dc power supply for information about the power-supply LEDs.

The following minimum configuration is required for the DC LED on the power supply to be lit:
* Power supply
* Power backplane
* Power cord

The following minimum configuration is required for the server to start:
* One microprocessor
* Two 512 MB DIMMs on the system board
* One power supply
* Power backplane
* Power cord

The following illustration shows the locations of the power-supply LEDs.

Attention: In a dc power environment, see the documentation that comes with the dc power supply for information about the power-supply LEDs.
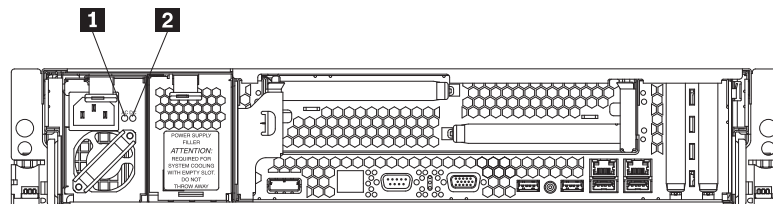
| 1 | AC power LED |
| 2 | DC power LED |

The following table describes the problems that are indicated by various combinations of the ac power-supply LEDs and the power-on LED on the operator information panel and suggested actions to correct the detected problems.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove the dc power supply. See the documentation that comes with each dc power supply.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Power-supply LEDs		Operator information panel power-on LED	Description	Action
AC	DC			
Off	Off	Off	No power to the server, or a problem with the ac power source.	1. Check the ac power to the server. 2. Make sure that the power cord is connected to a functioning power source. 3. Remove one power supply at a time.
Lit	Off	Off	DC source power problem.	1. Remove one power supply at a time. 2. View the system error logs (see "Error logs" on page 136).
Lit	Lit	Off	Standby power problem.	1. View the system error logs (see "Error logs" on page 136). 2. Remove one power supply at a time. 3. Replace the power backplane.
Lit	Lit	Lit	The power is good.	No action is necessary.

Diagnostic programs, messages, and error codes

The diagnostic programs are the primary method of testing the major components of the server. As you run the diagnostic programs, text messages and error codes are displayed on the screen and are saved in the test log. A diagnostic text message or error code indicates that a problem has been detected; to determine what action you should take as a result of a message or error code, see the table in "Diagnostic error codes" on page 170.

Running the diagnostic programs

To run the diagnostic programs, complete the following steps:

1. If the server is running, turn off the server and all attached devices.
2. Turn on all attached devices; then, turn on the server.
3. When the prompt `F2 for Diagnostics` appears, press F2. If you have set both a power-on password and an administrator password, you must type the administrator password to run the diagnostic programs.
4. From the top of the screen, select either **Extended** or **Basic**.
5. From the diagnostic programs screen, select the test that you want to run, and follow the instructions on the screen.

   When you are diagnosing hard disk drives, select **SCSI Attached Disk Test** for the most thorough test. Select **Fixed Disk Test** for any of the following situations:
   - You want to run a faster test.
   - The server contains RAID arrays.

- The server contains SATA or IDE hard disk drives.

For help with the diagnostic programs, press F1. You also can press F1 from within a help screen to obtain online documentation from which you can select different categories. To exit from the help information, press Esc.

To determine what action you should take as a result of a diagnostic text message or error code, see the table in "Diagnostic error codes" on page 170.

If the diagnostic programs do not detect any hardware errors but the problem remains during normal server operations, a software error might be the cause. If you suspect a software problem, see the information that comes with your software.

A single problem might cause more than one error message. When this happens, correct the cause of the first error message. The other error messages usually will not occur the next time you run the diagnostic programs.

Exception: If there are multiple error codes or diagnostics LEDs that indicate a microprocessor error, the error might be in a microprocessor or in a microprocessor socket. See "Microprocessor problems" on page 152 for information about diagnosing microprocessor problems.

If the server stops during testing and you cannot continue, restart the server and try running the diagnostic programs again. If the problem remains, replace the component that was being tested when the server stopped.

The keyboard and mouse (pointing device) tests assume that a keyboard and mouse are attached to the server. If no mouse is attached to the server, you cannot use the **Next Cat** and **Prev Cat** buttons to select categories. All other mouse-selectable functions are available through function keys. You can use the regular keyboard test to test a USB keyboard, and you can use the regular mouse test to test a USB mouse.

To view server configuration information (such as system configuration, memory contents, interrupt request (IRQ) use, direct memory access (DMA) use, device drivers, and so on), select **Hardware Info** from the top of the screen.

Diagnostic text messages

Diagnostic text messages are displayed while the tests are running. A diagnostic text message contains one of the following results:

Passed: The test was completed without any errors.

Failed: The test detected an error.

User Aborted: You stopped the test before it was completed.

Not Applicable: You attempted to test a device that is not present in the server.

Aborted: The test could not proceed because of the server configuration.

Warning: The test could not be run. There was no failure of the hardware that was being tested, but there might be a hardware failure elsewhere, or another problem prevented the test from running; for example, there might be a configuration problem, or the hardware might be missing or is not being recognized.

The result is followed by an error code or other additional information about the error.

Viewing the test log

To view the test log when the tests are completed, select **Utility** from the top of the screen and then select **View Test Log**. The test-log data is maintained only while you are running the diagnostic programs. When you exit from the diagnostic programs, the test log is cleared.

To save the test log to a file on a diskette or to the hard disk, click **Save Log** on the diagnostic programs screen and specify a location and name for the saved log file.

Notes:

1. To create and use a diskette, you must add an optional external diskette drive to the server before initiating the diagnostic programs.
2. To save the test log to a diskette, you must use a diskette that you have formatted yourself; this function does not work with preformatted diskettes. If the diskette has sufficient space for the test log, the diskette can contain other data.

Diagnostic error codes

The following table describes the error codes that the diagnostic programs might generate and suggested actions to correct the detected problems.

