Lenovo ThinkServer sd350 Server Type 5493, Lenovo ThinkServer n400 Enclosure Type 5495 Installation and Service Guide

Machine Type: Type 5493 and 5495

Note

Before using this information and the product it supports, read the general information in Appendix C "Getting help and technical assistance" on page 167, Appendix D "Notices" on page 171, the *Warranty Information* document, and the *Safety Information* and *Environmental Notices and User Guide* documents on the Lenovo *Documentation* CD.

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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.

ᠡ ᠲᠣᠸᠠᠷ ᠶᠢ ᠲᠠᠯᠪᠢᠬᠤ ᠡ ᠠᠶᠤᠯ ᠦᠭᠡᠢ ᠶᠢᠨ
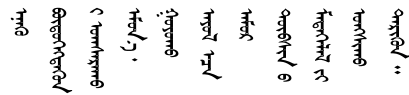
Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

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.

ཐོན་ཐུས་འདི་བདེ་སྐྱོད་མ་བྱས་གོང་། སྐོར་གྱི་ཡིད་གཟབ་
བྱ་འདུ་མིན་ཡོད་པའི་འོད་སྟེར་བསྟུ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۈر مەھسۇلاتنى ئورنتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

Youq mwngz yungh canjbinj neix gaxgonq, itdingh aeu doeg aen canjbinj soengq cungj vahgangj ancien siusik.

Guidelines for trained service technicians

This section contains information for trained service technicians.

CAUTION:
Restricted Access LocationThis server is intended for installation only in restricted access locations as defined in Sub-Clause 1.2.7.3 of IEC 60950-1, 2nd Edition where both these conditions apply:

- **Access can only be gained by service persons or by users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken.**
- **Access is through the use of a a tool or lock and key, or other means of security, and its controlled by the authority responsible for the location.**

Inspecting for unsafe conditions

Use this information to help you identify potential unsafe conditions in a device that you are working on.

Each device, 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 unsupported alterations or attachment of unsupported 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:

1. Make sure that the power is off and the power cords are disconnected.
2. Make sure that the exterior cover is not damaged, loose, or broken, and observe any sharp edges.
3. Check the power cords:
   - 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 cords are the correct type.
   - Make sure that the insulation is not frayed or worn.
4. Remove the cover.
5. Check for any obvious unsupported alterations. Use good judgment as to the safety of any unsupported alterations.
6. Check inside the system 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 these 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 current.
- Regularly inspect and maintain your electrical hand tools for safe operational condition. Do not use worn or broken tools or testers.
- Do not touch the reflective surface of a dental mirror to a live electrical circuit. The surface is conductive and can cause personal injury or equipment damage if it touches a live electrical circuit.
- Some rubber floor mats contain small conductive fibers to decrease electrostatic discharge. Do not use this type of mat to protect yourself from electrical shock.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Locate the emergency power-off (EPO) switch, disconnecting switch, or electrical outlet so that you can turn off the power quickly in the event of an electrical accident.
- Disconnect all power before you perform a mechanical inspection, work near power supplies, or remove or install main units.
- Before you work on the equipment, disconnect the power cord. If you cannot disconnect the power cord, have the customer power-off the wall box that supplies power to the equipment and lock the wall box in the off position.
- Never assume that power has been disconnected from a circuit. Check it to make sure that it has been disconnected.
- If you have to work on equipment that has exposed electrical circuits, observe the following precautions:
  - Make sure that another person who is familiar with the power-off controls is near you and is available to turn off the power if necessary.

– When you work 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

These statements provide the caution and danger information that is used in this documentation.

Important: Each caution and danger statement in this documentation 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 documentation before you perform the procedures. Read any additional safety information that comes with your system or optional device before you install the device.

Statement 1

DANGER

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

To avoid a shock hazard:

• **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**

• **Connect all power cords to a properly wired and grounded electrical outlet.**

• **Connect to properly wired outlets any equipment that will be attached to this product.**

• **When possible, use one hand only to connect or disconnect signal cables.**

• **Never turn on any equipment when there is evidence of fire, water, or structural damage.**

• **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**

- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	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 Part Number 33F8354 or an equivalent type 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-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

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

⚠️ **DANGER**

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

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

Statement 4

⚠️

CAUTION: Use safe practices when lifting.
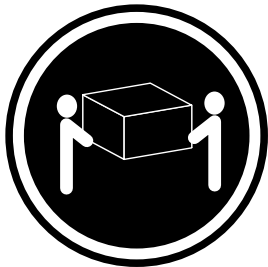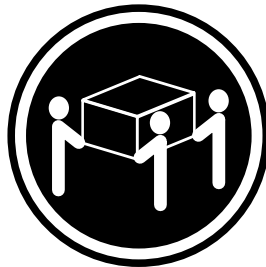
≥ 18 kg (39.7 lb)   ≥ 32 kg (70.5 lb)   ≥ 55 kg (121.2 lb)
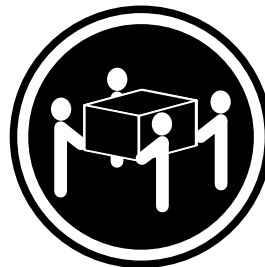
Statement 5

⚠️ ⚡

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 6

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

Statement 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 12

CAUTION:
The following label indicates a hot surface nearby.

Statement 13

⚠️**DANGER**

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

Statement 14

CAUTION:
Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the following label is attached.

Statement 15

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

Statement 26

CAUTION:
Do not place any object on top of rack-mounted devices.
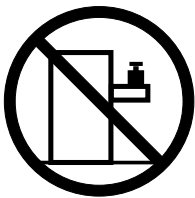
Statement 27

CAUTION:
Hazardous moving parts are nearby.

Statement 34

CAUTION:
To reduce the risk of electric shock or energy hazards:

- **This equipment must be installed by trained service personnel in a restricted-access location, as defined by the NEC and IEC 60950-1, 2nd Edition, The Standard for Safety of Information Technology Equipment.**

- **Connect the equipment to a properly grounded safety extra low voltage (SELV) source. A SELV source is a secondary circuit that is designed so that normal and single fault conditions do not cause the voltages to exceed a safe level (60 V direct current).**

- **Incorporate a readily available approved and rated disconnect device in the field wiring.**

- **See the specifications in the product documentation for the required circuit-breaker rating for branch circuit overcurrent protection.**

- **Use copper wire conductors only. See the specifications in the product documentation for the required wire size.**

- **See the specifications in the product documentation for the required torque values for the wiring-terminal screws.**

Statement 35

>240VA

CAUTION:
Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in splattered metal, burn, or both.

Rack Safety Information, Statement 2

DANGER

- **Always lower the leveling pads on the rack cabinet.**
- **Always install stabilizer brackets on the rack cabinet.**
- **Always install servers and optional devices starting from the bottom of the rack cabinet.**
- **Always install the heaviest devices in the bottom of the rack cabinet.**

Chapter 1. The Lenovo ThinkServer sd350 Server Type 5493, Lenovo ThinkServer n400 Enclosure Type 5495

This *Installation and Service Guide* contains information and instructions for setting up your Lenovo ThinkServer sd350 Server Type 5493, Lenovo ThinkServer n400 Enclosure Type 5495, instructions for installing some optional devices, cabling and configuring the server, removing and replacing devices, and diagnostics and troubleshooting information.

The Lenovo ThinkServer sd350 Server Type 5493, Lenovo ThinkServer n400 Enclosure Type 5495 is a 2-U[1]-high rack model server for high-volume network transaction processing. This high-performance, multi-core server is ideally suited for networking environments that require superior microprocessor performance, input/output (I/O) flexibility, and high manageability.

Performance, ease of use, reliability, and expansion capabilities were key considerations in the design of the server. These design features make it possible for you to customize the system hardware to meet your needs today and provide flexible expansion capabilities for the future.

The server comes with a limited warranty. For information about the terms of the warranty and getting service and assistance, see the Lenovo *Warranty Information* document that comes with the server.

The server contains X-Architecture next generation technologies, which help increase performance and reliability. For more information, see "What your server offers" on page 8 and "Reliability, availability, and serviceability" on page 12.

You can obtain up-to-date information about the server and other Lenovo server products at http://shop.lenovo.com/us/en/systems/. At http://www.lenovo.com/support, you can create a personalized support page by identifying Lenovo products that are of interest to you. From this personalized page, you can subscribe to weekly email notifications about new technical documents, search for information and downloads, and access various administrative services.

The Lenovo ThinkServer sd350 Server Type 5493, Lenovo ThinkServer n400 Enclosure Type 5495 supports up to twenty–four 2.5-inch hot-swap Serial Attached SCSI (SAS) or SATA hard disk drives.

If firmware and documentation updates are available, you can download them from the Lenovo website. The server might have features that are not described in the documentation that comes with the server, and 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. To check for updates, go to http://www.lenovo.com/support.

Note: The illustrations in this document might differ slightly from your model.

Record information about the server in the following table.

Table 1. Record of the system information

Product name	Machine Type (s)	Model number	Serial number
Lenovo ThinkServer sd350 Server Type 5493, Lenovo ThinkServer n400 Enclosure Type 5495	Type 5493 and 5495		

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1. Racks are measured in vertical increments of 4.45 cm (1.75 inches) each. Each increment is called a "U." A 1-U-high device is 1.75 inches tall

The model number and serial number are on the ID label on the front of the server and the chassis, as shown in the following illustration.

Note: The illustrations in this document might differ slightly from your hardware.
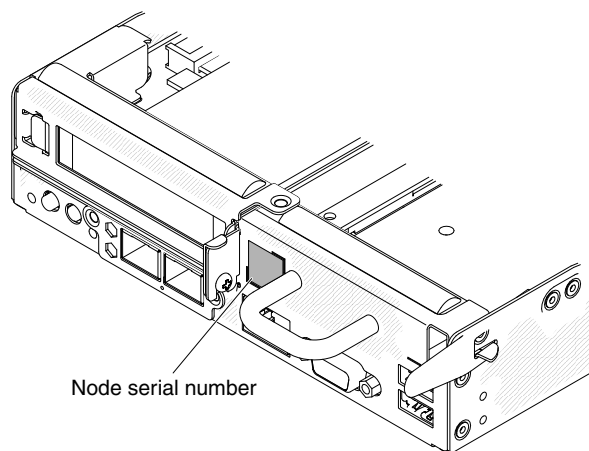
Figure 1. ID label on the front of the server
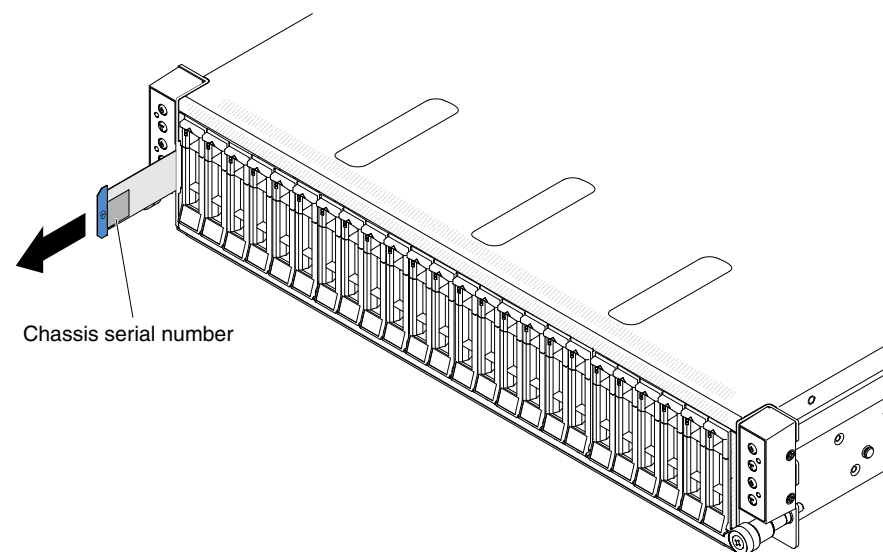
Figure 2. ID label on the front of the chassis

In addition, the system service label, which is on the top of the chassis, provides a QR code for mobile access to service information. You can scan the QR code using a QR code reader and scanner with a mobile device and get quick access to the Lenovo Service Information website. The Lenovo Service Information website provides additional information for parts installation and replacement videos, and error codes for server support.

The following illustration shows the QR code:

Figure 3. QR code

You can download the Lenovo *EasyStartup Setup and Installation* CD to help you configure the hardware, install device drivers, and install the operating system.

For a list of supported optional devices for the server, see http://www.lenovo.com/us/en/ serverproven/.

See the *Rack Installation Instructions* document on the Lenovo *ThinkServer Documentation* CD for complete rack installation and removal instructions.

The Lenovo *ThinkServer Documentation* CD

The Lenovo *ThinkServer Documentation* CD contains documentation for the server in Portable Document Format (PDF) and includes the Lenovo Documentation Browser to help you find information quickly.

Hardware and software requirements

The hardware and software requirements of the Lenovo *ThinkServer Documentation* CD.

The Lenovo *ThinkServer Documentation* CD requires the following minimum hardware and software:

- Microsoft Windows or Red Hat Linux
- 100 MHz microprocessor
- 32 MB of RAM
- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

The Documentation Browser

Use the Documentation Browser to browse the contents of the CD, read brief descriptions of the documents, and view documents, using Adobe Acrobat Reader or xpdf.

The Documentation Browser automatically detects the regional settings in use in your server and displays the documents in the language for that region (if available). If a document is not available in the language for that region, the English-language version is displayed.

Use one of the following procedures to start the Documentation Browser:

- If Autostart is enabled, insert the CD into the CD or DVD drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users, use one of the following procedures:

    - If you are using a Windows operating system, insert the CD into the CD or DVD drive and click **Start ➙ Run**. In the **Open** field, type:
    `e:\win32.bat`
    where *e* is the drive letter of the CD or DVD drive, and click **OK**.

    - If you are using Red Hat Linux, insert the CD into the CD or DVD drive; then, run the following command from the `/mnt/cdrom` directory:
    `sh runlinux.sh`

Select the server from the **Product** menu. The **Available Topics** list displays all the documents for the server. Some documents might be in folders. A plus sign (+) indicates each folder or document that has additional documents under it. Click the plus sign to display the additional documents.

When you select a document, a description of the document is displayed under **Topic Description**. To select more than one document, press and hold the `Ctrl` key while you select the documents. Click **View** to view the selected document or documents in Acrobat Reader or xpdf. If you selected more than one document, all the selected documents are opened in Acrobat Reader or xpdf.

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it, and press Crtl+F to use the Acrobat search function, or press Alt+F to use the xpdf search function within the document.

Click **Help** for detailed information about using the Documentation Browser.

Related documentation

This *Installation and Service Guide* contains general information about the server including how to set up and cable the server, how to install supported optional devices, how to configure the server, and information to help you solve problems yourself and information for service technicians.

The following documentation also comes with the server:

- *Environmental Notices and User Guide*

  This document is in PDF format on the Lenovo *Documentation* CD. It contains translated environmental notices.

- *Lenovo License Agreement for Machine Code*

  This document is in PDF format on the Lenovo *Documentation* CD. It provides translated versions of the *Lenovo License Agreement for Machine Code* for your product.

- *Important Notices*

  This document is in printed format and comes with the server. It contains information about the safety, environmental, and electronic emission notices for your Lenovo product.

- *Licenses and Attributions Documents*

  This document is in PDF format on the Lenovo *Documentation* CD. It provides the open source notices.

- *Rack Installation Instructions*

  This printed document contains instructions for installing the server in a rack and comes with the rack kit.

- *Rack Safety Information*

  This multilingual document provides translated versions of the caution and danger statements that appear in the rack documentation. Each caution and danger statement has an assigned number, which you can use to locate the corresponding statement in your native language.

- *Safety Information*

  This document is in PDF format on the Lenovo *Documentation* CD. 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.

- *Safety Information Labels*

  This document provides the Simplified Chinese, Mongolian, Tibetan, Uygur, and Zhuang translated versions of the product safety labels.

- *Warranty Information*

This document is in printed format and comes with the server. It contains warranty terms and a pointer to the Lenovo Statement of Limited Warranty on the Lenovo website.

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

The server might have features that are not described in the documentation that you received 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 website. To check for updated documentation and technical updates, go to http://www.lenovo.com/support.

Notices and statements in this document

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is on the Lenovo *ThinkServer Documentation* CD. Each statement is numbered for reference to the corresponding statement in your language 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 might 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.

Server features and specifications

Use this information for an overview of the server features and specifications.

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

Microprocessor (depending on the model):

- Supports up to two Intel Xeon E5-2600 v4 series multi-core microprocessors (one installed)
- Level-3 cache
- Two QuickPath Interconnect (QPI) links speed up to 9.6 GT per second

  Notes:

  1. Use the Setup utility to determine the type and speed of the microprocessors in the server
  2. For a list of supported microprocessors, see http://www.lenovo.com/us/en/ serverproven/.

Memory:

- Sixteen DIMM connectors per node (eight per microprocessor)
- Support RDIMM, 8 GB/16 GB/32 GB memory capacities.
- Types: PC4-19200 (dual-rank), 2400 MHz, ECC, DDR4 registered DIMMs only

- Connectors: Four dual inline memory module (DIMM) connectors, two-way interleaved

Hard disk drive expansion bays (depending on the model):

Supports twenty-four 2.5-inch hot-swap SAS/SATA hard disk drive bays (per chassis, total of 4 nodes).

Attention: As a general consideration, do not mix standard 512-byte and advanced 4-KB format drives in the same RAID array because it might lead to potential performance issues.

PCI expansion slots:

Supports three PCI interface slots: low-profile half-length, OCP type mezzanine, and customized mezzanine adapter.

Power supply (depending on the model):

Supports two hot-swap AC power supplies.