If the diagnostic programs generate error codes that are not listed in the table, make sure that the latest levels of BIOS, Remote Supervisor Adapter II SlimLine, and ServeRAID code are installed.

In the error codes, x can be any numeral or letter. However, if the three-digit number in the central position of the code is 000, 195, or 197, *do not* replace a CRU or FRU. These numbers appearing in the central position of the code have the following meanings:

000   The server passed the test. Do not replace a CRU or FRU.

195   The Esc key was pressed to end the test. Do not replace a CRU or FRU.

197   This is a warning error, but it does not indicate a hardware failure; do not replace a CRU or FRU. Take the action that is indicated in the Action column but *do not replace a CRU or a FRU*. See the description of **Warning** in "Diagnostic text messages" on page 169 for more information.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
001-xxx-000	Failed core tests.	(Trained service technician only) Replace the system board.
001-xxx-001	Failed core tests.	(Trained service technician only) Replace the system board.
001-250-001	Failed system board ECC.	(Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
005-xxx-000	Failed video test.	1. Reseat the optional video adapter, if one is installed. 2. (Trained service technician only) Replace the system board.
011-xxx-000	Failed COM1 serial port test.	1. Check the loopback plug that is connected to the externalized serial port; reseat or replace it if necessary. 2. Check the cable from the externalized serial port to the system board; reseat the cable if necessary. 3. (Trained service technician only) Replace the system board.
014-xxx-000	Failed parallel port test.	(Trained service technician only) Replace the system board.
015-xxx-001	USB interface not found, board damaged.	(Trained service technician only) Replace the system board.
015-xxx-015	Failed USB external loopback test.	1. Make sure that the port is not disabled. 2. Check the loopback plug that is connected to the externalized USB port; reseat or replace it if necessary. 3. Check the cable from the externalized USB port to the system board; reseat the cable if necessary. 4. Run the USB external loopback test again. 5. (Trained service technician only) Replace the system board.
015-xxx-198	USB device connected during USB test.	1. Remove USB devices from the external USB ports. 2. Run the USB external loopback test again. 3. (Trained service technician only) Replace the system board.

020-xxx-000	Failed PCI Interface test.	1. Reseat the riser-card assembly and the adapters in the low-profile PCI slots.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Riser-card assembly
		  b. (Trained service technician only) System board

030-xxx-099	Failed internal SCSI interface test.	(Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
035-285-001	Adapter Communication Error.	1. Update the ServeRAID SAS controller firmware. 2. Reseat the ServeRAID SAS controller. 3. Replace the ServeRAID SAS controller.
035-286-001	Adapter CPU Test Error.	1. Update the ServeRAID SAS controller firmware. 2. Reseat the ServeRAID SAS controller. 3. Replace the ServeRAID SAS controller.
035-287-001	Adapter Local RAM Test Error.	1. Update the ServeRAID SAS controller firmware. 2. Reseat the ServeRAID SAS controller. 3. Replace the ServeRAID SAS controller.
035-288-001	Adapter NVSRAM Test Error.	1. Update the ServeRAID SAS controller firmware. 2. Reseat the ServeRAID SAS controller. 3. Replace the ServeRAID SAS controller.
035-289-001	Adapter Cache Test Error.	1. Update the ServeRAID SAS controller firmware. 2. Reseat the ServeRAID SAS controller. 3. Replace the ServeRAID SAS controller.
035-292-001	Adapter Parameter Set Error.	1. Update the ServeRAID SAS controller firmware. 2. Reseat the ServeRAID SAS controller. 3. Replace the ServeRAID SAS controller.
035-230-001	Battery Low.	Replace the battery module on the ServeRAID SAS controller.
035-231-001	Abnormal Battery Temperature.	Replace the battery module on the ServeRAID SAS controller.
035-231-001	Battery Status Unknown.	Replace the battery module on the ServeRAID SAS controller.
089-xxx-00n	Failed microprocessor test. **Note:** n = APIC ID for failing microprocessor - 0, 1, 2, 3 = microprocessor 1 - 4, 5,6, 7 = microprocessor 2 Odd APIC numbers are hyperthreads.	1. Make sure that the BIOS code is at the latest level. 2. (Trained service technician only) Reseat the microprocessor. 3. (Trained service technician only) Replace the microprocessor.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
166-051-000	System Management: Failed. Unable to communicate with Remote Supervisor Adapter II SlimLine.	1. Update the firmware (BIOS, service processor, diagnostics) to the latest levels. 2. Run the diagnostic test again. 3. Correct other error conditions (including failed systems-management tests and items that are logged in Remote Supervisor Adapter II SlimLine system event/error log) and run the test again. 4. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and run the test again. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 5. Reseat the Remote Supervisor Adapter II SlimLine. 6. Replace the Remote Supervisor Adapter II SlimLine.
166-060-000	System Management: Failed. Unable to communicate with Remote Supervisor Adapter II SlimLine.	1. Update the firmware (BIOS, service processor, diagnostics) to the latest levels. 2. Run the diagnostic test again. 3. Correct other error conditions (including failed systems-management tests and items that are logged in Remote Supervisor Adapter II SlimLine system event/error log) and run the test again. 4. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and run the test again. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 5. Reseat the Remote Supervisor Adapter II SlimLine. 6. Replace the Remote Supervisor Adapter II SlimLine.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
166-070-000	System Management: Failed. Unable to communicate with Remote Supervisor Adapter II SlimLine.	1. Update the firmware (BIOS, service processor, diagnostics) to the latest levels. 2. Run the diagnostic test again. 3. Correct other error conditions (including failed systems-management tests and items that are logged in Remote Supervisor Adapter II SlimLine system event/error log) and run the test again. 4. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and run the test again. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 5. Reseat the Remote Supervisor Adapter II SlimLine. 6. Replace the Remote Supervisor Adapter II SlimLine.
166-198-000	System Management: Aborted.	1. Run the diagnostic test again. 2. Correct other error conditions (including failed system management tests and items logged in the BMC error log and the system event/error log) and retry the test. 3. Disconnect all server and optional-device power cords from the server, wait 30 seconds, reconnect the power cords, and retry the test. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 4. Replace the Remote Supervisor Adapter II SlimLine, if installed. 5. (Trained service technician only) Replace the system board.
166-250-000	System Management: Failed. I^2C cable is disconnected.	1. Reconnect the I^2C ribbon cable between the operator information panel assembly and the system board. 2. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action
166-260-000	System Management: Failed. Remote Supervisor Adapter II SlimLine restart error.	1. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and run the test again. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 2. Reseat the Remote Supervisor Adapter II SlimLine. 3. Replace the Remote Supervisor Adapter II SlimLine.
166-342-000	System Management: Failed. Remote Supervisor Adapter II SlimLine BIST indicates failed tests.	1. Update the firmware for BIOS and the Remote Supervisor Adapter II SlimLine to the latest levels. 2. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and run the test again. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 3. Reseat the Remote Supervisor Adapter II SlimLine. 4. Replace the Remote Supervisor Adapter II SlimLine.
166-400-000	System Management: Failed. BMC self-test failed.	1. Update the BMC firmware to the latest level. 2. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action