- 1200-watt power supply
- 1600-watt power supply
- 1+1 redundant

RAID controllers (depending on the model):

- Software RAID supportability for RAID levels 0, 1, 5, and 10
- Hardware RAID supportability for RAID levels 0, 1, 10, and 1E

Integrated functions:

- TMM, which consolidates multiple management functions in a single chip
- One System Management RJ-45 port to connect to a systems management network. This system management connector is dedicated to the TMM functions, which consolidates multiple management functions in a single chip
- Two Universal Serial Bus (USB) ports on the rear on each node
- Integrated SATA controller in PCH
- One VGA port

Video controller (integrated into TMM chip):

- ASPEED
- SVGA compatible video controller
- Avocent Digital Video Compression
- Video memory is not expandable

Note: Maximum video resolution is 1920 x 1200 at 60 Hz.

Size:
2U chassis

- Height: 87 mm (3.43 inches)
- Depth: 835 mm (32.9 inches)
- Width: 442 mm (17.40 inches)
- Weight:
    - Minimum configuration (with one node): 22.4 kg (49 lbs)
    - Maximum configuration (with four nodes): 36.9 kg (81 lbs)

Node

- Height: 41 mm (1.62 inches)
- Depth: 572 mm (22.51 inches)
- Width: 171 mm (6.74 inches)
- Weight:

  - Minimum weight: 2.4 kg (5 lb)
  - Maximum weight: 2.9 kg (6 lb)

Acoustical noise emissions:

With the maximum configuration of two microprocessors installed, full memory installed, full hard disk drives installed, and two power supplies installed:

- Operation: 6.8 bels
- Idle: 6.2 bels

Environment:

The ThinkServer sd350 Server complies with ASHRAE class A2 specifications

- Power on[1]:

  - Temperature: 10°C - 35°C (50°F - 95°F) up to 950 m (3,117ft). Above 950 m, de-rated maximum air temperature 1°C / 300m [2]
  - Humidity, non-condensing: 20% - 80% relative humidity [3]
  - Maximum dew point: 21°C (70°F)
  - Maximum altitude: 3050 m (10,000 ft) & 10°C - 28°C (50°F - 82°F)
  - Maximum rate of temperature change: 5°C/hr (41°F/hr) for tape drive, 20°C/hr (68°F/hr) for HDDs [4]
- Power off[5]:

  - Temperature: 5°C to 45°C (41°F - 113°F)
  - Relative humidity: 8% - 80%
  - Maximum dew point: 27°C (80.6°F)
- Storage (non-operating)::

  - Temperature: 1°C to 60°C (33.8°F - 140°F)
  - Altitude: 3050 m (10,000 ft)
  - Relative humidity: 5% - 80%
  - Maximum dew point: 29°C (84.2°F)
- Shipment (non-operating)

  - Temperature: -40°C to 60°C (-40°F - 140°F)
  - Altitude: 10700 m (35105 ft)
  - Relative humidity: 5% - 100%
  - Maximum dew point: 29°C (84.2°F)

Fan fails mode:

When any fan fails and ambient temperature is above 27°C, system performance may be degraded and have an event log indicated.

Heat output (based on 1600–Watts):

Approximate heat output:

- Minimum configuration: 604.1 BTU per hour (177 watts)
- Maximum configuration: 6051.3 BTU per hour (1773 watts)

Electrical input:

- Sine-wave input (50-60 Hz) required
- Input voltage high range:
  - Minimum: 200 V AC
  - Maximum: 240 V AC
- Input kilovolt-amperes (kVA), approximately:
  - Minimum: 0.153 kVA
  - Maximum: 1.544 kVA

Attention:

1. Chassis is powered on.
2. A2 - Derate maximum allowable temperature 1°C/300 m above 950 m.
3. Moisture levels lower than 0.5°C DP, but not lower -10 °C DP or 8% relative humidity, can be accepted if appropriate control measures are implemented to limit the generation of static electricity on personnel and equipment in the data center. All personnel and mobile furnishings and equipment must be connected to ground via an appropriate static control system. The following items are considered the minimum requirements:
   a. Conductive materials (conductive flooring, conductive footwear on all personnel that go into the datacenter, all mobile furnishings and equipment will be made of conductive or static dissipative materials).
   b. During maintenance on any hardware, a properly functioning wrist strap must be used by any personnel who contacts IT equipment.
4. 5°C/hr for data centers employing tape drives and 20°C/hr for data centers employing disk drives.
5. Chassis is removed from original shipping container and is installed but not in use, for example, during repair, maintenance, or upgrade.

What your server offers

The server uses the following features and technologies.

- **Lenovo*EasyStartup Setup and Installation* CD**

  The *EasyStartup Setup and Installation* CD, which you can download from the web, provides programs to help you set up the server and install a Windows/Linux/Vmware operating system. The LenovoEasyStartup program detects installed optional hardware devices and provides the correct configuration programs and device drivers. For more information about the *EasyStartup Setup and Installation* CD, see "Using the EasyStartup Setup" on page 26.

- **Basic System Management**

  The TMM combines service processor functions, video controller, and remote presence and blue-screen capture features in a single chip. The TMM provides advanced service-processor control, monitoring, and alerting function. If an environmental condition exceeds a threshold or if a system component fails, the TMM lights LEDs to help you diagnose the problem, records the error in the TMM event log, and alerts you to the problem. Optionally, the TMM also provides a virtual presence capability for remote

server management capabilities. The TMM provides remote server management through the following industry-standard interfaces:

– Intelligent Platform Management Interface (IPMI) version 2.0

– Simple Network Management Protocol (SNMP) version 3.0

– Common Information Model (CIM)

– Web browser

For additional information, see the TMM User Guide: *Thinkserver SD350 System Manager User Guide.pdf* at the http://www.lenovo.com/support.

- **Lenovo ThinkServer Diagnostics (LTD)**

  There are three editions of Lenovo ThinkServer Diagnostics: standalone edition (LTDS), Windows edition(LTDW) and Linux Edition(LTDL). The Lenovo ThinkServer Diagnostics enables you to diagnose server problems, perform some diagnostic tests, and collect system information. Examples of the system information include basic operating-system information, hardware information, SEL, RAID log, and so on. Depending on the model, your server might come with one of the following diagnostic program editions:

  – Lenovo ThinkServer Diagnostics Linux Edition (LTDL)

  – Lenovo ThinkServer Diagnostics Standalone Edition (LTDS)

  – Lenovo ThinkServer Diagnostics Windows Edition (LTDW)

  For more information about Lenovo ThinkServer Diagnostics, go to https://support.lenovo.com/tw/zh/lenovodiagnosticsolutions/downloads. Locate the **Lenovo ThinkServer Diagnostics** section at the bottom of the Web page. Then, click the desired link for more information.

- **Large data-storage capacity and hot-swap capability (6 drive bays per node)**

  The server supports a maximum of twenty-four 2.5-inch hot-swap Serial Attached SCSI (SAS) or Serial ATA (SATA) hard disk drives.

- **Large system-memory capacity**

  The server supports up to 32 GB RDIMMs memory module. The memory controller supports error correcting code (ECC) for up to 4 industry-standard PC4-19200 (DDR4-2400), DDR4 (fourth-generation double-data-rate).

- **Lenovo Partner Pack for Microsoft System Center Configurations management**

  The Lenovo Partner Pack for Microsoft System Center Configurations Management (SCCM) program helps you manage the firmware components in your ThinkServer server. The firmware components include TMM, BIOS, Deployment Manager Application, Windows Driver Package for Deployment Manager, and Linux Driver Package for Deployment Manager. The program also enables users to send e-mail alerts to related recipients when certain events are detected. For detailed information about using the program, refer to the help system of the program.

- **Lenovo Partner Pack for Microsoft System Center Operations management**

  The Lenovo Partner Pack for Microsoft System Center Operations Management program automatically detects the managed servers of your ThinkServer server and provides detailed system information about the managed servers. The system information includes component inventory, component status, and sensor status. The program also enables users to perform management tasks, such as restarting or turning off your ThinkServer server, launching a remote console, and accessing the Thinkserver Management Module (TMM) interface. For detailed information about using the program, refer to the help system of the program.

- **Lenovo Partner Pack for VMware vCenter**

  The Lenovo Partner Pack for VMware vCenter program provides detailed system information about the managed servers of your ThinkServer server in the VMware virtualized environment. The system information includes the inventory and status of components such as microprocessors, memory modules,

fans, and temperature sensors. The program enables users to perform tasks such as launching a remote console and accessing the Thinkserver Management Module (TMM) interface. The program also provides an easy way to update the firmware and send e-mail alerts to related recipients when certain events are detected. For detailed information about using the program, refer to the help system of the program.

- **Lenovo ThinkServer Power Planner**

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

- **Lenovo XClarity Administrator**

  Lenovo XClarity Administrator is a centralized resource-management solution that enables administrators to deploy infrastructure faster and with less effort. The solution seamlessly integrates into System x, ThinkServer, and NeXtScale servers, as well as the Flex System converged infrastructure platform.

  Lenovo XClarity Administrator provides:

  – Automated discovery

  – Agent-free hardware management

  – Monitoring

  Administrators are able to find the right information and accomplish critical tasks faster through an uncluttered, dashboard-driven graphical user interface (GUI). Centralizing and automating foundational infrastructure deployment and lifecycle management tasks across large pools of systems frees up administrator time, and makes resources available to end-users faster.

  Lenovo XClarity is easily extended into the leading virtualization management platforms from Microsoft and VMware using software plug-ins, called Lenovo XClarity Integrators. The solution improves workload uptime and service-level assurance by dynamically relocating workloads from affected hosts in the cluster during rolling server reboots or firmware updates, or during predicted hardware failures.

  For more information about Lenovo XClarity Administrator, see the http://shop.lenovo.com/us/en/systems/software/systems-management/xclarity/ and the http://pic.dhe.ibm.com/infocenter/flexsys/information/topic/com.lenovo.lxca.doc/aug_product_page.html.

- **Installing Lenovo XClarity Administrator**

  – **Installing Lenovo XClarity Administrator for the first time**

    The initial setup of Lenovo XClarity Administrator involves preparing the network, installing and configuring the Lenovo XClarity Administrator virtual appliance, managing systems, and optionally setting up automatic problem notification.

    There are a number of different ways to connect manageable systems to the network and to set up the Lenovo XClarity Administrator to manage those systems based on the network topology that is implemented in your environment. For guidance for installing the Lenovo XClarity Administrator in VMware ESXi-based and Hyper-V environments, see http://pic.dhe.ibm.com/infocenter/flexsys/information/index.jsp?topic=%2Fcom.lenovo.lxca.doc%2 Fsetup.html.

  – **Free 90-day trial**

    Lenovo XClarity Administrator offers a free, 90-day trial license that enables you to use all available features (including operating-system deployment, firmware maintenance, and configuration management) for a limited time.

    To continue using Lenovo XClarity Administrator to manage your Lenovo hardware after the 90–day trial period, you are required to purchase a full-function-enablement license for Lenovo XClarity Administrator. You can purchase Lenovo XClarity Administrator licenses from your Lenovo seller or business partner.

For information about installing the license, see
http://pic.dhe.ibm.com/infocenter/flexsys/information/index.jsp?topic=%2Fcom.lenovo.lxca.doc%2
Fupdate_lxcasw.html.

– **Updating Lenovo XClarity Administrator**

You can download or import Lenovo XClarity Administrator updates and
install the updates from the Lenovo XClarity Administrator web interface.
For information about updating a Lenovo XClarity Administrator, see
http://pic.dhe.ibm.com/infocenter/flexsys/information/index.jsp?topic=%2Fcom.lenovo.lxca.doc%2
Fupdate_lxcasw.html.Ensure that you carefully read the Installation and Setup Instructions in the
`Invgy_sw_lxca_***_anyos_noarch.txt` file that is provided in the update package .zip file.

- **Multi-core processing**

  The server supports Intel Xeon E5-26xx v4 series multi-core microprocessors. The server comes with
  one microprocessor installed.

- **PCI adapter capabilities**

  The server has three PCI interface slots: low-profile half-length, OCP type mezzanine, and customized
  mezzanine.

- **Cooling and optional power capabilities**

  The server supports five speed-controlled simple-swap fans for a full configuration. The server comes
  with two 1200 or 1600-watt hot-swap power supply installed. The server supports a maximum of two
  1600-watt hot-swap power supplies. For redundancy support on hot-swap models, two power-supplies
  must be installed in the server. Two power supplies enables continued operation if one of the power
  supplies fails.

- **RAID support**

  The RAID adapter provides hardware redundant array of independent disks (RAID) support to create
  configurations. The standard RAID adapter provides RAID levels 0, 1, and 10.

- **Systems-management capabilities**

  The server comes with a TMM. When the TMM is used with the systems-management software that
  comes with the server, you can manage the functions of the server locally and remotely. The TMM also
  provides system monitoring, event recording, and network alert capability. The systems-management
  connector for the TMM is located on the rear of the server.

- **UEFI-compliant server firmware**

  The UEFI firmware offers several features, including Unified Extensible Firmware Interface (UEFI)
  version 2.1 compliance, enhanced reliability, availability, and serviceability (RAS) capabilities, and basic
  input/output system (BIOS) compatibility support. UEFI replaces the BIOS and defines a standard
  interface between the operating system, platform firmware, and external devices. The server is capable of
  booting UEFI-compliant operating systems, BIOS-based operating systems, and BIOS-based adapters
  as well as UEFI-compliant adapters.

Lenovo XClarity Administrator

Lenovo XClarity Administrator is a centralized, resource-management solution that simplifies infrastructure
management, speeds responses, and enhances the availability of Lenovo® server systems and solutions. It
runs as a virtual appliance that automates discovery, inventory, tracking, monitoring, and provisioning for
Lenovo servers, Flex System servers, and RackSwitch switches in a secure environment.

Lenovo XClarity Administrator provides a central interface to perform the following functions for all managed
endpoints.

- **Hardware management**

Lenovo XClarity Administrator provides agent-free hardware management. It can automatically discover manageable endpoints, including Flex System chassis and components, System x, NeXtScale, and ThinkServer servers, and RackSwitch switches. Inventory of the discovered endpoints is also gathered, so an at-a-glance view of the managed hardware inventory and status is possible.

- **Hardware monitoring**

  Lenovo XClarity Administrator provides a centralized view of all events and alerts that are generated from the managed endpoints. When a CMM or IMM detects an issue, an alert or event is passed to the Lenovo XClarity Administrator and is displayed in the events or alerts log. A summary of all alerts and events is visible from the Dashboard and the Status bar. Events and alerts for a specific endpoint are available from the Alerts and Events detail page for that endpoint.

- **Service and support**

  Lenovo XClarity Administrator can be set up to collect and send diagnostic files automatically to your preferred service provider when certain serviceable events occur in Lenovo XClarity Administrator and the managed endpoints. You can choose to send diagnostic files to Lenovo Support using call home or to another service provider using SFTP. You can also manually collect diagnostic files, open a problem record, and send diagnostic files to the Lenovo Support Center.

- **Task automation using scripts**

  Lenovo XClarity Administrator can be integrated into external, higher-level management and automation platforms through open REST application programming interfaces (APIs). Using the REST APIs, Lenovo XClarity Administrator can easily integrate with your existing management infrastructure. You can also run Lenovo XClarity *cmdlets* in a Microsoft PowerShell session to automate certain management functions. The cmdlets use Lenovo XClarity Administrator REST APIs and can automate functions

- **Integration with other management software**

  Lenovo XClarity Administrator is available stand-alone or as a bundled offering that is known asLenovo XClarity Pro. Lenovo XClarity Pro is composed of the base Administrator product plus two Lenovo XClarity Integrator modules that provide integration into Microsoft Systems Center or VMware vCenter. Together, these tools provide discovery, monitoring, configuration, and management functions to reduce the cost and complexity of routine system administration for System x, NeXtScale, and Flex System endpoints.

More information about Lenovo XClarity Administrator is available at
http://shop.lenovo.com/us/en/systems/software/systems-management/xclarity/.

Reliability, availability, and serviceability

Three important computer design features are reliability, availability, and serviceability (RAS). The RAS features help to ensure the integrity of the data that is stored in the server, the availability of the server when you need it, and the ease with which you can diagnose and correct problems.

Your server has the following RAS features:
- 1-year parts and 1-year labor limited warranty (Machine Type 5493 and 5495)
- Backup basic input/output system switching under the control of the TMM
- Built-in monitoring for fan, power, temperature, voltage, and power-supply redundancy
- Diagnostic support for RAID and Ethernet adapters
- Error codes and messages
- Error correcting code (ECC) and system memory
- Cooling fans with speed-sensing capability
- Hot-swap hard disk drives
- Memory error correcting code and parity test
- Microprocessor built-in self-test (BIST), internal error signal monitoring, internal thermal trip signal monitoring, configuration checking, and microprocessor and voltage regulator module failure identification through diagnostics
- Parity checking on the PCIe buses

- Power management: compliance with Advanced Configuration and Power Interface (ACPI)
- Power-on self-test (POST)
- Redundant hot-swap power supplies
- Serial Presence Detection (SPD) on memory, VPD on system board, and power supply
- Single-DIMM isolation of excessive correctable error or multi-bit error by the Unified Extensible Firmware Interface (UEFI)
- Upgradeable Unified Extensible Firmware Interface (UEFI), TMM firmware, and read-only memory (ROM) resident code, locally or over the LAN

Major components

The following illustration shows the major components in the server.