166-404-001	System Management: Failed.
	BMC indicates failure in I^{2}C bus test.
		1. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and run the test again.
		
		Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
		
		2. Update the BMC firmware to the latest level.
		3. Reseat the power backplane.
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Power backplane
		  b. (Trained service technician only) System board

166-406-001	System Management: Failed.
	BMC indicates failure in I^{2}C bus test.
		1. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and retry the test.
		
		Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
		
		2. Update the BMC firmware to the latest level.
		3. Reseat the following components:
		  a. Hard disk drive signal cable
		  b. Hard disk drive backplane
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Hard disk drive backplane
		  b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action

166-407-001	System Management: Failed.
	BMC indicates failure in I^{2}C bus test.
		1. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and retry the test.
		
		Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
		
		2. Update the BMC firmware to the latest level.
		3. Reseat the operator information panel cable.
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Operator information panel assembly
		  b. (Trained service technician only) System board

166-nnn-001	System Management: Failed. **Note:** nnn indicates the failure type. • 300 to 320: Self-test failure • 400 to 420 (excluding 412, 414, and 415): I^{2}C bus test failure	1. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and retry the test. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 2. Update the BMC firmware to the latest level. 3. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action

166-412-001	System Management: Failed. I^{2}C bus failure.	1. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and retry the test.
		
		Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
		
		2. Update the BMC firmware to the latest level.
		3. Reseat the power backplane.
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		   a. Power backplane
		   b. (Trained service technician only) System board

166-414-001	System Management: Failed. I^{2}C bus failure.	1. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and retry the test.
		
		Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
		
		2. Update the BMC firmware to the latest level.
		3. Reseat the hard disk drive signal cable.
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		   a. Hard disk drive backplane
		   b. (Trained service technician only) System board

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action

166-415-001	System Management: Failed. I^{2}C bus failure.	1. Disconnect all power cords and external cables from the server, wait 30 seconds, reconnect the power cords and cables, and retry the test.
		
		Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
		
		2. Update the BMC firmware to the latest level.
		3. Reseat the operator information panel cable.
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Operator information panel assembly
		  b. (Trained service technician only) System board

180-xxx-000	Diagnostics LED failure.	Run diagnostics panel LED test for the failing LED.

180-xxx-001	Failed front LED panel test.	1. Reseat the operator information panel cable.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Operator information panel assembly
		  b. (Trained service technician only) System board

180-xxx-002	Failed diagnostics LED panel test.	**Note:** The Easy LED Diagnostics panel is part of the operator information panel assembly.
		
		1. Reseat the operator information panel cable.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Operator information panel assembly
		  b. (Trained service technician only) System board

180-361-003	Failed fan LED test.	1. Reseat the fans.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Fans
		  b. (Trained service technician only) System board

180-xxx-003	Failed system board LED test.	(Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action

180-xxx-005	Failed hard disk drive backplane LED test.	1. Reseat the following components:
		  a. Hard disk drive backplane cable.
		  b. Hard disk drive backplane.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Hard disk drive backplane
		  b. (Trained service technician only) System board

201-xxx-0nn	Failed memory test. **Note:** nn = slot number of failing DIMM.	Replace the following components one at a time, in the order shown, restarting the server each time: 1. DIMM identified by nn 2. (Trained service technician only) System board

201-xxx-n99	Multiple DIMM failure.
	Note: n = the number of the failing pair (see Table 16 on page 88 and the illustration following).
		1. See the error text to identify the failing DIMMs.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. DIMMs in pair n
		  b. (Trained service technician only) System board

202-xxx-00n	Failed system cache test.
	Note: n = APIC ID for failing microprocessor.
	• 0, 1, 2, 3 = microprocessor 1
	• 4, 5, 6, 7 = microprocessor 2
	
	Odd APIC numbers are hyperthreads.
		1. Make sure that the BIOS code is at the latest level.
		2. Reseat the following components:
		  a. (If n = 4, 5, 6, or 7) VRM
		  b. (Trained service technician only) The indicated microprocessor.
		3. Replace the following components, one at a time, in the order shown, restarting the server each time:
		  a. (If n = 4, 5, 6, or 7) VRM
		  b. (Trained service technician only) The indicated microprocessor.

215-xxx-000	Failed CD-RW/DVD drive test.	1. Run the test again with a different CD-RW/DVD drive.
		2. Reseat the following components:
		  a. CD-RW/DVD drive
		  b. Operator information panel assembly
		3. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. CD-RW/DVD drive
		  b. CD/DVD media backplane

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

Error code	Description	Action

217-198-xxx	Could not establish drive parameters.	1. Reseat the hard disk drive signal cable.
		 2. Reseat the hard disk drive.
		 3. Replace the following components in the order shown, restarting the server each time:
		   a. Hard disk drive
		   b. Hard disk drive signal cable
		   c. Hard disk drive backplane

217-xxx-00n	Failed fixed disk test. **Note:** n is the number of the failed drive. The hard disk drive numbers are on the server front.	1. Reseat the hard disk drive indicated by n. 2. Replace the hard disk drive indicated by n.

301-xxx-000	Failed keyboard test.
	 Note: After installing a USB keyboard, you might have to use the Configuration/Setup Utility program to enable keyboardless operation and prevent the POST error message 301 from being displayed during startup.
		1. Reseat the keyboard cable.
		 2. Replace the following components one at a time, in the order shown, restarting the server each time:
		   a. Keyboard
		   b. (Trained service technician only) System board

405-xxx-000	Failed Ethernet test on Ethernet controller.	1. Run the Configuration/Setup Utility program and make sure that Ethernet is not disabled and that the BIOS code is at the latest level. 2. (Trained service technician only) Replace the system board.
405-xxx-00n	Failed Ethernet test on adapter in PCI slot n.	1. Reseat the Ethernet adapter in slot n. 2. Replace the Ethernet adapter in slot n. 3. (Trained service technician only) Replace the system board.

415-xx-000	Failed modem test.	1. Reseat the modem cable.
		 Note: Make sure that the modem is present and attached to the server.
		 2. Replace the following components one at a time, in the order shown, restarting the server each time:
		   a. Modem
		   b. (Trained service technician only) System board

Recovering the BIOS code

If the BIOS code has become damaged, such as from a power failure during an update, you can recover the BIOS code using the boot block jumper and a BIOS recovery diskette.

Notes:

1. You can obtain a BIOS recovery diskette from one of the following sources:
   - Start the EasyUpdate program.
   - Download the BIOS code image to create the POST/BIOS recovery diskette, CD, or DVD from http://www.lenovo.com/support/.
   - Contact your Lenovo service representative.

2. To create and use a diskette, you must attach an optional external USB diskette drive to the server. To enable the USB diskette drive, complete the following steps:
   a. Enable the **USB Support** option in the **Devices and I/O Ports** menu in the Configuration/Setup Utility program.
   b. Set your removable media device as the first startup device.
   c. Select the removable media device that you want to boot from and move it to the top of the list.

The flash memory of the server consists of a primary page and a backup page. The backup page is a protected area that cannot be overwritten. If the primary page becomes corrupted, the server boots from the backup page, which enables you to replace the BIOS code for the primary page.

To recover the BIOS code and restore the server operation to the primary page, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 53.
2. Turn off the server, and disconnect all power cords and external cables.
   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the server cover. See "Removing the cover" on page 56 for more information.

4. Locate the boot block recovery jumper block (J42) on the system board.
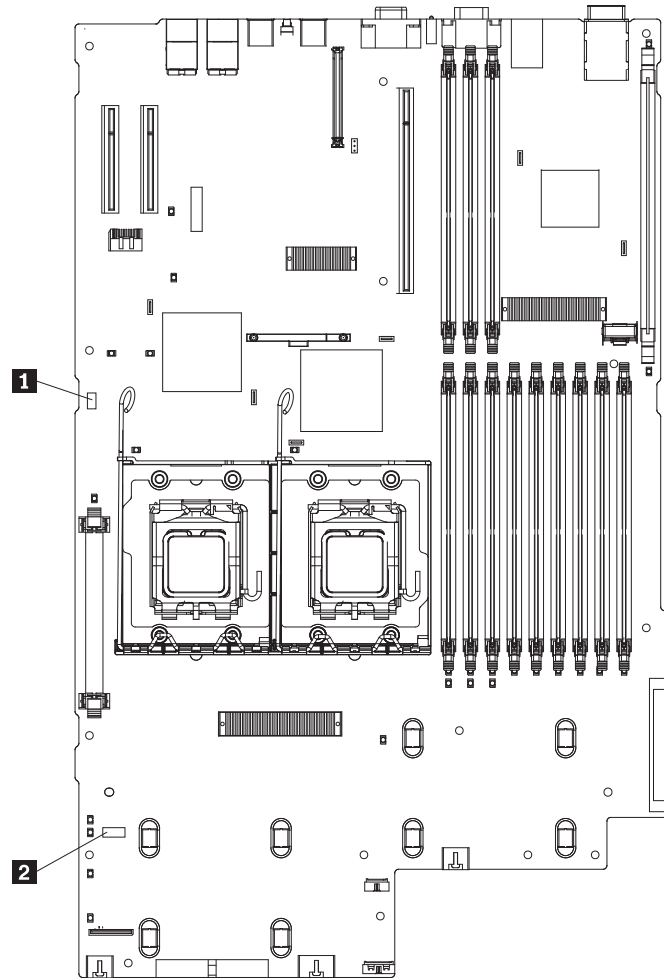
| 1 | Boot block recovery jumper |
| 2 | Switch block (SW2) |

5. Move the jumper from pins 1 and 2 to pins 2 and 3 to enable the BIOS recovery mode.
6. Insert the BIOS recovery diskette into the diskette drive.
7. Reinstall the server cover; then, reconnect all power cords.

    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

8. Restart the server. The power-on self test (POST) starts.
9. Select **1 - Update POST/BIOS** from the menu that contains various flash update options.
10. When you are asked whether you want to save the current code to a diskette, press N.
11. When you are asked to choose a language, select a language (from 0 to 7) and press Enter.
12. Remove the BIOS recovery diskette from the diskette drive.

13. Turn off the server, and disconnect all power cords and external cables; then, remove the server cover.

    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

14. Remove the jumper from the boot block recovery jumper block, or move it to pins 1 and 2, to return to normal startup mode.