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

Fan cover

PCI riser-card assembly

LAN Mezz. card

Power interface board

HBA Mezz. card

Power interface board bracket

Heat sink (CPU2)

Fan board

Heat sink (CPU1)

Fan

Air baffle

Microprocessor

DIMM

Node system

Fan cage

2.5-inch HDD hot-swap backplane

Power supply

System management board cover

System management board / power backplane

2.5-inch hot-swap hard disk drive

2.5-inch hard disk drive filler panel

2.5-inch hard disk drive x4 filler panel
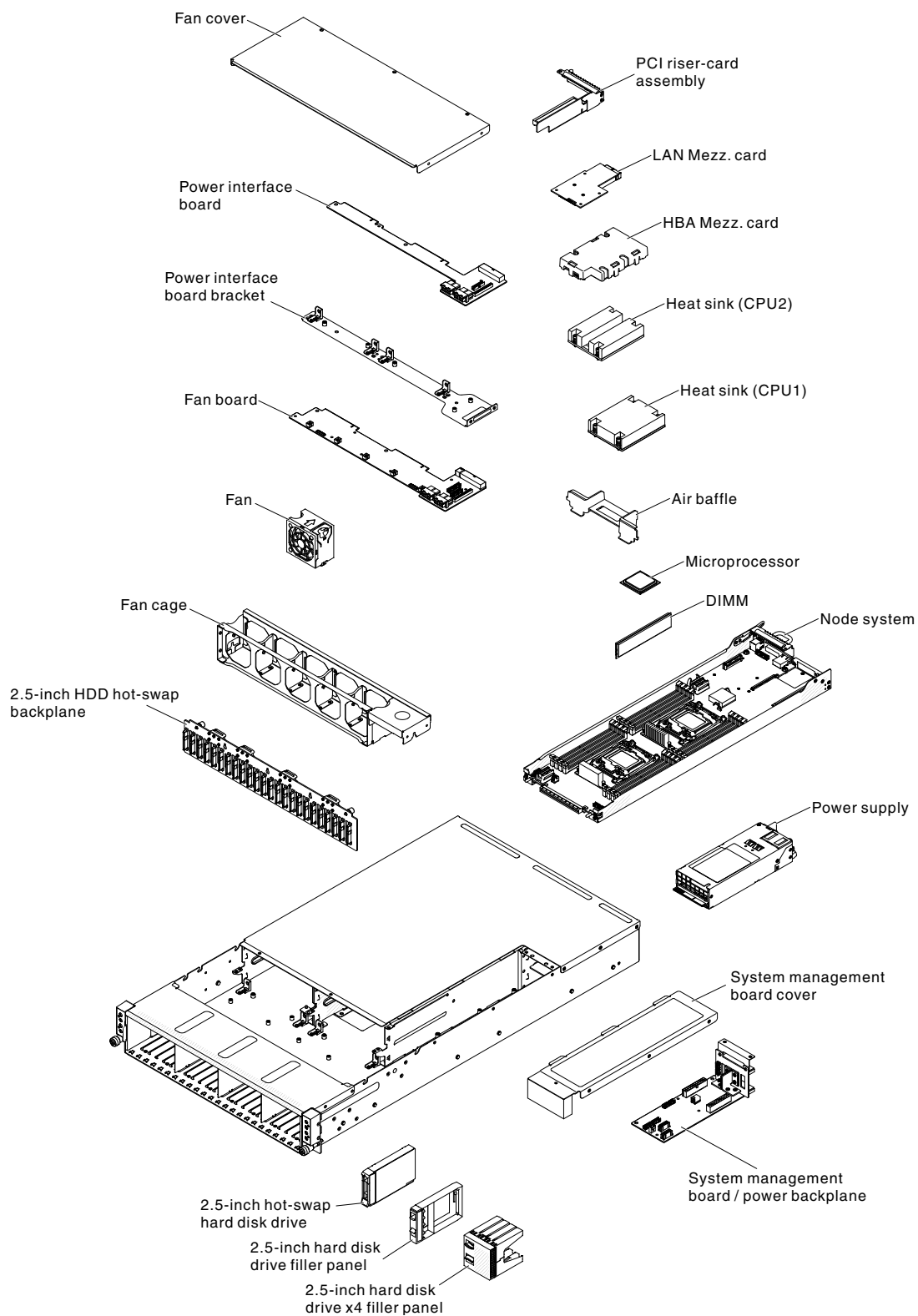
Figure 4. Major components

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.

Note: 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.

Server controls, LEDs, and power

This section describes the controls and light-emitting diodes (LEDs) and how to turn the server on and off.

For the locations of other LEDs on the system board, see "System-board LEDs" on page 21.

Front view

The following illustration shows the controls, LEDs, and connectors on the front of the server.

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

The following illustration shows the control panels and the 2.5-inch hot-swap hard disk drives.
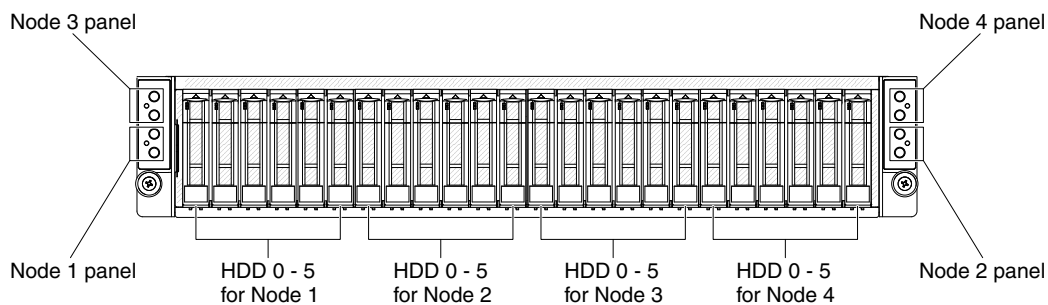
Figure 5. Front view of the 2.5-inch hot-swap hard disk drive server

The following illustration shows the control panel and its LEDs in the front of the server.
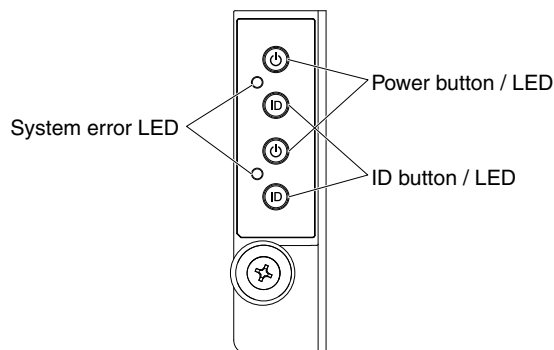
Figure 6. Control panel

- **Power button/LED:**

  When this LED is lit (green), it indicates that the node has power.

- **System error/LED:**

  When this LED is lit (yellow), it indicates that a system error has occurred. Check the event log for additional information.

- **ID button/LED:**

  The system administrator can remotely light this LED to aid in visually locating the compute node. When this LED is lit, the identify LED on the chassis is also lit.

Rear view

The following illustration shows the connectors and LEDs on the rear of the server.
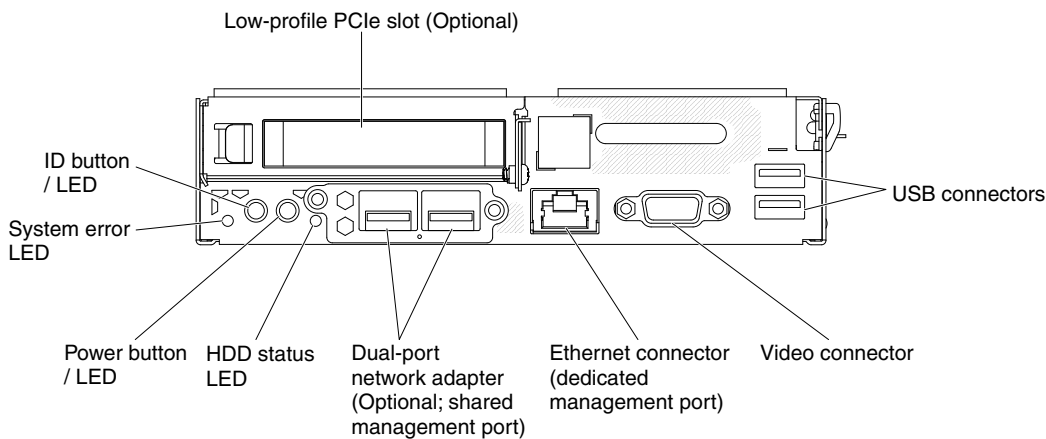
Figure 7. Connectors on the rear of the server

The following illustration shows the rear view of the entire system.
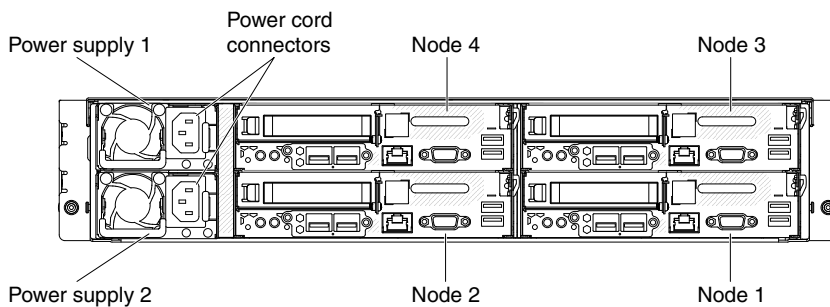
Figure 8. The rear view of the entire system

- **Power button/LED:** When this LED is lit (green), it indicates that the node has power.
- **System error/LED:** When this LED is lit (yellow), it indicates that a system error has occurred. Check the event log for additional information.
- **ID button/LED:** The system administrator can remotely light this LED to aid in visually locating the compute node. When this LED is lit, the identify LED on the chassis is also lit.
- **Hard disk drive LED:** When this LED is lit, it indicates that one or more hard disk drive has failed.

- **Low-profile PCIe slot (optional):** Support one PCI Express Gen3 low-profile, half-length adapter.
- **Ethernet connectors:** Use this dedicated management port to connect the server to a network. When you use the Ethernet 1 connector, the network can be shared with the TMM through NC-SI interface.
- **Video connector:** Connect a monitor to this connector.
- **USB connectors:** Connect a USB device, such as a USB mouse, keyboard, or other device to any of these connectors.
- **Power cord connector:** Connect the power cord to this connector.

System-board internal connectors

The following illustration shows the internal connectors on the system board.

Main power connector

JPT1 (SATA / SAS) connector

DIMM F2
DIMM F1
DIMM E2
DIMM E1

DIMM H2
DIMM H1
DIMM G2
DIMM G1

Microprocessor 2

DIMM B2
DIMM B1
DIMM A2
DIMM A1

DIMM D2
DIMM D1
DIMM C2
DIMM C1

Microprocessor 1

SATA 1 connector

JP18 (SATA) connector

SATA 2 connector

HBA mezzanine connector

PCIe riser connector

OCP mezzanine connector
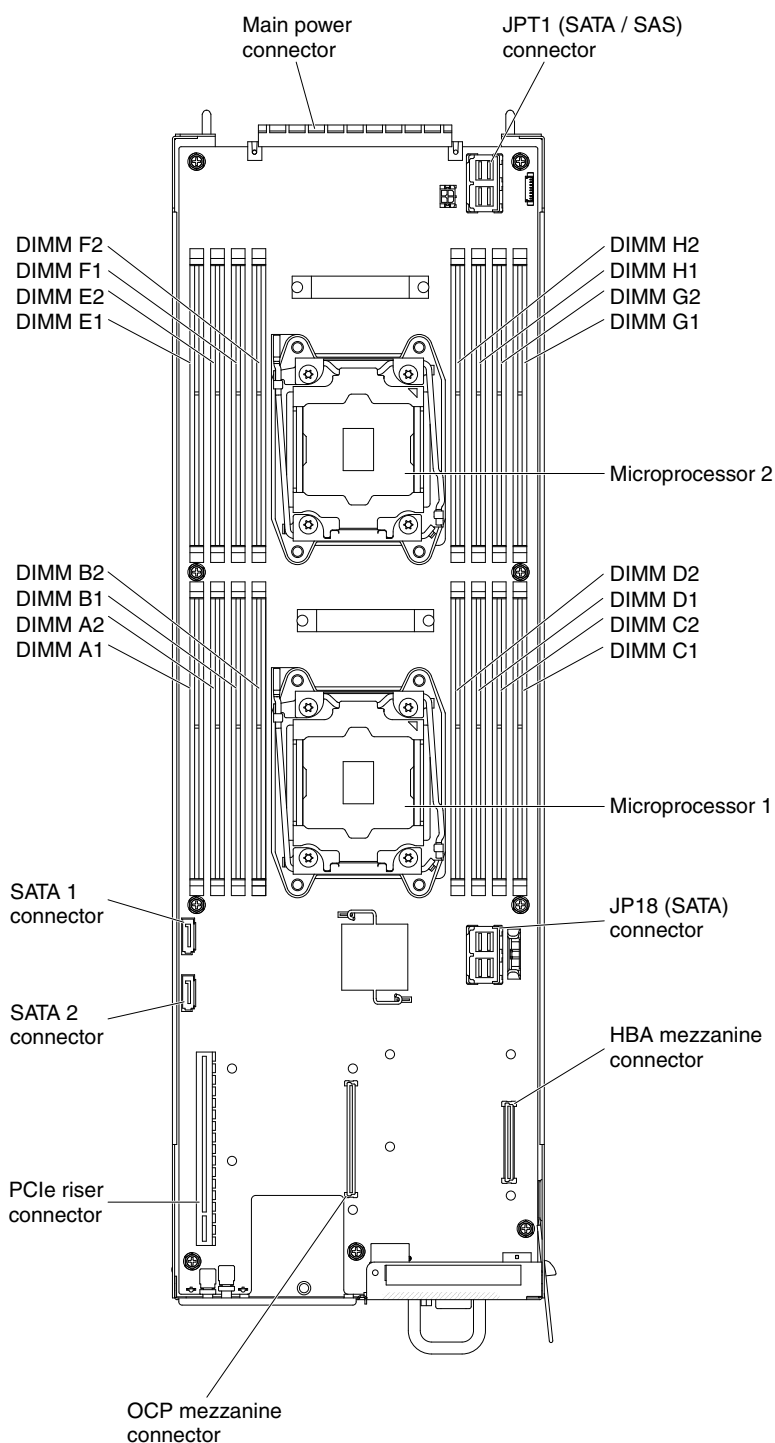
Figure 9. Internal connectors on the system board

System-board external connectors

The following illustration shows the external connectors on the system board.

Ethernet connector (dedicated management port)　　Video connector　　USB connectors
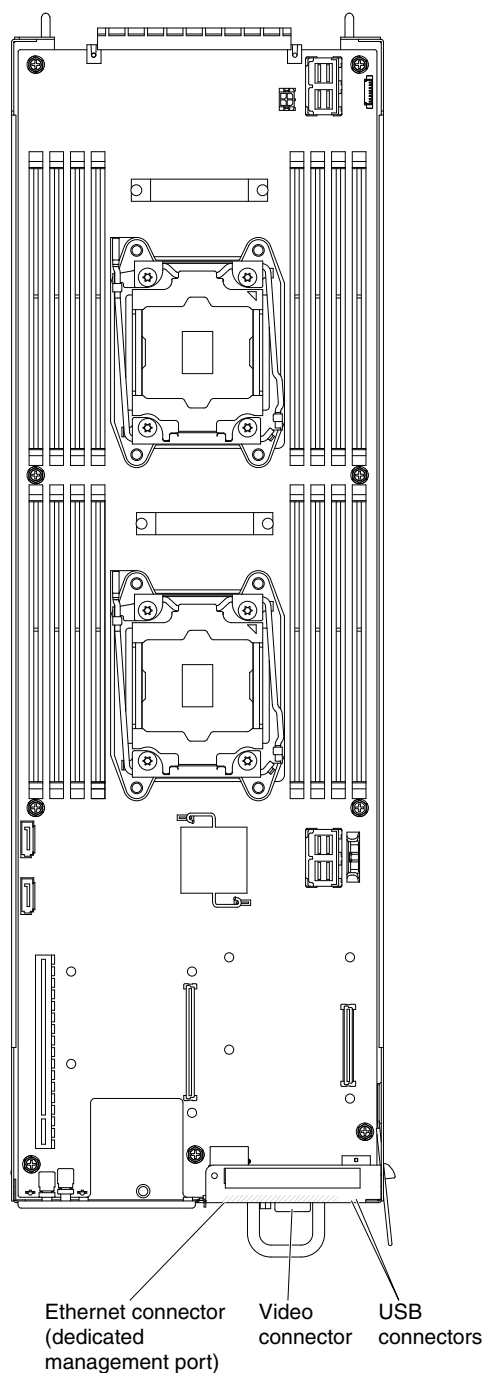
Figure 10. External connectors on the system board

System-board switches and jumpers

The following illustration shows the location and description of the switches, jumpers, and buttons.

Important:

1. Before you change any switch settings or move any jumpers, turn off the server; then, disconnect external cables. Review the information in "Safety" on page v, "Installation guidelines" on page 69, and "Turning off the server" on page 23.