15. Reconnect all external cables and power cords, and turn on the peripheral devices; then, reinstall the server cover.

    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

16. Restart the server.

System event/error log messages

A system event/error log is generated only if a Remote Supervisor Adapter II SlimLine is installed. The system event/error log can contain messages of three types:

Information   Information messages do not require action; they record significant system-level events, such as when the server is started.

Warning   Warning messages do not require immediate action; they indicate possible problems, such as when the recommended maximum ambient temperature is exceeded.

Error   Error messages might require action; they indicate system errors, such as when a fan is not detected.

Each message contains date and time information, and it indicates the source of the message (POST/BIOS or the service processor).

Note: The BMC system event log, which you can view through the Configuration/Setup Utility program, also contains many information, warning, and error messages.

In the following example, the system event/error log message indicates that the server was turned on at the recorded time.

```
- - - - - - - - - - - - - - - - - - - -
   Date/Time: 2002/05/07 15:52:03
   DMI Type:
   Source: SERVPROC
   Error Code: System Complex Powered Up
   Error Code:
   Error Data:
   Error Data:
- - - - - - - - - - - - - - - - - - - - -
```

The following table describes the possible system event/error log messages and suggested actions to correct the detected problems.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action

+12v critical over voltage fault	1. If the OVER SPEC LED on the Easy LED Diagnostics panel is lit, or any of the four power channel error LEDs (A, B, C, or D) on the system board are lit, see the entries about power-channel error LEDs in "Power problems" on page 155. (See "Internal connectors, LEDs, and jumpers" on page 8 for the location of the power channel error LEDs.)
	
	 2. If the actions in "Power problems" on page 155 do not identify a defective component, complete the following steps:
	
	   a. Remove the power supplies.
	
	     Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove the dc power supply. See the documentation that comes with each dc power supply.
	
	   b. Replace the power supplies one at a time, restarting the server each time, to isolate a failing power supply.
	
	   c. If the server fails to start, replace the power backplane. Restart the server.
	
	   d. If the server fails to start, (trained service technician only) replace the system board.

+12v critical under voltage fault	1. If the OVER SPEC LED on the Easy LED Diagnostics panel is lit, or any of the four power channel error LEDs (A, B, C, or D) on the system board are lit, see the entries about power-channel error LEDs in "Power problems" on page 155. (See "Internal connectors, LEDs, and jumpers" on page 8 for the location of the power channel error LEDs.)
	
	 2. If the actions in "Power problems" on page 155 do not identify a defective component, complete the following steps:
	
	   a. Remove the power supplies.
	
	     Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove the dc power supply. See the documentation that comes with each dc power supply.
	
	   b. Replace the power supplies one at a time, restarting the server each time, to isolate a failing power supply.
	
	   c. If the server fails to start, replace the power backplane. Restart the server.
	
	   d. If the server fails to start, (trained service technician only) replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action

12v planar fault	1. If the OVER SPEC LED on the Easy LED Diagnostics panel is lit, or any of the four power channel error LEDs (A, B, C, or D) on the system board are lit, see the entries about power-channel error LEDs in "Power problems" on page 155. (See "Internal connectors, LEDs, and jumpers" on page 8 for the location of the power channel error LEDs.)
	
	2. If the actions in "Power problems" on page 155 do not identify a defective component, complete the following steps:
	
	  a. Remove the power supplies.
	
	    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove the dc power supply. See the documentation that comes with each dc power supply.
	
	  b. Replace the power supplies one at a time, restarting the server each time, to isolate a failing power supply.
	
	  c. If the server fails to start, replace the power backplane. Restart the server.
	
	  d. If the server fails to start, (trained service technician only) replace the system board.

+5v critical over voltage fault	1. Remove the following devices, which are powered by 5 volts:
	  • All PCI adapters
	  • USB devices
	  • CD-RW/DVD drive
	  • Tape drive, if one is installed
	  • Hard disk drive backplane
	
	2. Reinstall each I/O device removed in step 1, one at a time, restarting the server each time, to isolate a defective device. Replace any defective device.
	
	3. If the error continues, replace the power backplane. Restart the server.
	
	4. If the error continues, (trained service technician only) replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action

+5v critical under voltage fault	1. Remove the following devices, which are powered by 5 volts:
	   • All PCI adapters
	   • USB devices
	   • CD-RW/DVD drive
	   • Tape drive, if one is installed
	   • Hard disk drive backplane
	 2. Reinstall each I/O device removed in step 1 on page 186, one at a time, restarting the server each time, to isolate a defective device. Replace any defective device.
	 3. If the error continues, replace the power backplane. Restart the server.
	 4. If the error continues, (trained service technician only) replace the system board.

5V fault	1. Remove the following devices, which are powered by 5 volts:
	   • All PCI adapters
	   • USB devices
	   • CD-RW/DVD drive
	   • Tape drive, if one is installed
	   • Hard disk drive backplane
	 2. Reinstall each I/O device removed in step 1 on page 186, one at a time, restarting the server each time, to isolate a defective device. Replace any defective device.
	 3. If the error continues, replace the power backplane. Restart the server.
	 4. If the error continues, (trained service technician only) replace the system board.

+2.5v critical over voltage fault	Information only
+2.5v critical under voltage fault	Information only
+1.8v critical over voltage fault	Information only
+1.8v critical under voltage fault	Information only
The system real time clock battery is no longer reliable.	Replace the battery.
+3.3v critical over voltage fault	1. Remove all PCI adapters. 2. Reinstall each PCI adapter, one at a time, restarting the server each time, to isolate a defective adapter. Replace any defective adapter. 3. If the error continues, (trained service technician only) replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action
+3.3v critical under voltage fault	1. Remove all PCI adapters. 2. Reinstall each PCI adapter, one at a time, restarting the server each time, to isolate a defective adapter. Replace any defective adapter. 3. If the error continues, (trained service technician only) replace the system board.
3.3V Bus Fault	1. Remove all PCI adapters. 2. Reinstall each PCI adapter, one at a time, restarting the server each time, to isolate a defective adapter. Replace any defective adapter. 3. If the error continues, (trained service technician only) replace the system board.
Power Good Fault	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove the dc power supply. See the documentation that comes with each dc power supply. 1. Reseat the power supplies. 2. If the error continues, replace the power backplane.
VRM 1 Power Good Fault	1. (Trained service technician only) Reseat microprocessor 1. 2. (Trained service technician only) Replace microprocessor 1. 3. (Trained service technician only) Replace the system board.
VRM 2 Power Good Fault	1. Reseat the VRM. 2. (Trained service technician only) Reseat microprocessor 2. 3. Replace the VRM. 4. (Trained service technician only) Replace microprocessor 2. 5. (Trained service technician only) Replace the system board.
VRM 2 is present	Information only
VRM 2 is not present	If microprocessor 2 is installed, install or replace the VRM.
Memory Area non-critical over temperature warning	1. Make sure that the fans are operating and are not obstructed. 2. Make sure that the air baffles are in place and correctly installed. 3. Make sure that the server cover is installed and fully closed.
Memory Area non-recoverable over temperature fault	1. Make sure that the fans are operating and are not obstructed. 2. Make sure that the air baffles are in place and correctly installed. 3. Make sure that the server cover is installed and fully closed. 4. (Trained service technician only) Replace the system board.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action
Fan *n* Failure *n* = the fan number	1. Make sure that the connector on the fan is not damaged. 2. Make sure that the fan connector on the system board is not damaged. 3. Make sure that the fan is fully installed (press down on the fan). 4. Reseat fan *n*. 5. Replace fan *n*.
Fan *n* Fault *n* = the fan number	1. Make sure that the connector on the fan is not damaged. 2. Make sure that the fan connector on the system board is not damaged. 3. Make sure that the fan is fully installed (press down on the fan). 4. Reseat fan *n*. 5. Replace fan *n*.
Hard Drive *n* Fault *n* = the hard disk drive number	1. Reseat hard disk drive *n*. 2. Replace hard disk drive *n*.
Hard drive *n* removal detected. *n* = the hard disk drive number	Reseat hard disk drive *n*.
Power supply *n* removed *n* = the power supply number	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove the dc power supply. See the documentation that comes with each dc power supply. 1. Reseat power supply *n*. 2. Replace power supply *n*. 3. Replace the power backplane.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action

Power supply *n* fault
n = the power supply number
	1. If the server power-on LED is lit, perform the following steps:
	  a. Reduce the server to the minimum configuration (see "Solving undetermined problems" on page 194 for a description of the miniimum configuration).
	  b. Reinstall the components you removed, one at a time, restarting the server each time.
	  c. If the error reoccurs, the component you just reinstalled is defective; replace the defective component.
	2. Reseat the following components:
	  a. Power supply *n*
	    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove the dc power supply. See the documentation that comes with each dc power supply.
	  b. Power backplane
	3. Replace the components listed in step 2, one at a time, in the order shown, restarting the server each time.

Power supply *n* AC power removed *n* = the power supply number	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove the dc power supply. See the documentation that comes with each dc power supply. 1. Make sure that the power cords are correctly connected to the server and to a working power source. 2. Replace power supply *n*. 3. Replace the power backplane.
Power supply *n* fan fault *n* = the power supply number	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove the dc power supply. See the documentation that comes with each dc power supply. 1. Make sure that there are no obstructions, such as bundled cables, to the airflow on the power-supply fan. 2. Replace power supply *n*.
Power supply current exceeded max spec value	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove the dc power supply. See the documentation that comes with each dc power supply. 1. Make sure that two power supplies are installed, and that the power cords are correctly connected to the power supplies and to a working power source. 2. Replace the power backplane.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action

Front panel NMI	1. If the MEM LED on the Easy LED Diagnostics panel is lit, complete the following steps:
	   a. Check the other system logs for related entries and actions.
	   b. Reinstall the server device drivers.
	   c. Reinstall the operating system.
	2. If the error LED for PCI slot 1 or PCI slot 2 on the riser card is lit, complete the following steps:
	   a. Remove the adapter from the PCI slot that has the lit error LED.
	   b. If the error continues, replace the riser-card assembly.
	   c. (Trained service technician only) If the error continues, replace the system board.
	3. If the error LED for PCI slot 3 or PCI slot 4 on the system board is lit, complete the following steps:
	   a. Remove the adapter from the PCI slot that has the lit error LED.
	   b. (Trained service technician only) If the error continues, replace the system board.
	4. Remove all PCI adapters from the server. (Trained service technician only) If the error continues, replace the system board.

Software NMI	Information only
CPU n IERR detected, the system has been restarted n = the microprocessor number	1. Make sure that you have installed the latest levels of firmware and device drivers for all adapters and standard devices, such as Ethernet, SCSI, or SAS. 2. Run the diagnostics programs for the hard disk drives and other I/O devices. 3. (Trained service technician only) Replace microprocessor n.
CPU n IERR, the CPU has been disabled n = the microprocessor number	1. (Trained service technician only) Reseat microprocessor n. 2. (Trained service technician only) Replace microprocessor n. 3. (Trained service technician only) Replace the system board.
CPU n over temperature n = the microprocessor number	1. Make sure that the fans are operating, that there are no obstructions to the airflow, that the air baffles are in place and correctly installed, and that the server cover is installed and completely closed. 2. Make sure that the heat sink for microprocessor n is installed correctly. 3. (Trained service technician only) Replace microprocessor n.
CPU removal detected	Information only. Take action as appropriate.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