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

3. If there is a clear protective sticker on the switch blocks, you must remove and discard it to access the switches.
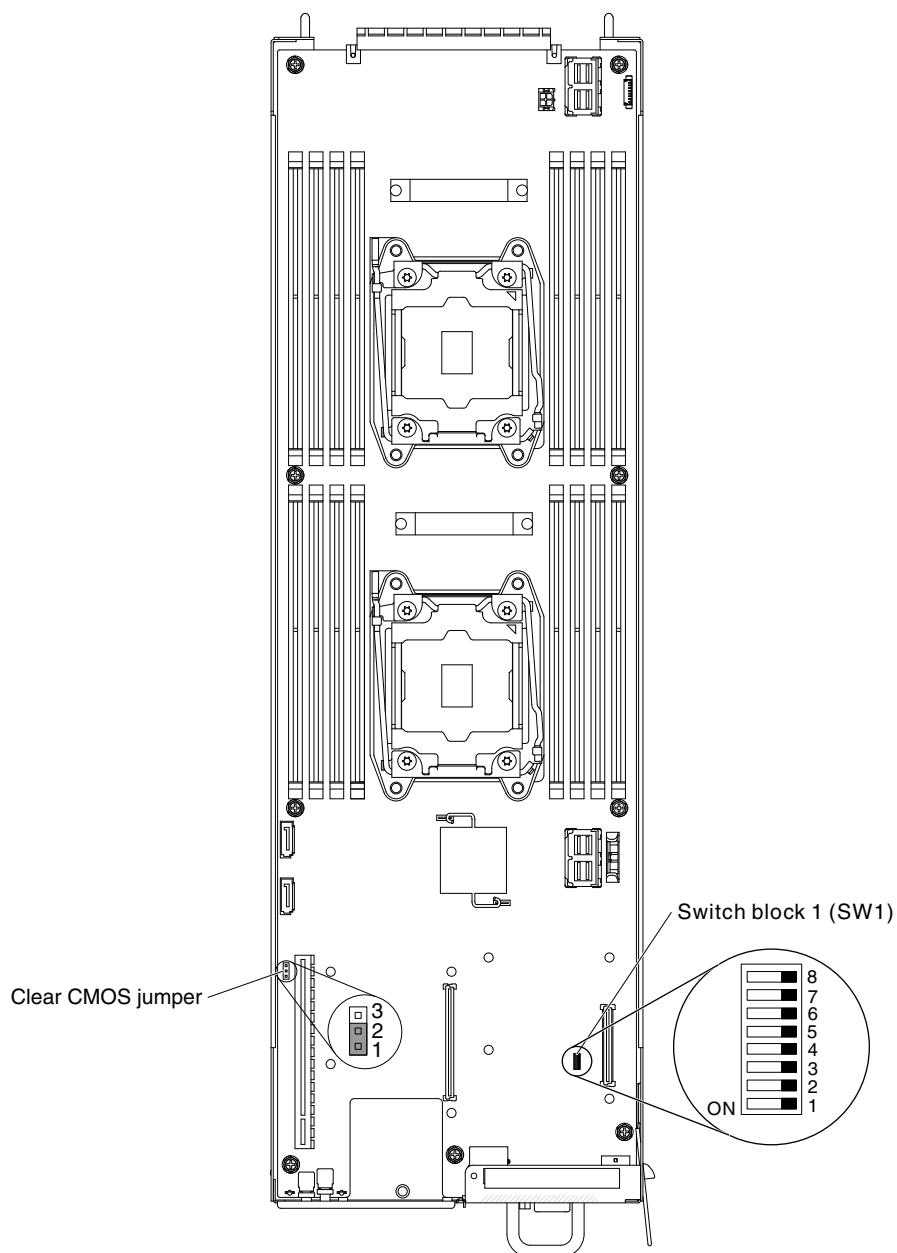
Figure 11. Location of the switches, jumpers, and buttons on the system board

The following table describes the jumpers on the system board.

Table 2. Jumpers definition

Jumper name	Description
Clear CMOS jumper	• Pins 1 and 2: Keep CMOS data (default) • Pins 2 and 3: Clear CMOS data

The following table describes the functions of the SW1 switch block on the system board.

Table 3. System board SW1 switch block definition

Switch number	Default position	Description
1	Off	BIOS recovery.
2	Off	ME recovery.
3	Off	Default off.
4	Off	Password clear.

System-board LEDs

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

System error LED   ID LED   Power LED   HDD status LED
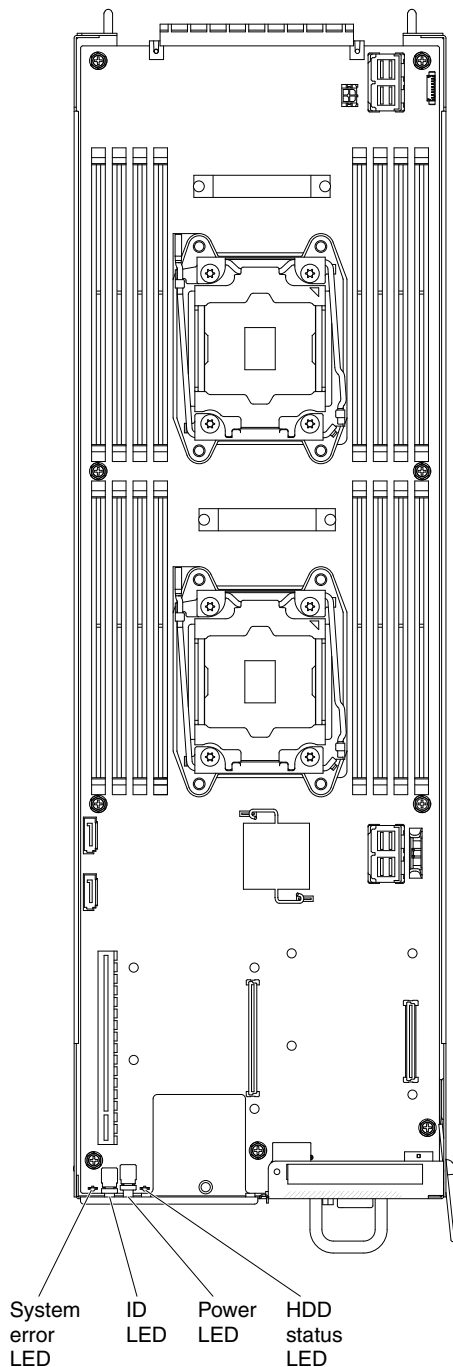
Figure 12. The LEDs on the system board

Server power features

When the server is connected to an ac power source but is not turned on, the operating system does not run, and all core logic except for the TMM is shutdown.

However, the server can respond to requests from TMM, such as a remote request to turn on the server. The power-on LED will not be lit when the server is connected to ac power but is not turned on.

Turning on the server

Use this information to turn on the server.

Approximately 5 seconds after the server is connected to ac power, all fans will start running to provide cooling while the server is connected to power and the power-on button LED will be off. Approximately 50 seconds after the server is connected to ac power, more fans might start running to provide cooling while the server is connected to power. You can turn on the server by pressing the power-control button and the power-on button LED will be lit.

Step 1. Press the power-on button to turn on the server.

Step 2. The server can also be turned on in any of the following ways:

- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.
- If your operating system supports the Wake on LAN feature, the Wake on LAN feature can turn on the server.

Note: When 8 GB or more of memory (physical or logical) is installed, some memory is reserved for various system resources and is unavailable to the operating system. The amount of memory that is reserved for system resources depends on the operating system, the configuration of the server, and the configured PCI options.

Turning off the server

Use this information to turn off the server.

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

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

Statement 5

CAUTION:
The power control button on the device 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.
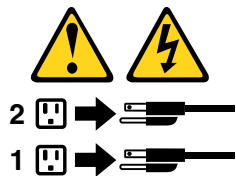
Step 1. The server can be turned off in any of the following ways:

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will turn off automatically.

- You can press the power-control button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.

- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the server.

- The server can be turned off by Wake on LAN feature with the following limitation:

  Note: When you install any PCI adapter, the power cords must be disconnected from the power source before you remove the PCI Express assembly. Otherwise, the Wake on LAN feature might not work.

- The TMM can turn off the server as an automatic response to a critical system failure.

Chapter 2. Configuration information and instructions

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

EasyUpdate firmware updater

This information provides an overview of the EasyUpdate firmware updater.

EasyUpdate is a standalone tool to easily update firmware in ThinkServer system and other supported devices present in ThinkServer systems. Firmware includes at least the system BIOS, low-level code on smart adapters such as RAID cards, HBA and system management controllers. The tool is delivered as an ISO image of a bootable CD, to be downloaded by end users from the Lenovo support website at http://www.lenovo.com/support. The CD contains an operating system environment, all necessary device drivers, the firmware updater user application, system and device firmware updating tools, firmware images, and documentation.

It is envisioned that the ISO images for firmware updater will be released quarterly by request and include the latest firmware updates that have been released prior to that date. The availability of Firmware Updater does not remove the requirement to have individual update packages available from the Lenovo support website at http://www.lenovo.com/support.

Using EasyUpdate firmware updater

To update the server firmware, do the following:

1. Go to the Lenovo Support Web site at http://www.lenovo.com/support to download the latest Firmware Updater ISO image. And burn the ISO image into CD/DVD or USB disk.

   Notes: Use rufus to burn the ISO image into USB disk

   a. Decompress "rufus_v1.3.4.exe" from the directory "usbutility" of ISO image and then execute it.

   b. Insert an empty USB key into a USB slot of your computer. Please note that the USB will be formatted during this procedure and all the contents will be lost.

   c. In the drop-down list box which is in the right of "Create a bootable disk using:", select "ISO image". And then click the right button in the drop-down list box to select Firmware Updater ISO image.

   d. Click "Start" to create a bootable USB key.

2. Insert the CD/DVD into the CD/DVD drive of the server or Insert the USB disk into the USB slot of the server. Then boot the server from CD/DVD or USB disk. Firmware Updater starts automatically and the language selection window is displayed.

3. Select a preferable language and click OK. Then the Welcome window is displayed.

4. Click Next, and a list of available firmware updates is displayed. From the list, you can select which firmware to be updated.

   Notes:

   a. By default, if a later or same version of the firmware exists on your server, then this firmware will not be selected. If you want to select this item, a message will be displayed to remind you whether to proceed the update process. If you click Yes, this firmware update will be selected.

   b. By default, some firmware needs to be updated at the same time. Once one of the firmware updates is selected or cleared, then others will be selected or cleared accordingly.

5. Click Next to begin the update process.

6. Wait for the update process to complete, which will take up to 30 minutes. Then click Next and the results window opens.

7. After reviewing the update results, restart the server to make the firmware updates take effect and remove the CD/DVD or USB disk.

Configuring the server

The following configuration programs come with the server:

- **Lenovo *EasyStartup Setup and Installation* CD**

  The EasyStartup program provides software-setup tools and installation tools that are designed for the server. Use this CD during the installation of the server to configure basic hardware features, such as an integrated SAS/SATA controller with RAID capabilities, and to simplify the installation of your operating system. For information about using this CD, see "Using the EasyStartup Setup" on page 26.

- **BIOS setup utility**

  The Setup utility is part of the UEFI firmware. Use it to perform configuration tasks, changing the startup-device sequence, setting the date and time, and setting passwords.

- **Boot Manager program**

  The Boot Manager is part of the UEFI firmware. Use it to override the startup sequence that is set in the Setup utility and temporarily assign a device to be first in the startup sequence. For more information about using this program, see "Using the Boot Manager" on page 32.

- **TMM**

  Use the TMM for configuration, to update the firmware and sensor data record/field replaceable unit (SDR/FRU) data, and to remotely manage a network.

- **Remote presence capability and blue-screen capture**

  The remote presence and blue-screen capture features are integrated functions of the TMM. The remote presence feature provides the following functions:

  – Remotely viewing video with graphics resolutions up to 1024 x 768, regardless of the system state

  – Remotely accessing the server, using the keyboard and mouse from a remote client

  – Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the server

  – Uploading a diskette image to the TMM memory and mapping it to the server as a virtual drive

  The blue-screen capture feature captures the video display contents before the TMM restarts the server when the TMM detects an operating-system hang condition. A system administrator can use the blue-screen capture feature to assist in determining the cause of the hang condition. For more information, see "Using the remote presence and blue-screen capture features" on page 33.

- **Ethernet controller configuration**

  For information about configuring the Ethernet controller, see Ethernet controller configuration section.

- **Configuring RAID arrays**

  For information about configuring RAID arrays, see "Configuring RAID arrays" on page 34 and http://docs.avagotech.com/docs/12353379.

  Important: It is highly recommended to apply a clean hard disk drive for RAID function to prevent unexpected system behavior.

Using the EasyStartup Setup

Use this information as an overview for using the EasyStartup Setup.

ThinkServer EasyStartup is a tool designed to facilitate the configuration and installation of the operating systems on the Lenovo Servers. It provides a Graphical User Interface that provides you a step by step process to Startup their system.

This tool allows you to choose the language, keyboard layout they want to use during the configuration process. It detects the server model and displays it to you before the configuration starts. It gives you an option to specify the size and type of the partition they want to create or to use the existing partitions. It then lists the operating systems supported on the detected server model and gives you the option to pick the operating system they want to install on the server.

ThinkServer EasyStartup installs on native hardware of the system. The bootable DVD detects for the supported Lenovo Servers and will only configure and install on a Lenovo supported server.

You can configure the following settings before the installation of the operating systems begins:

- Server Date & Time
- Full Name & Computer Name
- Administrator/root Password/root

If it is a Windows OS, it can also support the following settings:

- Organization
- Product ID
- Workgroup & Domain
- Configure the network Adapters
- Time Zone

It detects the installed hardware on the system and installs the device drivers based on the hardware detected.

EasyStartup features

This information provides an overview of the EasyStartup features.

The EasyStartup program has the following features:

- Provide for manual server configuration, installation, and operations
- Provide for automated server configuration, installation and operations
- Install device drivers based on the hardware that is detected during initial configuration
- Minimize restarts during hardware configuration and native OS installation
- Provide an easy to use graphical user interface
- Provide help text to guide usage and installation
- Hard disk configuration
- Validate configuration and provide configuration self-documentation
- Support cloning of configuration to support creation of identical servers
- Default to automated installation assistance
- Create and Format the install partition on the hard drives
- Support OS Install on pre-existing drive partitions
- Manual & Cloning RAID Configuration
- Support OS Install with EasyStartup DVD via Remote Management Module

- Support GPT partition mode (>2.2 TB volumes and arrays)
- Support Hypervisors install
- Server Introduction (Chinese and English only)

Windows only features

- Allow entries for GUI Run-Once line variables
- Install windows components
- Network configuration
- Auto-generate computer name

Using the Setup utility

Use these instructions to start the Setup utility.

Use the Unified Extensible Firmware Interface (UEFI) Setup Utility program 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 the startup characteristics of the server and the order of startup devices
- Set and change settings for advanced hardware features
- View, set, and change settings for power-management features
- View and clear error logs
- Change interrupt request (IRQ) settings
- Resolve configuration conflicts

Starting the Setup utility

Use this information to start up the Setup utility.

To start the Setup utility, complete the following steps:

Step 1.   Turn on the server.

> **Note:** Approximately 5 to 10 seconds after the server is connected to power, the power-control button becomes active.

Step 2.   When the prompt **<F1> Setup** is displayed, press F1. If you have set an administrator password, you must type the administrator password to access the full Setup utility menu. If you do not type the administrator password, a limited Setup utility menu is available.

Step 3.   Select settings to view or change.

Setup utility menu choices

Use the Setup utility main menu to view and configure server configuration data and settings.

The following choices are on the Setup utility main menu for the UEFI. Depending on the version of the firmware, some menu choices might differ slightly from these descriptions.

- **Main**

This page shows you the system information, include UEFI firmware version, build time and the system Date / Time were being set. This page also includes 2 sub-mainus below:

– **Processors**

Select this choice to view or change the processor settings.

– **Memory**

Select this choice to view or change the memory settings.

- **Advanced**

    – **AST2400 Super IO Configuration**

    Select this to enter Super IO next configuration page.

    – **Upper IO chip**

    Enter this page you can view the Super IO Chipest information.

    – **Serial Port 1 Configuration**

    Enter this page you can Enable/Disable Serial Port of this Super IO.

    – **Serial Port Console Redirection**

    Select this to enter the Super IO Console Redirection sub configuration page or view Windows Emergency Management Service (EMS) Console Redirection setting.

    – **Console Redirection Settings**

    Select this to view the overall settings.

    – **Legacy Console Redirection Setting**

    – **Console Redirection Settings**

    – **PCI Subsystem Settings**

    Select this to view or change the PCI Devices common settings.

    – **Network Stack Configuration**

    Select this to view or change Network Stace IPV4 and IPV6 PXE Support settings.

    – **CSM Configuration**

    Select this to view or change CSM Support and Netwrok, Storage, Video, Other PCI devices legacy support.

    – **Infor Report Configuration**

    Select this to view or change POST Report and Summary Screen settings.

    – **iSCSI Configuration**

    Select this to Add, Delete or Change an iSCSI Initiator Name or Attempt.

- **IntelRCSetup**

    – **Processor Configuration**

    Select this choice to view Processor common settings or change the dedicate processor settings.

    – **Per-Socket Configuration**

    Select to view or change CPU 0 or CPU 1 Configuration.

    – **Advanced Power Management Configuration**

    Select this to view or change Intel Chipset Power Management Configuration.

    – **CPU Pstate Control**

    – **CPU HWPM State Control**

    – **CPU C State Control**

- **CPU T State Control**
- **Common RefCode Configuration**

  Select this to view or change Intel Reference Code Configuration on Chipset.

  - **NMIOBase**
  - **NMIO High Size**
  - **Isoc Mode**
  - **Numa**

- **Memory Configuration**

  Select this to view or change Intel Chipset Integrated Memroy Controller settings.

  - **Memory Map**
  - **Memory RAS configuration**

  There are a couple of memory configuration modes that you can select for IT purposes.

  To set memory independent channel mode, mirror mode, or lockstep mode, you can choose **IntelRCSetup-> memory configuration-> memory RAS configuration-> RAS mode**. Then the screen displays 3 options (Disabled, Mirror, or Lockstep Mode). Choose accordingly as you expect the system to be operated at this mode (set Disabled is to select the independent channel mode).

  To enable memory sparing mode, you can choose **IntelRCSetup-> memory configuration-> memory RAS configuration-> memory rank sparing**. Then the screen displays 2 options (Disabled or Enabled) to active or not active the sparing mode.

  Note: You can not choose to enable sparing and mirroring modes at the same time. In case if the mirror mode is enabled, sparing mode will not be selected.

- **IIO Configuration**

  Select this to view or change Intel Chipset IIO Configuration.

  - **IIO0 Configuration**
  - **IIO1 Configuration**
  - **Intel VT for Directed I/O (VT-d)**

- **PCH Configuration**

  Select this to view or change PCH Configuration, include devices under PCH.

  - **PCH Devices**
  - **PCH sSATA Configuration**

    Select this to view or change PCH sSATA device configuration.

  - **PCH SATA Configuration**

    Select this to view or change PCH SATA device configuration.

  - **USB Configuration**

    Select this to view or change USB settings.

- **Server Mgmt**

  Select this to view or change the settings of how system is managed by UEFI and TMM server management functions.

  - **System Event Log**

    Select this to handle how the logs in SEL to be managed.

  - **TMM network Configuration**

    Select this choice to view the system management network interface port, the MAC address.

- **View Sysetm Event Log**

  Select this choice to enter the System Event viewer to view the log messages details.

- **DNS Configuration**

  Select this to Enable/Disable DNS Service, change DNS DHCP mode and DNS Server IP address

- **Security**

  There are 2 levels of passwords can be applied for the system: Administrator Passwrod and and User Password. ONLY if the Administrator's password is set, then this only limits access to Setup and is only asked for when entering Setup. ONLY if the User's password is set, then this is a power on password and must enterred to boot or enter Setup. In Setup the User will have Administrator rights. The password legnth must be within the Minum length 3 to Maximum length 20.

- **Boot**

  Select this to view the settings or change the Boot behavior during system boot time.

- **Save & Exit**

  Select this choice to exit from the Setup utility. If you have not saved the changes that you have made.

Passwords

From the **User Security** menu choice, you can set, change, and delete a power-on password and an administrator password.

The **User Security** menu choice is on the full Setup utility menu only.

If you set only a power-on password, you must type the power-on password to complete the system startup and to have access to the full Setup utility menu.

An administrator password is intended to be used by a system administrator; it limits access to the full Setup utility menu. If you set only an administrator password, you do not have to type a password to complete the system startup, but you must type the administrator password to access the Setup utility menu.

If you set a power-on password for a user and an administrator password for a system administrator, you must type the power-on password to complete the system startup. A system administrator who types the administrator password has access to the full Setup utility menu; the system administrator can give the user authority to set, change, and delete the power-on password. A user who types the power-on password has access to only the limited Setup utility menu; the user can set, change, and delete the power-on password, if the system administrator has given the user that authority.

User password

If a user password is set, when you turn on the server, you must type the user password to complete the system startup. You can use any combination of 6 - 20 printable ASCII characters for the password.

When a user password is set, you can enable the Unattended Start mode, in which the keyboard and mouse remain locked but the operating system can start. You can unlock the keyboard and mouse by typing the user password.

If you forget the user password, you can regain access to the server in any of the following ways:

- If an administrator password is set, type the administrator password at the password prompt. Start the Setup utility and reset the user password.

  Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.

- Remove the battery from the server, wait 30 seconds, and then reinstall it.

- Change the position of the user password switch (enable switch 2 of the system board switch block (SW1) to bypass the password check (see "System-board switches and jumpers" on page 19 for more information).

  Attention: Before you change any switch settings or move any jumpers, turn off the server; then, disconnect all power cords and external cables. See the safety information that begins "Safety" on page v. Do not change settings or move jumpers on any system-board switch or jumper blocks that are not shown in this document.

  The default for all of the switches on switch block SW1 is Off.

  While the server is turned off, move switch 2 of the switch block SW1 to the On position to enable the user password override. You can then start the Setup utility and reset the user password. You do not have to return the switch to the previous position.

  The user password override switch does not affect the administrator password.

Administrator password

If an administrator password is set, you must type the administrator password for access to the full Setup utility menu. You can use any combination of 6 to 20 printable ASCII characters for the password.

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.

Using the Boot Manager

Use this information for the Boot Manager.

The Boot Manager program is a built-in, menu-driven configuration utility program that you can use to temporarily redefine the first startup device without changing settings in the Setup utility.

To use the Boot Manager program, complete the following steps:

Step 1. Turn off the server.

Step 2. Restart the server.

Step 3. When the prompt ‹F1› *Setup* screen is displayed, move cursor Right Key to select Boot page, press Enter.

Step 4. Use the Up arrow and Down arrow keys to select Boot Option, then select an item from the menu and press Enter.

The next time the server starts, it returns to the startup sequence that is set in the Setup utility.

Using the TMM

The TMM is a second generation of the functions that were formerly provided by the baseboard management controller hardware. It combines service processor functions, video controller, and remote presence function in a single chip.

The TMM supports the following basic systems-management features:

- Alerts (in-band and out-of-band alerting, PET traps - IPMI style, SNMP, e-mail).

- Automatic microprocessor disable on failure and restart in a two-microprocessor configuration when one microprocessor signals an internal error. When one of the microprocessors fail, the server will disable the failing microprocessor and restart with the other microprocessor.

- Automatic Server Restart (ASR) when POST is not complete or the operating system hangs and the operating system watchdog timer times-out. The TMM might be configured to watch for the operating

system watchdog timer and reboot the system after a timeout, if the ASR feature is enabled. Otherwise, the TMM allows the administrator to generate a nonmaskable interrupt (NMI) by pressing an NMI button for an operating-system memory dump. ASR is supported by IPMI.

- A virtual media key, which enables remote presence support (remote video, remote keyboard/mouse, and remote storage).
- Boot sequence manipulation.
- Command-line interface.
- Configuration save and restore.
- DIMM error assistance. The Unified Extensible Firmware Interface (UEFI) disables a failing DIMM that is detected during POST, and the TMM lights the associated system error LED and the failing DIMM error LED.
- Environmental monitor with fan speed control for temperature, voltages, fan failure, power supply failure, and power backplane failure.
- Intelligent Platform Management Interface (IPMI) Specification V2.0 and Intelligent Platform Management Bus (IPMB) support.
- Invalid system configuration (CONFIG) LED support.
- Local firmware code flash update
- Nonmaskable interrupt (NMI) detection and reporting.
- Operating-system failure blue screen capture.
- PCI configuration data.
- Power/reset control (power-on, hard and soft shutdown, hard and soft reset, schedule power control).
- Query power-supply input power.
- ROM-based TMM firmware flash updates.
- Serial over LAN (SOL).
- Serial port redirection over telnet or ssh.
- SMI handling
- System event log (SEL) - user readable event log.

The TMM also provides the following remote server management capabilities through the ipmitool, a management utility program:

- **Command-line interface (IPMI Shell)**

  The command-line interface provides direct access to server management functions through the IPMI 2.0 protocol. Use the command-line interface to issue commands to control the server power, view system information, and identify the server. You can also save one or more commands as a text file and run the file as a script.

- **Serial over LAN**

  Establish a Serial over LAN (SOL) connection to manage servers from a remote location. You can remotely view and change the UEFI settings, restart the server, identify the server, and perform other management functions. Any standard Telnet client application can access the SOL connection.

Using the remote presence and blue-screen capture features

The remote presence and blue-screen capture features are integrated functions of the TMM.

The remote presence feature provides the following functions:

- Remotely viewing video with graphics resolutions up to 1024 x 768, regardless of the system state

- Remotely accessing the server, using the keyboard and mouse from a remote client
- Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the server
- Uploading a diskette image to the TMM memory and mapping it to the server as a virtual drive

The blue-screen capture feature captures the video display contents before the TMM restarts the server when the TMM detects an operating-system hang condition. A system administrator can use the blue-screen capture to assist in determining the cause of the hang condition.

Logging on to the web interface

Use this information to log on to the web interface.

To log on to the TMM web interface, complete the following steps:

Step 1. On a system that is connected to the server, open a web browser. In the **Address** or **URL** field, type the IP address or host name of the TMM to which you want to connect.

Note: If you are logging on to the TMM for the first time after installation, the TMM defaults to DHCP. The TMM network access tag provides the default host name of the TMM and does not require you to start the server.

Step 2. On the Login page, type the user name and password. If you are using the TMM for the first time, you can obtain the user name and password from your system administrator. All login attempts are documented in the system-event log.

Note: The TMM is set initially with a user name of **admin** and password of **admin**. You have read/write access. You must change the default password the first time you log on.

Step 3. Click **Log in** to start the session. The System Status and Health page provides a quick view of the system status.

Note: If you boot to the operating system while in the TMM GUI and the message "Booting OS or in unsupported OS" is displayed under **System Status → System State**, disable Windows 2008 or 2012 firewall or type the following command in the Windows 2008 or 2012 console. This might also affect blue-screen capture features.

```
netsh firewall set icmpsetting type=8 mode=ENABLE
```

By default, the icmp packet is blocked by Windows firewall. The TMM GUI will then change to "OS booted" status after you change the setting as indicated above in both the Web and CLI interfaces.

Configuring RAID arrays

Through the Setup utility, you can access utilities to configure RAID arrays.

For information about configuring RAID arrays, see "Configuring RAID arrays" on page 34 and http://docs.avagotech.com/docs/12353379.

Chapter 3. Troubleshooting

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

If you cannot diagnose and correct a problem by using the information in this chapter, see Appendix C "Getting help and technical assistance" on page 167 for more information.

Start here

You can solve many problems without outside assistance by following the troubleshooting procedures in this documentation and on the World Wide Web.

This document describes the diagnostic tests that you can perform, troubleshooting procedures, and explanations of error messages and error codes. The documentation that comes with your operating system and software also contains troubleshooting information.

Diagnosing a problem

Before you contact Lenovo or an approved warranty service provider, follow these procedures in the order in which they are presented to diagnose a problem with your server.

Step 1. **Return the server to the condition it was in before the problem occurred.**

If any hardware, software, or firmware was changed before the problem occurred, if possible, reverse those changes. This might include any of the following items:

- Hardware components
- Device drivers and firmware
- System software
- UEFI firmware
- System input power or network connections

Step 2. **View the System error LEDs and event logs.**

The server is designed for ease of diagnosis of hardware and software problems.

- **System error LEDs:** See "Front view" on page 15 for information about the descriptions of the LEDs.
- **Event logs:** See "System event logs" on page 41 for information about notification events and diagnosis.
- **Software or operating-system error codes:** See the documentation for the software or operating system for information about a specific error code. See the manufacturer's website for documentation.

Step 3. **Run Lenovo ThinkServer Diagnostics (LTD) and collect system data.**

Run Lenovo ThinkServer Diagnostics (LTD) to collect information about the hardware, firmware, software, and operating system. Have this information available when you contact Lenovo or an approved warranty service provider.

Step 4. **Check for and apply code updates.**

Fixes or workarounds for many problems might be available in updated UEFI firmware, device firmware, or device drivers. To display a list of available updates for the server, go to http://www.lenovo.com/support.

Attention: Installing the wrong firmware or device-driver update might cause the server to malfunction. Before you install a firmware or device-driver update, read any readme and change history files that are provided with the downloaded update. These files contain important information about the update and the procedure for installing the update, including any special procedure for updating from an early firmware or device-driver version to the latest version.

Important: Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code.

a. **Install manual system updates.**

1. **Determine the existing code levels.**

   In ThinkServer Diagnostics Tool, collect log and click **html** to view system firmware levels and operating-system levels.

2. **Download and install updates of code that is not at the latest level.**

   To display a list of available updates for the server, go to http://www.lenovo.com/support.

   When you click an update, an information page is displayed, including a list of the problems that the update fixes. Review this list for your specific problem; however, even if your problem is not listed, installing the update might solve the problem.

Step 5. **Check for and correct an incorrect configuration.** If the server is incorrectly configured, a system function can fail to work when you enable it; if you make an incorrect change to the server configuration, a system function that has been enabled can stop working.

a. **Make sure that all installed hardware and software are supported.**

   See http://www.lenovo.com/us/en/ serverproven/ to verify that the server supports the installed operating system, optional devices, and software levels. If any hardware or software component is not supported, uninstall it to determine whether it is causing the problem. You must remove nonsupported hardware before you contact Lenovo or an approved warranty service provider for support.

b. **Make sure that the server, operating system, and software are installed and configured correctly.**

   Many configuration problems are caused by loose power or signal cables or incorrectly seated adapters. You might be able to solve the problem by turning off the server, reconnecting cables, reseating adapters, and turning the server back on. For information about performing the checkout procedure, see "About the checkout procedure" on page 37. For information about configuring the server, see Chapter 2 "Configuration information and instructions" on page 25.

Step 6. **See controller and management software documentation.**

   If the problem is associated with a specific function (for example, if a RAID hard disk drive is marked offline in the RAID array), see the documentation for the associated controller and management or controlling software to verify that the controller is correctly configured.

   Problem determination information is available for many devices such as RAID and network adapters.

For problems with operating systems or Lenovo software or devices, go to http://www.lenovo.com/support.

Step 7. **Check for troubleshooting procedures and TECH tips.**

Troubleshooting procedures and RETAIN tips document known problems and suggested solutions. To search for troubleshooting procedures and RETAIN tips, go to http://www.lenovo.com/support.

Step 8. **Use the troubleshooting tables.**

See "Troubleshooting by symptom" on page 43 to find a solution to a problem that has identifiable symptoms.

A single problem might cause multiple symptoms. Follow the troubleshooting procedure for the most obvious symptom. If that procedure does not diagnose the problem, use the procedure for another symptom, if possible.

If the problem remains, contact Lenovo or an approved warranty service provider for assistance with additional problem determination and possible hardware replacement. To open an online service request, go to http://www.lenovo.com/support. Be prepared to provide information about any error codes and collected data.

Undocumented problems

If you have completed the diagnostic procedure and the problem remains, the problem might not have been previously identified by Lenovo. After you have verified that all code is at the latest level, all hardware and software configurations are valid, and no diagnostics LEDs or log entries indicate a hardware component failure, contact Lenovo or an approved warranty service provider for assistance.

To open an online service request, go to http://www.lenovo.com/support. Be prepared to provide information about any error codes and collected data and the problem determination procedures that you have used.

Service bulletins

Lenovo continually updates the support website with the latest tips and techniques that you can use to solve problem that you might have with the Lenovo ThinkServer sd350 Server server.

To find service bulletins that are available for the Lenovo ThinkServer sd350 Server server, go to http://www.lenovo.com/support and search for 5493 and 5495, and retain.

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 you perform the checkout procedure for diagnosing hardware problems, review the following information.

- Read the safety information that begins on page "Safety" on page v.
- Lenovo ThinkServer Diagnostics (LTD) provides the primary methods of testing the major components of the server, such as the system board, memory, processor, Ethernet controller, and hard disk drives. 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.
- If the server is halted and no error message is displayed, see "Troubleshooting by symptom" on page 43 and "Solving undetermined problems" on page 54.

- For information about power-supply problems, see "Solving power problems" on page 52 and "Power problems" on page 50,.
- For intermittent problems, check the event log; see "System event logs" on page 41 and Appendix B "Diagnostic error messages" on page 163.

Performing the checkout procedure

Use this information to perform the checkout procedure.

To perform the checkout procedure, complete the following steps:

Step 1. Is the server part of a cluster?

- **No:** Go to step 2.
- **Yes:** Shut down all failing servers that are related to the cluster. Go to step 2.

Step 2. Complete the following steps:

a. Check the power supply LEDs (see "Front view" on page 15).

b. Turn off the server and all external devices.

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

d. Check all cables and power cords.

e. Turn on all external devices.

f. Turn on the server. If the server does not start, see "Troubleshooting by symptom" on page 43.

g. Check for the following results:

- Successful completion of POST (see "POST" on page 42 for more information).
- Successful completion of startup, which is indicated by a readable display of the operating-system desktop.

Step 3. Is there a readable image on the monitor screen?

- **No:** Find the failure symptom in "Troubleshooting by symptom" on page 43; if necessary, see "Solving undetermined problems" on page 54.
- **Yes:** Run LTD.
  - If LTD reports an error, follow the instructions in Appendix B "Diagnostic error messages" on page 163.
  - If LTD does not report an error but you still suspect a problem, see "Solving undetermined problems" on page 54.

Diagnostic tools

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

- **Diagnostics**

  Use system error LED to diagnose system errors quickly. See "Front view" on page 15 for more information.

- **Event logs**

  The event logs list the error codes and messages that are generated when an error is detected for the subsystems TMM, POST, LTD, and the server baseboard management controller. See "System event logs" on page 41 for more information.

- **TMM**

  The TMM combines service processor functions, video controller, and remote presence and blue-screen capture features in a single chip. The TMM provides advanced service-processor control, monitoring, and alerting function. If an environmental condition exceeds a threshold or if a system component fails, the TMM lights LEDs to help you diagnose the problem, records the error in the TMM event log, and alerts you to the problem. Optionally, the TMM also provides a virtual presence capability for remote server management capabilities. The TMM provides remote server management through the following industry-standard interfaces:

  - Intelligent Platform Management Protocol (IPMI) version 2.0

  - Simple Network Management Protocol (SNMP) version 3

  - Common Information Model (CIM)

  - Web browser

  For more information about the TMM, see "Using the TMM" on page 32, "TMM error messages" on page 146.

- **Troubleshooting by symptom**

  These tables list problem symptoms and actions to correct the problems. See "Troubleshooting by symptom" on page 43 for more information.

System error LEDs

This section describes the system error LEDs on the system board and the suggested actions to correct the detected problems.

The illustration shows the system-board LEDs. The system board has system error LEDs that will help to locate the source of the error. Run the diagnostic programs to find out the cause of the error.
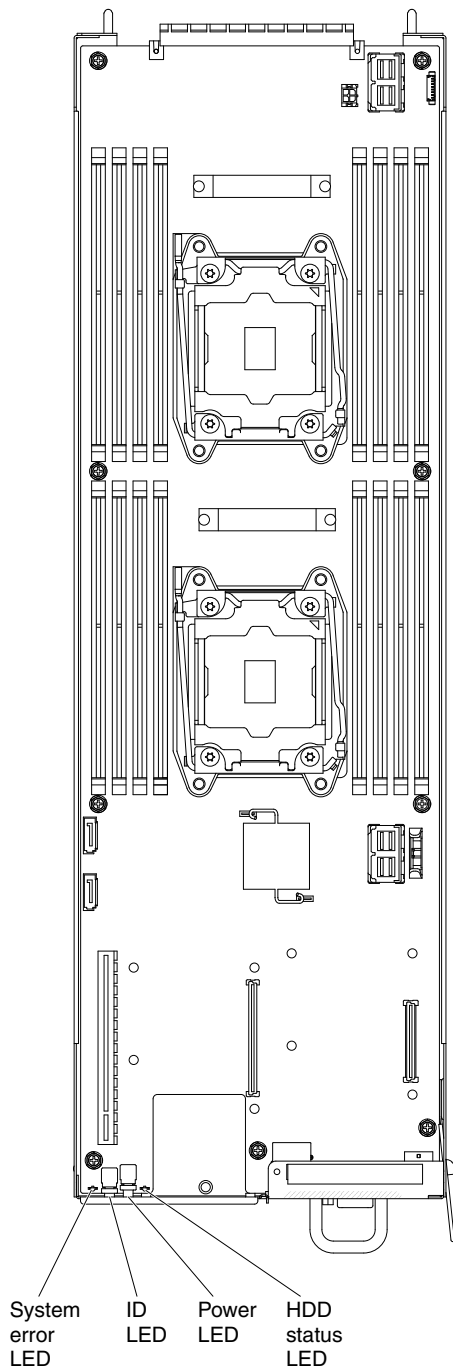
System error LED   ID LED   Power LED   HDD status LED

Figure 13. The LEDs on the system board

The server is designed so that LEDs remain lit when the server is connected to an ac power source but is not turned on, provided that the power supply is operating correctly. This feature helps you to isolate the problem when the operating system is shut down.