System event/error log message	Action
CPU *n* non-critical over temperature warning *n* = the microprocessor number	1. Make sure that the fans are operating, that there are no obstructions to the airflow, that the air baffles are in place and correctly installed, and that the server cover is installed and completely closed. 2. Make sure that the heat sink for microprocessor *n* is installed correctly.
CPU *n* non-recoverable over temperature fault	1. Make sure that the fans are operating, that there are no obstructions to the airflow, that the air baffles are in place and correctly installed, and that the server cover is installed and completely closed. 2. Make sure that the heat sink for microprocessor *n* is installed correctly. 3. (Trained service technician only) Replace microprocessor *n* 4. (Trained service technician only) Replace the system board.
VRD 1 critical over voltage fault	1. (Trained service technician only) Reseat microprocessor 1. 2. (Trained service technician only) Replace the system board.
VRD 1 critical under voltage fault	1. (Trained service technician only) Reseat microprocessor 1. 2. (Trained service technician only) Replace the system board.
VRD 2 critical over voltage fault VRD 2 = VRM	1. Reseat the VRM. 2. (Trained service technician only) Reseat microprocessor 2. 3. (Trained service technician only) Replace the system board.
VRD 2 critical under voltage fault VRD 2 = VRM	1. Reseat the VRM. 2. (Trained service technician only) Reseat microprocessor 2. 3. (Trained service technician only) Replace the system board.
Processor VTT Power Fault.	1. (Trained service technician only) Reseat microprocessor 1. 2. (Trained service technician only) Replace the system board.

Solving power problems

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Power problems can be difficult to solve. For example, a short circuit can exist anywhere on any of the power distribution buses. Usually, a short circuit will cause the power subsystem to shut down because of an overcurrent condition. To diagnose a power problem, use the following general procedure:

1. Turn off the server and disconnect all power cords.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

2. Check for loose cables in the power subsystem. Also check for short circuits, for example, if a loose screw is causing a short circuit on a circuit board.

3. If a power-channel error LED on the system board is lit, perform the following steps; otherwise, go to step 4. See "System-board LEDs" on page 15 for the location of the power-channel error LEDs. Table 21 identifies the components associated with each power channel, and the order in which to troubleshoot the components.

   a. Disconnect the cables and power cords to all internal and external devices. Leave the power-supply cords connected.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

   b. Remove each component that is associated with the LED, one at a time, in the sequence indicated in Table 21, restarting the server each time, until the cause of the overcurrent condition is identified.

   Important: Only a trained service technician should remove or replace a FRU, such as a microprocessor or the system board. See Chapter 3, "Parts listing, ThinkServer RD120 Machine Types 6444, 6445, 6446, and 6447," on page 25 to determine whether a component is a FRU.

   Table 21. Components associated with power-channel error LEDs

Power-channel error LED	Components
A	Fan 4, fan 6, fan 8, fan 9, microprocessor 1, system board (integrated voltage regulator)
B	Fan 1, fan 2, fan 3, fan 5, VRM, IDE CD/DVD cable, IDE CD/DVD media backplane, microprocessor 2, system board
C	ServeRAID SAS controller (8k or 8k-l), DIMMs, tape power (connector J100), system board
D	Low-profile PCI Express adapter (PCI slots 3 and 4), adapter on PCI riser card (PCI slots 1 and 2), system board

   c. Replace the identified component.

4. Remove the adapters and disconnect the cables and power cords to all internal and external devices until the server is at the minimum configuration that is required for the server to start (see "Solving undetermined problems" on page 194 for the minimum configuration).

5. Reconnect all power cords and turn on the server.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
   If the server starts successfully, replace the adapters and devices one at a time until the problem is isolated.

If the server does not start from the minimum configuration, replace the components in the minimum configuration one at a time until the problem is isolated.

Solving Ethernet controller problems

The method that you use to test the Ethernet controller depends on which operating system you are using. See the operating-system documentation for information about Ethernet controllers, and see the Ethernet controller device-driver readme file.

Try the following procedures:
- Make sure that the correct device drivers, which come with the server, are installed and that they are at the latest level.
- Make sure that the Ethernet cable is installed correctly.
    - The cable must be securely attached at all connections. If the cable is attached but the problem remains, try a different cable.
    - You must use Category 5 cabling.
- Determine whether the hub supports auto-negotiation. If it does not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.
- Check the Ethernet controller LEDs on the rear panel of the server. These LEDs indicate whether there is a problem with the connector, cable, or hub.
    - The Ethernet link status LED is lit when the Ethernet controller receives a link pulse from the hub. If the LED is off, there might be a defective connector or cable or a problem with the hub.
    - The Ethernet transmit/receive activity LED is lit when the Ethernet controller sends or receives data over the Ethernet network. If the Ethernet transmit/receive activity light is off, make sure that the hub and network are operating and that the correct device drivers are installed.
- Check the Ethernet activity LED on the rear of the server. The Ethernet activity LED is lit when data is active on the Ethernet network. If the Ethernet activity LED is off, make sure that the hub and network are operating and that the correct device drivers are installed.
- Check for operating-system-specific causes of the problem.
- Make sure that the device drivers on the client and server are using the same protocol.

If the Ethernet controller still cannot connect to the network but the hardware appears to be working, the network administrator must investigate other possible causes of the error.

Solving undetermined problems

If the diagnostic tests did not diagnose the failure or if the server is inoperative, use the information in this section.

If you suspect that a software problem is causing failures (continuous or intermittent), see "Software problems" on page 160.

Damaged data in CMOS memory or damaged BIOS code can cause undetermined problems. To reset the CMOS data, use the CMOS jumper to clear the CMOS memory and override the power-on password; see "System-board switches and jumpers" on page 13. If you suspect that the BIOS code is damaged, see "Recovering the BIOS code" on page 181.

Check the LEDs on all the power supplies (see "Power-supply LEDs" on page 167). If the LEDs indicate that the power supplies are working correctly, complete the following steps:
1. Turn off the server.
2. Make sure that the server is cabled correctly.