Note: When you disconnect the power source from the server, you lose the ability to view the LEDs because the LEDs are not lit when the power source is removed. Before you disconnect the power source, make a note of which LEDs are lit, including the LEDs that are lit on the operation information panel and LEDs inside the server on the system board.

Many errors are first indicated by a lit system-error LED on the control-panel assembly of the server. If this LED is lit, one or more LEDs elsewhere in the server might also be lit and can direct you to the source of the error.

Before you work inside the server to view the LEDs, read the "Safety" on page v and "Handling static-sensitive devices" on page 70.

If an error occurs, view the server LEDs in the following order:

1. Check the control-panel assembly on the front of the server. If the system-error LED is lit, it indicates that an error has occurred.

2. Check the front and rear of the server to determine whether any component LEDs are lit.

3. Look at the system service label inside the cover of the server, which gives an overview of internal components. This information can often provide enough information to correct the error.

System event logs

Error codes and messages are displayed in POST event log, system-event log, TMM event log, and Diagnostic event log.

- **System-event log:** This log contains POST and system management interrupt (SMI) events and all events that are generated by the baseboard management controller that is embedded in the TMM. You can view the contents of the system-event log through the Setup utility and through the Diagnostic program (as IPMI event log).The system-event log is limited in size. When it is full, new entries will not overwrite existing entries; therefore, you must periodically clear the system-event log through the Setup utility. When you are troubleshooting an error, you might have to save and then clear the system-event log to make the most recent events available for analysis.

    Messages are listed on the left side of the screen, and details about the selected message are displayed on the right side of the screen. To move from one entry to the next, use the Up Arrow (-) and Down Arrow (¯) keys.

    Some TMM sensors cause assertion events to be logged when their setpoints are reached. When a setpoint condition no longer exists, a corresponding deassertion event is logged. However, not all events are assertion-type events.

- **TMM event log:** This log contains a filtered subset of all TMM, POST, and system management interrupt (SMI) events. You can view the TMM event log through the TMM web interface. For more information, see "Logging on to the web interface" on page 34. You can also view the TMM event log through the Diagnostic program (as the ASM event log).

- **Diagnostic event log:** This log is generated by the Diagnostic program, and it is a chronologically ordered merge of the system-event log (as the IPMI event log), the RAID event log, the TMM event log, and the operating-system event logs. You can view the Diagnostic event log through the Diagnostic program (see "Viewing event logs without restarting the server" on page 42).

Viewing event logs through the Setup utility

Use this information to view the event logs through the Setup utility.

To view the POST event log or system-event log, complete the following steps:

Step 1.   Turn on the server.

Step 2.   When the prompt **<F1> Setup** is displayed, press F1. If you have set both a power-on password and an administrator password, you must type the administrator password to view the event logs.

Step 3.   Select **System Event Log** and use one of the following procedures:

- To view the POST event log, select **POST Event Viewer**.

- To view the system-event log, select **System Event Log**.

Viewing event logs without restarting the server

Use this information to view the event logs without restarting the server.

If the server is not hung and the TMM is connected to a network, methods are available for you to view one or more event logs without having to restart the server.

If IPMItool is installed in the server, you can use it to view the system-event log. Most recent versions of the Linux operating system come with a current version of IPMItool. For an overview of IPMI, go to blueprints and click **Using Intelligent Platform Management Interface (IPMI) on Lenovo Linux platforms**.

You can view the TMM event log through the **Event Log** link in the TMM web interface. For more information, see "Logging on to the web interface" on page 34.

The following table describes the methods that you can use to view the event logs, depending on the condition of the server. The first three conditions generally do not require that you restart the server.

Table 4. Methods for viewing event logs

Condition	Action
The server is not hung and is connected to a network (using an operating system controlled network ports).	Use any of the following methods: • Run diagnostic tool to view the diagnostic event log (requires IPMI driver) or create an output file that you can send to Lenovo service and support (using ftp or local copy). • Use IPMItool to view the system-event log (requires IPMI driver).
The server is not hung and is not connected to a network (using an operating system controlled network ports).	• Run diagnostic tool to view the diagnostic event log (requires IPMI driver) or create an output file that you can send to Lenovo service and support (using ftp or local copy). • Use IPMItool to view the system-event log (requires IPMI driver).
The server is not hung and the TMM is connected to a network.	In a web browser, type the IP address for the TMM and go to the **Event Log** page.
The server is hung, and no communication can be made with the TMM.	• Alternatively, you can restart the server and press F1 to start the Setup utility and view the POST event log or system-event log. For more information, see "Viewing event logs through the Setup utility" on page 41.

Clearing the event logs

Use this information to clear the event logs.

To clear the event logs, complete the following steps.

Note: The POST error log is automatically cleared each time the server is restarted.

Step 1. Turn on the server.

Step 2. When the prompt **<F1> Setup** is displayed, press F1. If you have set both a power-on password and an administrator password, you must type the administrator password to view the event logs.

Step 3. To clear the TMM system-event log, select **System Event Log ➔ Clear System Event Log**, then, press Enter twice.

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.

Note: This server does not use beep codes for server status.

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

If POST detects a problem, an error message is sent to the POST event log, see "System event logs" on page 41 for more information.

Error messages

This section provides the list of error codes and messages for UEFI/POST, TMM, and diagnostic that are generated when a problem is detected.

See Appendix A "TMM error messages" on page 145 and Appendix B "Diagnostic error messages" on page 163 for more information.

Troubleshooting by symptom

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

If you cannot find a solution to the problem in these tables, and Appendix B "Diagnostic error messages" on page 163 for more information about testing the server. For additional information to help you solve problems, see "Start here" on page 35.

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

Step 1.   Check the system-error LED on the operator information panel.

Step 2.   Remove the software or device that you just added.

Step 3.   Run Lenovo ThinkServer Diagnostics Tool to determine whether the server is running correctly (for information about using Lenovo ThinkServer Diagnostics Tool, see Appendix B "Diagnostic error messages" on page 163).

Step 4.   Reinstall the new software or new device.

General problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- If an action step is preceded by '(Trained technician only)', that step must be performed only by a Trained technician.
- Go to the Lenovo support website at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Table 5. General symptoms and actions

| Symptom	Action
A cover latch 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 microprocessor or the system board, the part must be replaced by a trained technician.
The server is hung while the screen is on. Cannot start the Setup utility by pressing F1.	See "Recovering the server firmware (UEFI update failure)" on page 56 for more information.

Hard disk drive problems
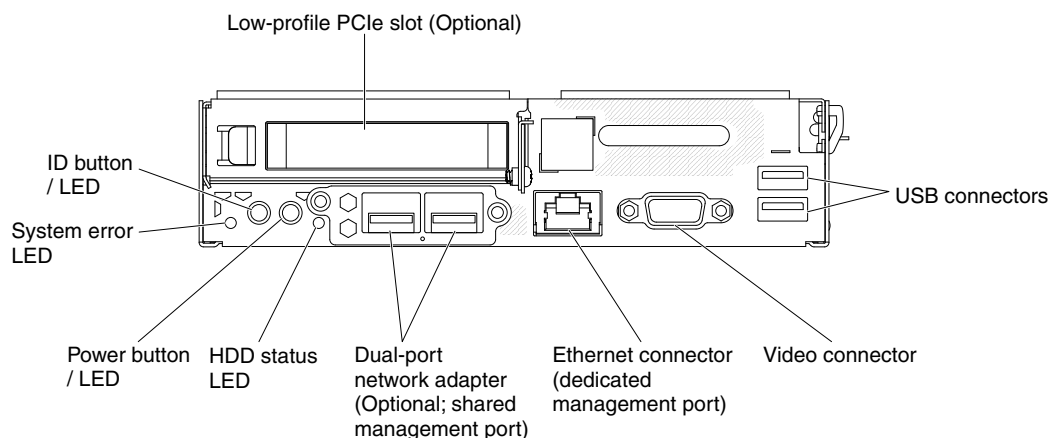
Figure 14. Connectors on the rear of the server

Note: HDD yellow status LED is not supported for PCH AHCI mode.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- If an action step is preceded by '(Trained technician only)', that step must be performed only by a Trained technician.
- Go to the Lenovo support website at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Table 6. Hard disk drive symptoms and actions

Symptom	Action
Not all drives are recognized by the hard disk drive diagnostic tests.	Remove the drive that is indicated by the diagnostic tests; then, run the hard disk drive diagnostic tests 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 Lenovo ThinkServer Diagnostics (LTD). **Note:** This test is not available on servers that have RAID arrays or servers that have SATA hard disk drives.
A hard disk drive has failed, and the associated yellow hard disk drive status LED is lit. (Hot-swap hard disk drives)	1. Re-configure the integrated SAS/SATA controller with RAID capabilities and the devices that are attached to it. 2. Run the Lenovo ThinkServer Diagnostics Tool disk drive test. 3. If the drive fails the test, replace the drive.

Table 6. Hard disk drive symptoms and actions (continued)

Symptom	Action
A newly installed hard disk drive is not recognized.	1. Observe the associated yellow hard disk drive status LED. If the LED is lit, it indicates a drive fault. 2. If the LED is lit, remove the drive from the bay, wait 45 seconds, and reinsert the drive, making sure that the drive assembly connects to the hard disk drive backplane. 3. Observe the associated green hard disk drive activity LED and the yellow status LED: • If the green activity LED is flashing and the yellow status LED is not lit, the drive is recognized by the controller and is working correctly. Run the Lenovo ThinkServer Diagnostics Tool hard disk drive test to determine whether the drive is detected. • If the green activity LED is flashing and the yellow status LED is flashing slowly, the drive is recognized by the controller and is rebuilding. • If neither LED is lit or flashing, check the hard disk drive backplane (go to step 4). • If the green activity LED is flashing and the yellow status LED is lit, replace the drive. If the activity of the LEDs remains the same, go to step 4. If the activity of the LEDs changes, return to step 1. 4. Make sure that the hard disk drive backplane is correctly seated. When it is correctly seated, the drive assemblies correctly connect to the backplane without bowing or causing movement of the backplane. 5. Reseat the backplane power cable and repeat steps 1 through 3. 6. Reseat the backplane signal cable and repeat steps 1 through 3. 7. Reseat the backplane configuration cable and repeat steps 1 through 3. 8. Suspect the backplane signal cable or the backplane: • Replace the affected backplane signal cable. • Replace the affected backplane. 9. Run the Lenovo ThinkServer Diagnostics Tool tests for the SAS/SATA adapter and hard disk drives. • If the adapter passes the test but the drives are not recognized, replace the backplane signal cable and run the tests again. • Replace the backplane. • If the adapter fails the test, disconnect the backplane signal cable from the adapter and run the tests again. • If the adapter fails the test, replace the adapter. 10. See "Problem determination tips" on page 54.
Multiple hard disk drives fail.	Make sure that the hard disk drive, SAS/SATA RAID adapter, and server device drivers and firmware are at the latest level. **Important:** Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code.
Multiple hard disk drives are offline.	1. Review the storage subsystem logs for indications of problems within the storage subsystem, such as backplane or cable problems. 2. See "Problem determination tips" on page 54.

Table 6. Hard disk drive symptoms and actions (continued)

Symptom	Action
A replacement hard disk drive does not rebuild.	1. Make sure that the hard disk drive is recognized by the adapter (the green hard disk drive activity LED is flashing). 2. Review the SAS/SATA RAID adapter documentation to determine the correct configuration parameters and settings.

A green hard disk drive activity LED does not accurately represent the actual state of the associated drive. (Hot-swap hard disk drives)	1. If the green hard disk drive activity LED does not flash when the drive is in use, run the Lenovo ThinkServer Diagnostics Tool disk drive test.
	2. Use one of the following procedures:
	  • If the drive passes the test, replace the backplane.
	  • If the drive fails the test, replace the drive.

An yellow hard disk drive status LED does not accurately represent the actual state of the associated drive. (Hot-swap hard disk drives)	1. If the yellow hard disk drive LED and the RAID adapter software do not indicate the same status for the drive, complete the following steps:
	  a. Turn off the server.
	  b. Reseat the SAS/SATA adapter.
	  c. Reseat the backplane configuration cable, signal cable, and backplane power cable.
	  d. Reseat the hard disk drive.
	  e. Turn on the server and observe the activity of the hard disk drive LEDs.
	2. See "Problem determination tips" on page 54.

Intermittent problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- If an action step is preceded by '(Trained technician only)', that step must be performed only by a Trained technician.
- Go to the Lenovo support website at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Table 7. Intermittent problems and actions

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.
	  • When the server is turned on, air is flowing from the fan grille. If there is no airflow, the fan is not working. This can cause the server to overheat and shut down.
	2. Check the system-error log or TMM event log (see "System event logs" on page 41).

Keyboard, mouse, or USB-device problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- If an action step is preceded by '(Trained technician only)', that step must be performed only by a Trained technician.
- Go to the Lenovo support website at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Table 8. Keyboard, mouse, or USB-device's symptoms and actions

Symptom	Action

All or some keys on the keyboard do not work.	1. Make sure that:
	  • The keyboard cable is securely connected.
	  • The server and the monitor are turned on.
	2. If you are using a USB keyboard, run the Setup utility and enable keyboardless operation.
	3. If you are using a USB keyboard and it is connected to a USB hub, disconnect the keyboard from the hub and connect it directly to the server.
	4. Replace the keyboard.

The mouse or USB-device does not work.	1. Make sure that:
	
	  • The mouse or USB device cable is securely connected to the server.
	
	  • The mouse or USB device drivers are installed correctly.
	
	  • The server and the monitor are turned on.
	
	  • The mouse option is enabled in the Setup utility.
	
	2. If you are using a USB mouse or USB device and it is connected to a USB hub, disconnect the mouse or USB device from the hub and connect it directly to the server.
	3. Replace the mouse or USB-device.

Memory problems

• Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.

• If an action step is preceded by '(Trained technician only)', that step must be performed only by a Trained technician.

• Go to the Lenovo support website at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Table 9. Memory problems and actions

Symptom	Action

The amount of system memory that is displayed is less than the amount of installed physical memory.	**Note:** Each time you install or remove a DIMM, you must disconnect the server from the power source; then, wait 10 seconds before restarting the server.
	1. Make sure that:
	
	  • No error LEDs are lit on the operator information panel.
	
	  • The memory modules are seated correctly.
	
	  • You have installed the correct type of memory.
	
	  • If you changed the memory, you updated the memory configuration in the Setup utility.
	
	  • 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.
	
	  • There is no memory mismatch when the server is at the minimum memory configuration.
	
	2. Reseat the DIMMs, and then restart the server.
	3. Check the POST error log:
	
	  • If a DIMM was disabled by a systems-management interrupt (SMI), replace the DIMM.

Table 9. Memory problems and actions (continued)

Symptom	Action
	• If a DIMM was disabled by the user or by POST, reseat the DIMM; then, run the Setup utility and enable the DIMM.
	4. Check that all DIMMs are initialized in the Setup utility.
	5. Make sure that there is no memory mismatch when the server is at the minimum memory configuration.
	6. Add one pair of DIMMs at a time, making sure that the DIMMs in each pair match.
	7. Reseat the DIMM.
	8. Re-enable all DIMMs using the Setup utility, and then restart the server.
	9. Replace the following components one at a time, in the order shown, restarting the server each time:
	a. DIMMs
	b. (Trained technician only) Replace the system board
Multiple rows of DIMMs in a branch are identified as failing.	**Note:** Each time you install or remove a DIMM, you must disconnect the server from the power source; then, wait 10 seconds before restarting the server.
	1. Reseat the DIMMs; then, restart the server.
	2. Replace the failing DIMM.
	3. (Trained technician only) Replace the 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.

• If an action step is preceded by '(Trained technician only)', that step must be performed only by a Trained technician.

• Go to the Lenovo support website at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Table 10. Monitor and video's symptoms and actions

The monitor and video's symptoms and actions table with one level of row and column headers.

Symptom	Action
Testing the monitor.	1. Make sure that the monitor cables are firmly connected.
	2. Try using a different monitor on the server, or try using the monitor that is being tested on a different server.
	3. (Trained technician only) Replace the 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 50. • The monitor cables are connected correctly.

Table 10. Monitor and video's symptoms and actions (continued)

Symptom	Action
	• The monitor is turned on and the brightness and contrast controls are adjusted correctly. • No POST errors are generated when the server is turned on. 3. Make sure that the correct server is controlling the monitor, if applicable. 4. Make sure that damaged server firmware is not affecting the video. 5. Observe the checkpoint LEDs on the system board; if the codes are changing, go to next step. 6. Replace the following components one at a time, in the order shown, restarting the server each time: a. Monitor b. Video adapter (if one is installed) c. (Trained technician only) System board 7. See "Solving undetermined problems" on page 54.
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.
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, fluorescents, 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 monitor and cable. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Monitor b. (Trained technician only) System board
Wrong characters appear on the screen.	1. If the wrong language is displayed, update the server firmware to the latest level with the correct language. 2. Reseat the monitor and cable. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Monitor b. (Trained technician only) System board

Network connection problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- If an action step is preceded by '(Trained technician only)', that step must be performed only by a Trained technician.
- Go to the Lenovo support website at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Table 11. Network connection problems and actions

Symptom	Action
Log in failed by using LDAP account with SSL enabled.	1. Make sure the license key is valid.
	2. Generate a new license key and log in again.

Optional-device problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- If an action step is preceded by '(Trained technician only)', that step must be performed only by a Trained technician.
- Go to the Lenovo support website at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Table 12. Optional-device problems and actions

Symptom	Action

An 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/us/en/serverproven/).
	  • 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.
	  • You updated the configuration information in the Setup utility. 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.

An Lenovo optional device that worked previously does not work now.	1. Make sure that all of the cable connections for the device are secure. 2. If the device comes with test instructions, use those instructions to test the device. 3. Reseat the failing device. 4. Replace the failing device.

Power problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- If an action step is preceded by '(Trained technician only)', that step must be performed only by a Trained technician.
- Go to the Lenovo support website at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Table 13. Power problems and actions

Symptom	Action

The power-control button does not work (the server does not start).
 	
Note: The power-control button will not function until approximately 5 to 10 seconds after the server has been connected to power.
	1. Make sure that the power-control button is working correctly:
	   a. Disconnect the server power cords.
	   b. Reconnect the power cords.
	   c. (Trained technician only) Reseat the operator information panel cable, and then repeat steps 1a and 1b.
	     • (Trained technician only) If the server starts, reseat the operator information panel. If the problem remains, replace the operator information panel.
	     • If the server does not start, bypass the power-control button by using the force power-on jumper (see "System-board switches and jumpers" on page 19). If the server starts, reseat the operator information panel. If the problem remains, replace the operator information panel.
	2. Make sure that :
	   a. The power cords are correctly connected to the server and to a working electrical outlet.
	   b. The type of memory that is installed is correct.
	   c. The DIMM is fully seated.
	   d. The LEDs on the power supply do not indicate a problem.
	   e. (Trained technician only) The microprocessors are installed in the correct sequence.
	3. Reseat the following components:
	   a. DIMMs
	   b. (Trained technician only) Power-supply cables to all internal components
	   c. (Trained technician only) Power switch connector
	4. Replace the following components one at a time, in the order shown, restarting the server each time:
	   a. DIMMs
	   b. Power supply
	   c. (Trained technician only) System board
	5. 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.
	6. See power button/LED "Front view" on page 15.
	7. See "Solving undetermined problems" on page 54.

The server does not turn off.	1. Determine whether you are using an Advanced Configuration and Power Interface (ACPI) or a non-ACPI operating system. If you are using a non-ACPI operating system, complete the following steps:
	   a. Press Ctrl+Alt+Delete.
	   b. Turn off the server by pressing the power-control button for 5 seconds.
	   c. Restart the server.
	   d. If the server fails POST and the power-control button does not work, disconnect the power cord for 5 seconds; then, reconnect the power cord and restart the server.
	2. If the problem remains or if you are using an ACPI-aware operating system, suspect the system board.

The server unexpectedly shuts down, and the LEDs on the	See "Solving undetermined problems" on page 54.

Table 13. Power problems and actions (continued)

Symptom	Action
operator information panel are not lit.	

Software problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- If an action step is preceded by '(Trained technician only)', that step must be performed only by a Trained technician.
- Go to the Lenovo support website at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Table 14. Software problems and actions

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 the software vendor.

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.
- If an action step is preceded by '(Trained technician only)', that step must be performed only by a Trained technician.
- Go to the Lenovo support website at http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Table 15. Universal Serial Bus (USB) port problems and actions

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 Setup utility (see "Using the Setup utility" on page 28 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.

Solving power problems

Use this information to solve power problems.

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:

Step 1. Turn off the server and disconnect all power cords.

Step 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.

Step 3. Turn on the server and check the LEDs.

Step 4. Turn off the server and disconnect all power cords.

Step 5. 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 54).

Step 6. Reconnect all ac power cords and turn on the server. If the server starts successfully, reseat the adapters and devices one at a time until the problem is isolated.

If the server does not start from the minimum configuration, see "Front view" on page 15 to replace the components in the minimum configuration one at a time until the problem is isolated.

Solving Ethernet controller problems

Use this information to solve the 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:

Step 1. Make sure that the correct device drivers, which come with the server are installed and that they are at the latest level.

Step 2. 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.

- If you set the Ethernet controller to operate at 100 Mbps, you must use Category 5 cabling.

- If you directly connect two servers (without a hub), or if you are not using a hub with X ports, use a crossover cable. To determine whether a hub has an X port, check the port label. If the label contains an X, the hub has an X port.

Step 3. 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.

Step 4. 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 is off, make sure that the hub and network are operating and that the correct device drivers are installed.

Step 5. Check the LAN activity LED on the rear of the server. The LAN activity LED is lit when data is active on the Ethernet network. If the LAN activity LED is off, make sure that the hub and network are operating and that the correct device drivers are installed.

Step 6.   Check for operating-system-specific causes of the problem.

Step 7.   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 Lenovo ThinkServer Diagnostics Tool cannot diagnose the failure or if the server is inoperative, use the information in this section to solve the undetermined problems.

If you suspect that a software problem is causing failures (continuous or intermittent), see "Software problems" on page 52.

Corrupted data in CMOS memory or corrupted UEFI firmware can cause undetermined problems. To reset the CMOS data, use the CMOS clear jumper to clear the CMOS memory and override the power-on password; see "System-board internal connectors" on page 17 for more information. If you suspect that the UEFI firmware is corrupted, see "Recovering the server firmware (UEFI update failure)" on page 56.

If the power supplies are working correctly, complete the following steps:

Step 1.   Turn off the server.

Step 2.   Make sure that the server is cabled correctly.

Step 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).
- Printer, mouse, and non-Lenovo devices.
- Each adapter.
- Hard disk drives.

   Note: The minimum configuration required for the server to start is one microprocessor and one 8 GB DIMM.

Step 4.   Turn on the server. If the problem remains, suspect the following components in the following order:

   1. Power supply

   2. Memory

   3. Microprocessor

   4. 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

Because of the variety of hardware and software combinations that can encounter, use the following information to assist you in problem determination. If possible, have this information available when requesting assistance from Lenovo.

The model number and serial number of the server are located on both the front bezel and the chassis.
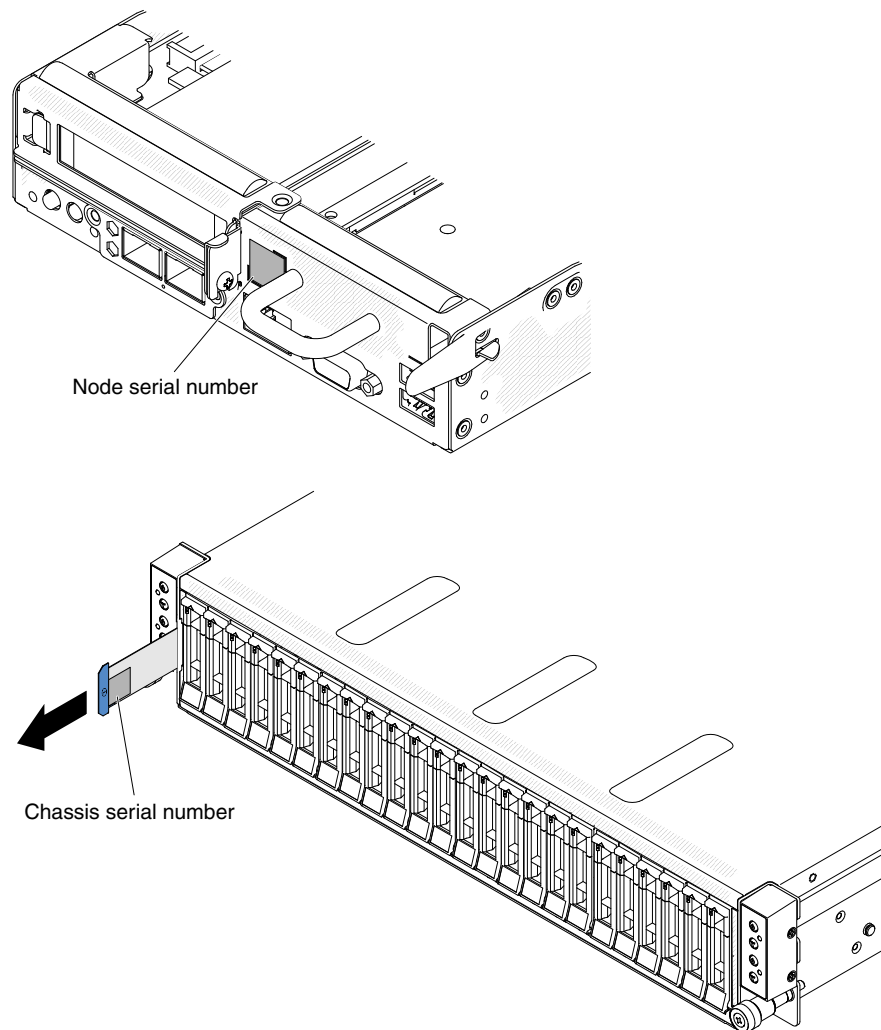
Node serial number

Chassis serial number

Figure 15. ID label on the front of the server and the chassis

- Machine type and model
- Microprocessor or hard disk drive upgrades
- Failure symptom
  - Does the server fail the diagnostic tests?
  - What occurs? When? Where?
  - Does the failure occur on a single server or on multiple servers?
  - Is the failure repeatable?
  - Has this configuration ever worked?
  - What changes, if any, were made before the configuration failed?
  - Is this the original reported failure?
- Diagnostic program type and version level
- Hardware configuration (print screen of the system summary)

- UEFI firmware level
- TMM firmware level
- Operating system software

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
- UEFI firmware level
- TMM firmware level
- 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

See Appendix C "Getting help and technical assistance" on page 167 for information about calling Lenovo for service.

Recovering the server firmware (UEFI update failure)

Use this information to recover the server firmware.

Important: Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code.

If the server firmware has become corrupted, such as from a power failure during an update, you can recover the server firmware in the following way:

- Recovery BIOS Function
- Recovery BIOS Function by SW1

Notes: You can obtain a server update package from one of the following sources:

- Download the server firmware update from the World Wide Web.
- Contact your Lenovo service representative.

To download the server firmware update package from the World Wide Web, go to http://www.lenovo.com/support.

The flash memory of the server consists of a primary bank and a backup bank. You must maintain a bootable UEFI firmware image in the backup bank. If the server firmware in the primary bank becomes corrupted, you can either manually boot the backup bank with the UEFI boot backup jumper (JP16), or in the case of image corruption, this will occur automatically with the Automated Boot Recovery function.

Recovery BIOS function

This section details the recovery BIOS function.

The BIOS support the book block to re-flash the mail BIOS image when the BIOS is be corrupted and cannot boot to the EFI Shell or operating system to perform a standard update.

Recovery BIOS step:

Step 1.   Insert USB key (this USB key need include the Recovery ROM file "AMIBOOT.ROM").

Step 2.   Power on the server and wait system into recovery mode in setup menu.

Step 3.   Select "Proceed with flash update" and Enter to start flash update.

Recovery BIOS Function by SW1

This section details the recovery BIOS Function by SW1.

Step 1.   Pull out the node and place SW1 DIP1 to "ON" location.
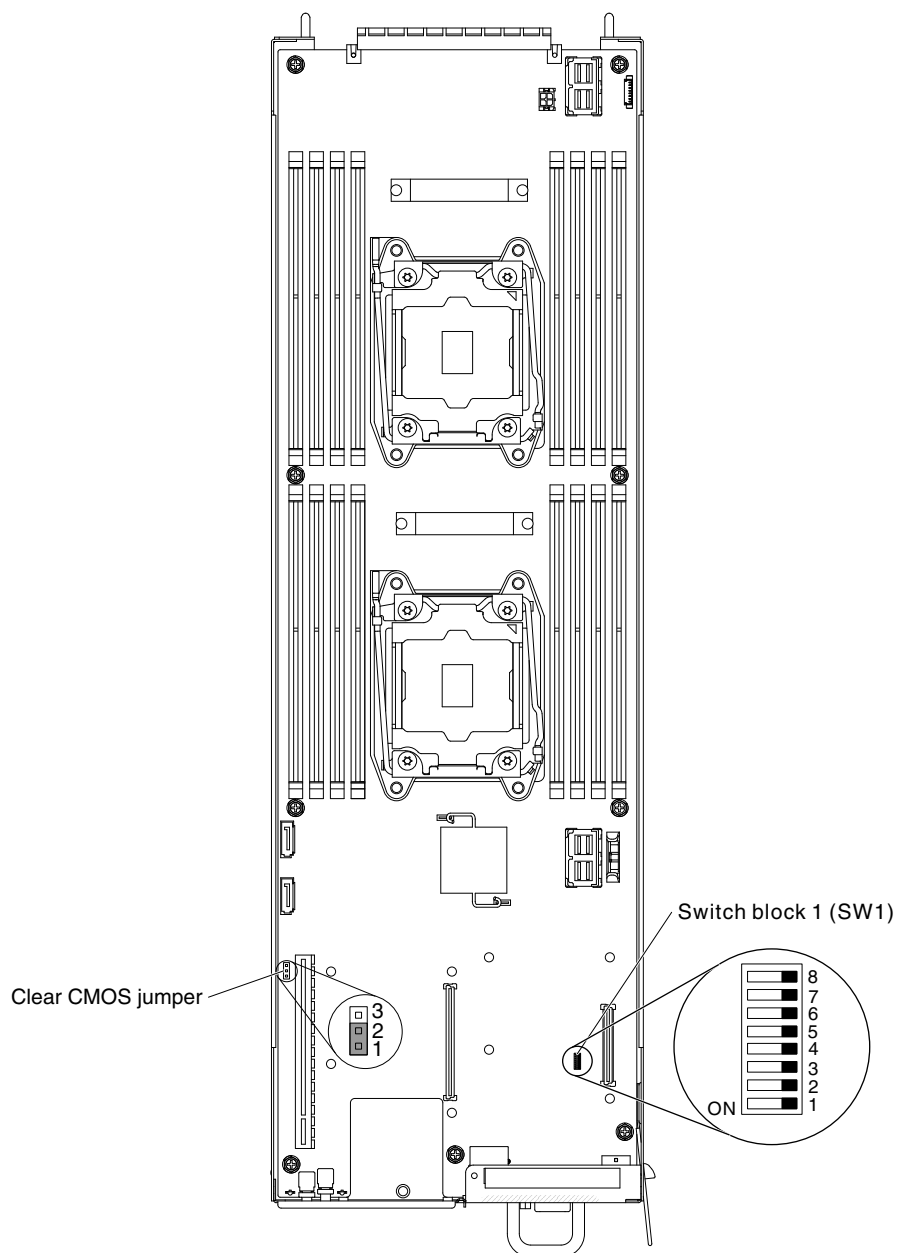
Figure 16. Location of the switches, jumpers, and buttons on the system board

Step 2.   Insert USB key (this USB key need include the Recovery ROM file "AMIBOOT.ROM").

Step 3.   Insert the node back into enclosure.

Step 4.   Power on the server and wait system into recovery mode in setup menu.

Step 5.   Select "Proceed with flash update" and Enter to start flash update.

Step 6.   After update finish, please follow same procedure to remove USB key & place SW1 DIP1 to "OFF" location.

Out-of-band method

For additional information, see the TMM User Guide: *Thinkserver SD350 System Manager User Guide.pdf* at the http://www.lenovo.com/support and Chapter 2 "Configuration information and instructions" on page 25 for firmware update.

Chapter 4. Parts listing, Lenovo ThinkServer sd350 Server Type 5493, Lenovo ThinkServer n400 Enclosure Type 5495

The parts listing of Lenovo ThinkServer sd350 Server Type 5493, Lenovo ThinkServer n400 Enclosure Type 5495.

The following replaceable components are available for the Lenovo ThinkServer sd350 Server Type 5493, Lenovo ThinkServer n400 Enclosure Type 5495 server, except as specified otherwise in "Replaceable server components" on page 61. For an updated parts listing, go to http://www.lenovo.com/support.

Replaceable server components

The replaceable server components for Lenovo ThinkServer sd350 Server Type 5493, Lenovo ThinkServer n400 Enclosure Type 5495.

Replaceable components are of three types:

- **Structural parts:** Purchase and replacement of structural parts (components, such as chassis assembly, top cover, and bezel) is your responsibility. If Lenovo acquires or installs a structural component at your request, you will be charged for the service. See "Structural parts" on page 65 for the list of structural parts.
- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If Lenovo installs a Tier 1 CRU at your request, you will be charged for the installation.
- **Tier 2 customer replaceable unit:** You may install a Tier 2 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 Information* document that comes with the server. For more information about getting service and assistance, see Appendix C "Getting help and technical assistance" on page 167.

Visit the ServerProven website for the latest options supporting plan.