3. Remove or disconnect the following devices, one at a time, until you find the failure. Turn on the server and reconfigure it each time.
   - Any external devices.
   - Surge-suppressor device (on the server).
   - Modem, printer, mouse, and non-Lenovo devices.
   - Each adapter.
   - Hard disk drives.
   - Memory modules. The minimum configuration requirement is 1 GB (two 512 MB DIMM, in DIMM slots 1 and 4).
   - Service processor (Remote Supervisor Adapter II SlimLine).

   The following minimum configuration is required for the server to start:
   - One microprocessor
   - Two 512 MB DIMMs
   - One power supply
   - Power backplane
   - Power cord
   - ServeRAID SAS controller
4. Turn on the server. If the problem remains, suspect the following components in the following order:
   a. Power backplane
   b. System board

If the problem is solved when you remove an adapter from the server but the problem recurs when you reinstall the same adapter, suspect the adapter; if the problem recurs when you replace the adapter with a different one, suspect the riser card.

If you suspect a networking problem and the server passes all the system tests, suspect a network cabling problem that is external to the server.

Problem determination tips

Due to the variety of hardware and software combinations that can be encountered, use the following information to assist you in problem determination. If possible, have this information available when requesting assistance from Service Support and Engineering functions.

- Machine type and model
- Microprocessor or hard disk upgrades
- Failure symptom
  - Do diagnostics fail?
  - What, when, where, single, or multiple systems?
  - Is the failure repeatable?
  - Has this configuration ever worked?
  - If it has been working, what changes were made prior to it failing?
  - Is this the original reported failure?
- Diagnostics version
  - Type and version level
- Hardware configuration
  - Print (print screen) configuration currently in use
  - BIOS level
- Operating system software
  - Type and version level

Note: To eliminate confusion, identical systems are considered identical only if they:

1. Are the exact machine type and models
2. Have the same BIOS level
3. Have the same adapters/attachments in the same locations
4. Have the same address jumpers/terminators/cabling
5. Have the same software versions and levels
6. Have the same diagnostics code (version)
7. Have the same configuration options set in the system
8. Have the same setup for the operation system control files

Comparing the configuration and software setup between "working" and "non-working" systems will often lead to problem resolution.

Calling Lenovo for service

See Appendix A, "Getting help and technical assistance," on page 197 for information about calling Lenovo for service.

When you call for service, have as much of the following information available as possible:
- Machine type and model
- Microprocessor and hard disk drive upgrades
- Failure symptoms
  - Does the server fail the diagnostic programs? If so, what are the error codes?
  - What occurs? When? Where?
  - Is the failure repeatable?
  - Has the current server configuration ever worked?
  - What changes, if any, were made before it failed?
  - Is this the original reported failure, or has this failure been reported before?
- Diagnostic program type and version level
- Hardware configuration (print screen of the system summary)
- BIOS code level
- Operating-system type and version level

You can solve some problems by comparing the configuration and software setups between working and nonworking servers. When you compare servers to each other for diagnostic purposes, consider them identical only if all the following factors are exactly the same in all the servers:
- Machine type and model
- BIOS level
- Memory amount, type, and configuration
- Adapters and attachments, in the same locations
- Address jumpers, terminators, and cabling
- Software versions and levels
- Diagnostic program type and version level
- Configuration option settings
- Operating-system control-file setup

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you. This section contains information about where to go for additional information about Lenovo and Lenovo products, what to do if you experience a problem with your system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system.
- Go to the Lenovo Support Web site at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the documentation that is provided with your Lenovo product. The documentation that comes with Lenovo systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your Lenovo system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. Most of the documentation for your server is on the *ThinkServer Documentation DVD* provided with your server. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs 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 device drivers and updates. To access these pages, go to http://www.lenovo.com/support and follow the instructions.

Getting help and information from the World Wide Web

On the World Wide Web, the Lenovo Web site has up-to-date information about Lenovo systems, optional devices, services, and support. For general information about Lenovo products or to purchase Lenovo products, go to http://www.lenovo.com. For support on Lenovo products, go to http://www.lenovo.com/support.

Calling for service

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

These services are available during the warranty period:

- **Problem determination -** Trained 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) available that apply to your hardware.

These items are not covered by the warranty:

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

Refer to the safety and warranty information that is provided with your computer for a complete explanation of warranty terms. You must retain your proof of purchase to obtain warranty service.

For a list of service and support phone numbers for your country or region, go to http://www.lenovo.com/support and click **Support phone list** or refer to the safety and warranty information provided with your computer.

Note: Phone numbers are subject to change without notice. If the number for your country or region is not provided, contact your Lenovo reseller or Lenovo marketing representative.

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

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

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 preinstalled Microsoft® Windows® product, refer to the Microsoft Product Support Services Web site at http://www.support.microsoft.com/directory/, or you can contact the Customer Support Center. Some fees might apply.

Purchasing additional services

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

Lenovo Taiwan product service

台 灣 **Lenovo** 產 品 服 務 資 訊 如 下 :
荷蘭商思惟個人電腦產品股份有限公司台灣分公司
台北市信義區信義路五段七號十九樓之一
服務電話: **0800-000-700**

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

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When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

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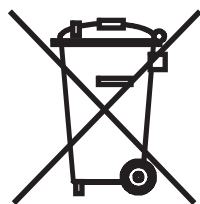
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This product may contain a lithium or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For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

For Taiwan: Please recycle batteries.

For the European Union:

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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.

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Electronic emissions notices

Federal Communications Commission (FCC) statement

Note: 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.

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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.

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

Attention: 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.

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 EMC Directive conformance statement

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 fitting of non-Lenovo option cards

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German Class A compliance statement

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Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

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Deutschland:

Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmittein

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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:

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種情況下，使用者會被要
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声　　明

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