The following illustration shows the major components in the server. The illustrations in this document might differ slightly from your hardware. For a list of structural parts, see "Structural parts" on page 65.
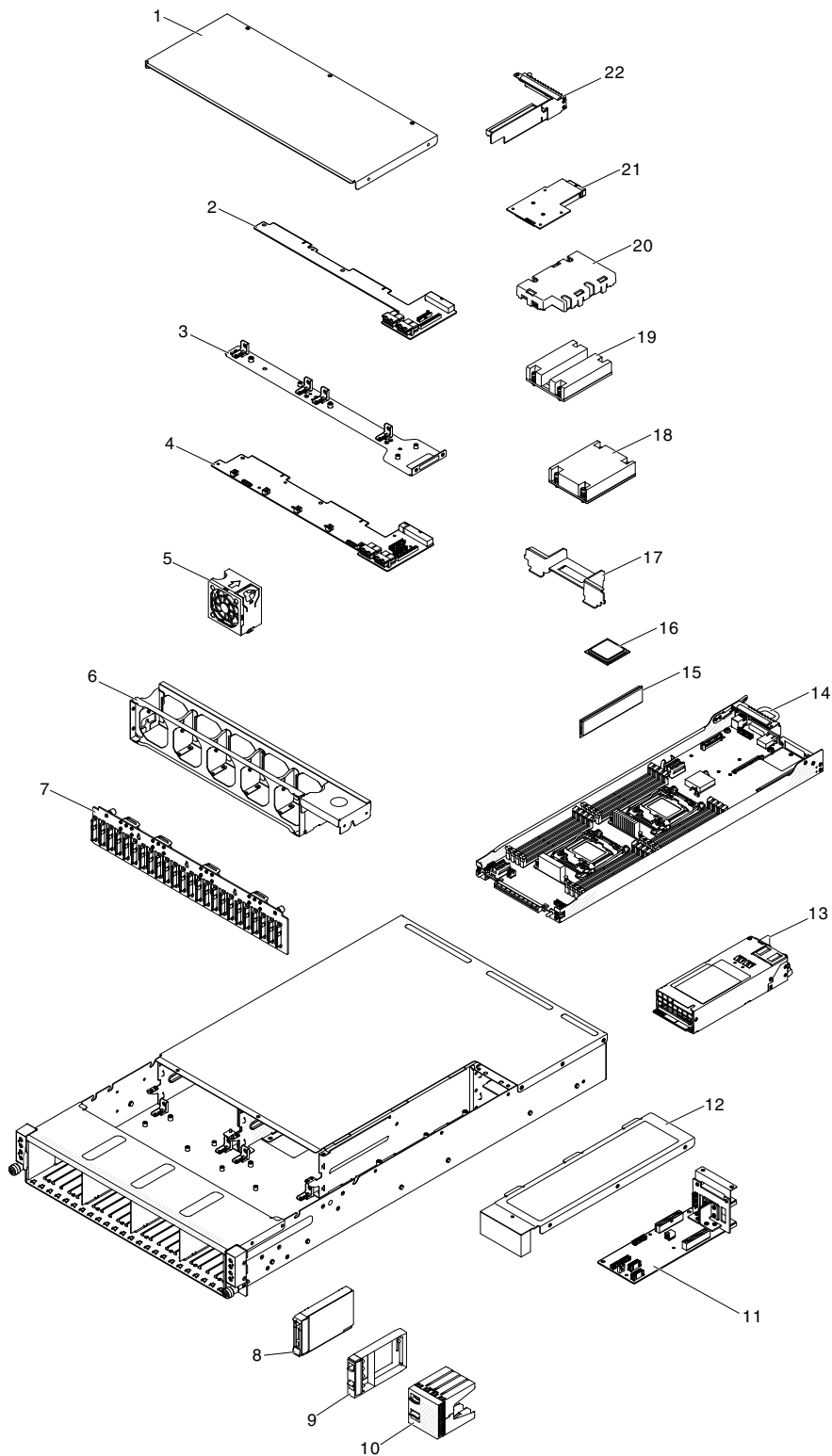
Figure 17. Server components

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

Table 16. Parts listing, Type 5493 and 5495

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
2	Power interface board module			00YD480
3	Power interface board bracket			00MW893
4	Fan board			00YD422
5	Fan	00MW875		
6	Fan cage assembly		00MW876	
7	2.5-inch hard disk drive hot-swap backplane		00YD432	
8	Hard disk drive, 2.5-inch G3 hot-swap 1 TB, 7.2 K 6 Gbps Near-Line SATA	00AJ142		
8	Solid state drive, 2.5-inch MLC enterprise value, G3 hot-swap 200 GB SAS	00FN380		
8	Solid state drive, 2.5-inch MLC enterprise value, G3 hot-swap 400 GB SAS	00FN390		
8	Hard disk drive, 2.5-inch G3 hot-swap 1 TB, 7.2 K 12 Gbps, Near-Line SAS	00NA492		
8	Hard disk drive, 2.5-inch G3 hot-swap 512e 2 TB, 7.2 K 6 Gbps Near-Line SATA	00NA527		
8	Solid state drive, 2.5-inch S3510 G3 hot-swap 480 GB enterprise entry SATA	00WG631		
8	Hard disk drive, 2.5-inch G3 hot-swap 300 GB, 15 K 12 Gbps SAS	00WG661		
8	Hard disk drive, 2.5-inch G3 hot-swap 600 GB, 15 K 12 Gbps SAS	00WG666		
8	Hard disk drive, 2.5-inch G3 hot-swap 300 GB, 10 K 12 Gbps SAS	00WG686		
8	Hard disk drive, 2.5-inch G3 hot-swap 600 GB, 10 K 12 Gbps SAS	00WG691		
8	Hard disk drive, 2.5-inch G3 hot-swap 900 GB, 10 K 12 Gbps SAS	00WG696		
8	Hard disk drive, 2.5-inch G3 hot-swap 1.2 TB, 10 K 12 Gbps SAS	00WG701		
8	Solid state drive, 2.5-inch S3710 G3 hot-swap 400 GB enterprise performance SATA	00YC326		
8	Solid state drive, 2.5-inch S3510 G3 hot-swap 120 GB enterprise entry SATA	00WG621		
8	Solid state drive, 2.5-inch S3510 G3 hot-swap 240 GB enterprise entry SATA	00WG626		
11	System management board module			00YD424
13	Power supply, 1200 watt, AC	00YD450		
13	Power supply, 1600 watt, AC	00YD451		
14	Node planar			00YD426

Table 16. Parts listing, Type 5493 and 5495 (continued)

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
15	Memory, 8 GB single-rank 1.2 V, TruDDR4, 2400 MHz, LP RDIMM	46W0823		
15	Memory, 16 GB dual-rank 1.2 V, TruDDR4, 2400 MHz, LP RDIMM	46W0831		
15	Memory, 32 GB dual-rank 1.2 V, TruDDR4, 2400 MHz, LP RDIMM	46W0835		
16	Microprocessor, Intel Xeon E5-2698 v4 2.2 GHz, 50 MB, 2400 MHz, 135 W (20 core)	00MW771		
16	Microprocessor, Intel Xeon E5-2623 v4 2.6 GHz, 10 MB, 2133 MHz, 85 W (4 core)	00MW781		
16	Microprocessor, Intel Xeon E5-2609 v4 1.7 GHz, 20 MB, 1866 MHz, 85 W (8 core)	00MW782		
16	Microprocessor, Intel Xeon E5-2603 v4 1.7 GHz, 15 MB, 1866 MHz, 85 W (6 core)	00MW783		
16	Microprocessor, Intel Xeon E5-2690 v4 2.6 GHz, 35 MB, 2400 MHz, 135 W (14 core)	00YD969		
16	Microprocessor, Intel Xeon E5-2680 v4 2.4 GHz, 35 MB, 2400 MHz, 120 W (14 core)	00YD970		
16	Microprocessor, Intel Xeon E5-2660 v4 2.0 GHz, 35 MB, 2400 MHz, 105 W (14 core)	00YD971		
16	Microprocessor, Intel Xeon E5-2650 v4 2.2 GHz, 30 MB, 2400 MHz, 105 W (12 core)	00YD972		
16	Microprocessor, Intel Xeon E5-2640 v4 2.4 GHz, 25 MB, 2133 MHz, 90 W (10 core)	00YD973		
16	Microprocessor, Intel Xeon E5-2630 v4 2.2 GHz, 20 MB, 2133 MHz, 85 W (10 core)	00YD974		
16	Microprocessor, Intel Xeon E5-2620 v4 2.1 GHz, 20 MB, 2133 MHz, 85 W (8 core)	00YD975		
18	Heat sink, front (for microprocessor 1)	00YD473		
19	Heat sink, rear (for microprocessor 2)	00YD474		
20	Host bus adapters mezzanine card, H701-L 6 Gb	00YD431		
21	Lan mezz card, I350AM2 OCP dual-port 1GbE RJ-45		00YJ082	
22	PCI riser assembly		00YD438	
	2.5-inch hard disk drive cage assembly (include the front IO module)			00MW869
	2U base chassis		00MW872	
	Cable, hard disk drive SAS	00MW864		
	Cable, host bus adapter mezz SAS	00MW865		
	Cable, power 24 pin power interface board to system management board	00MW880		
	Cable, fan power 4 pin	00MW881		

Table 16. Parts listing, Type 5493 and 5495 (continued)

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
	Cable, I²C 24 pin system management board to power backplane	00MW883		
	Cable, signal fan board to power interface board		00MW884	
	Cable, I²C Y 24 pin	00MW885		
	Cable, HDD SAS for node 4	00MW886		
	Cable, HDD SAS for node 3	00MW887		
	Cable, HDD SAS for node 2	00MW888		
	Cable, HDD SAS for node 1	00MW889		
	Cable, HDD backplane power 12 pin	00MW890		
	Cable, I²C fan board to HDD backplane	00MW894		
	Cable, rack power, 1.0m C13 to C14 jumper cord	39M5374		
	Cable, rack power, 2.8m, 10A/100-250V, C13 to IEC 320-C14	39M5377		
	Cable, rack power, 2.8m, 10A/100-250V, C13 to IEC 320-C20	39M5392		
	Cable, rack power, 1.345m, 2X C13 to C14 jumper cord	39M5401		
	Cable, rack power, 2.054m, 2X C13 to C14 jumper cord	39M5450		
	Cable, rack power, 2.5m, 16A/100-250V, 2 long C13s to short C20	69Y1627		
	Node air baffle	00YD553		
	Emulex VFA5 2x10 GbE SFP+ PCIe adapter		00JY823	
	Intel I350-T2 2xGbE BaseT adapter		00AG512	
	Intel I350-T4 4xGbE BaseT adapter		00AG522	
	Intel X550-T2 dual-port 10 G Base-T adapter		00MM862	
	Intel X710 2x10GbE SFP+ adapter		01DA902	
	Label	00YL627		
	Mellanox ConnectX-3 40 GbE/ FDR IB VPI adapter		00D9552	
	Mezz card, Intel X520 dual-port 10GbE SFP+ OCP	00MM882		
	Miscellaneous kit	00MW878		
	Serial ATA Disk on Module (SATADOM) 64 Gb		00YK205	
	Thermal sensor assembly 4 pin			00MW871

Structural parts

Structural parts are not covered by the Statement of Limited Warranty. You can place an order on the structural parts from the Lenovo retail store.

The following structural parts are available for purchase from the retail store.

Table 17. Structural parts, Type 5493 and 5495

Index	Description	Part number
1	Fan cover	00MW873
9	2.5-inch hard disk drive filler panel	00FW856
10	2.5-inch hard disk drive x4 filler panel	00KF417
12	System management board cover	00MW874
	Node filler	00YD520
	Rail kit	00MW877
	Shipping bracket kit	00YL629

To order a structural part, complete the following steps:

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

1. Go to http://www.lenovo.com.
2. From the **Products** menu, select **Upgrades, accessories & parts**.
3. Click **Obtain maintenance parts**; then, follow the instructions to order the part from the retail store.

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

If you need help with your order, call the toll-free number that is listed on the retail parts page, or contact your local Lenovo representative for assistance.

Power cords

For your safety, a power cord with a grounded attachment plug is provided to use with this 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.

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

Power cord part number	Used in these countries and regions
39M5206	China
39M5102	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea

Power cord part number	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
39M5130 39M5179	Denmark
39M5144	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda
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
39M5158	Liechtenstein, Switzerland
39M5165	Chile, Italy, Libyan Arab Jamahiriya
39M5172	Israel
39M5095	220 - 240 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
39M5076 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
39M5463	Taiwan
39M5087	Thailand
39M5219	Korea (Democratic People's Republic of), Korea (Republic of)
39M5199	Japan
39M5068	Argentina, Paraguay, Uruguay
39M5226	India

Power cord part number	Used in these countries and regions
39M5240 39M5241	Brazil
39M5375 39M5377 39M5378 39M5509 39M5512	Canada, United States of America

Chapter 5. Removing and replacing server components

Use this information to remove and replace the server components.

The types of replaceable components are:

- **Structural parts:** Purchase and replacement of structural parts (components, such as chassis assembly, cover, and bezel) is your responsibility. If Lenovo acquires or installs a structural component at your request, you will be charged for the service.
- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If Lenovo installs a Tier 1 CRU at your request, you will be charged for the installation.
- **Tier 2 customer replaceable unit (CRU):** You may install a Tier 2 CRU yourself or request Lenovo to install it, at no additional charge, under the type of warranty service that is designated for your server.

See Chapter 4 "Parts listing, Lenovo ThinkServer sd350 Server Type 5493, Lenovo ThinkServer n400 Enclosure Type 5495" on page 61 to determine whether a component is a structural part, Tier 1 CRU, or Tier 2 CRU.

For information about the terms of the warranty, see the *Warranty Information* document that comes with the server.

For more information about getting service and assistance, see Appendix C "Getting help and technical assistance" on page 167.

Installing an optional device

Some compute node components are available as both an optional device and a replaceable component. The installation procedure is the same for the optional device and the replaceable component.

Installation guidelines

Before you remove or replace a replaceable component or install an optional device, read the following information:

- Before you begin, read "Safety" on page v and "Handling static-sensitive devices" on page 70. This information will help you work safely.
- When you install your new compute node, 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 compute node is ready to function at maximum levels of performance.To download the latest firmware and device drivers, go to http://www.lenovo.com/support and select **ThinkServer sd350 Server.**
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- Back up all important data before you make changes to hard disk drives.
- Before you remove a compute node from the Lenovo ThinkServer n400 Enclosure Type 5495 chassis, you must shut down the operating system and turn off the compute node. You do not have to shut down the chassis itself.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the compute node, open or close a latch, and so on.
- For a list of supported optional devices for the compute node, see http://www.lenovo.com/us/en/serverproven/.

System reliability guidelines

Use these guidelines to ensure that the compute node meets the cooling and system reliability requirements:

- Each microprocessor socket always contains a heat-sink filler or a microprocessor and heat sink. If the compute node has only one microprocessor, it must be installed in microprocessor socket 1.
- The air baffles are installed over the DIMM connectors.
- The ventilation holes on the compute node are not blocked.

Handling static-sensitive devices

Use this information to handle 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.

Updating the compute node configuration

Use this information to update the compute node configuration.

When the compute node starts for the first time after you add or remove an internal device, you might receive a message that the configuration has changed. The Setup utility automatically starts so that you can save the new configuration settings. See "Using the Setup utility" on page 28 for more information about the Setup utility.

Some devices have device drivers that you must install. See the documentation that comes with each device for information about installing device drivers.

The compute node operates as a symmetric multiprocessing (SMP) compute node, regardless of how many microprocessors are installed. For optimum performance, you must upgrade the operating system to support SMP. See your operating-system documentation for additional information.

Removing a compute node from a chassis

Use this information to remove a compute node from a Lenovo ThinkServer n400 Enclosure Type 5495 chassis.

Before you remove a compute node, complete the following steps:

1. Read "Safety" on page v and "Installation guidelines" on page 69.
2. If the compute node is operating, shut down the operating system.
3. Press the power button to turn off the compute node (see "Turning off the server" on page 23 for more information).
4. Record the serial number for each node bay.

To remove the compute node from a chassis, complete the following steps:

Step 1.   Unhook the latch by pushing the side way.
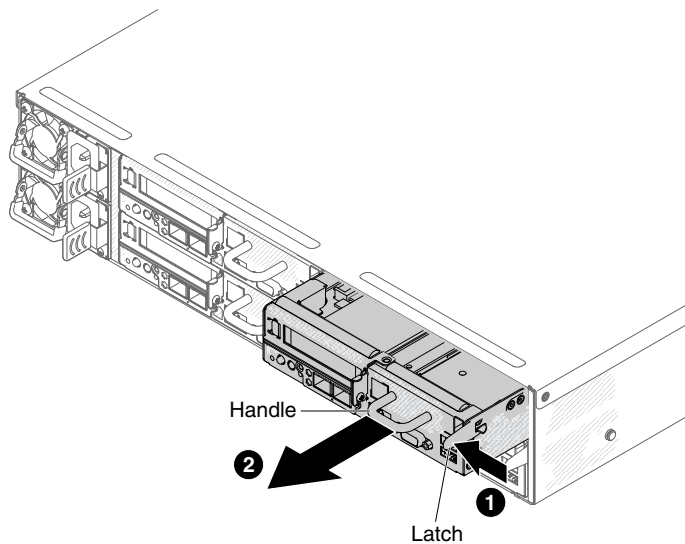
Attention:

- To maintain proper system cooling, do not operate the Lenovo ThinkServer n400 Enclosure Type 5495 chassis without a compute node or node bay filler installed in each node bay.
- When you remove the compute node, note the node bay number. Reinstalling a compute node into a different node bay from the one it was removed from can have unintended consequences. Some configuration information and update options are established according to node bay number. If you reinstall the compute node into a different node bay, you might have to reconfigure the compute node.

Step 2.   Pull the compute node out of the node bay.

Step 3.   Install either a node bay filler or another compute node in the node bay.

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

Installing a compute node in a chassis

Use this information to install a compute node in a Lenovo ThinkServer n400 Enclosure Type 5495 chassis.

Before you install the compute node in a chassis, read "Safety" on page v and "Installation guidelines" on page 69.

Statement 21

CAUTION:
Hazardous energy is present when the compute node is connected to the power source. Always replace the compute node cover before installing the compute node.

To install the compute node in a chassis, complete the following steps.
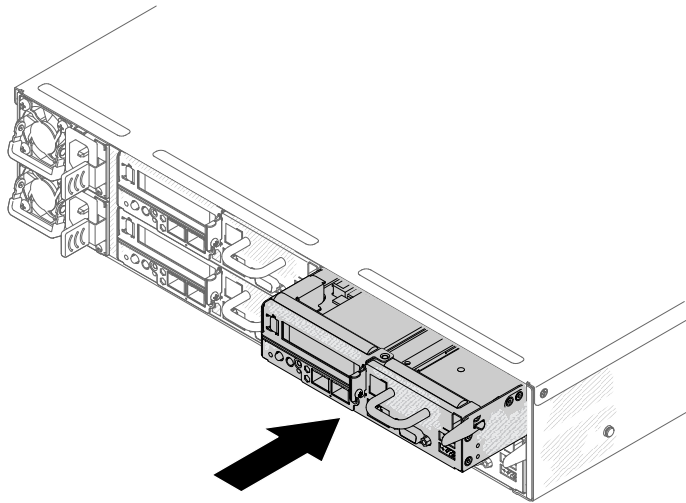
Step 1.   Select the node bay.

> **Notes:**
>
> 1. If you are reinstalling a compute node that you removed, you must install it in the same node bay from which you removed it. Some compute node configuration information and update options are established according to node bay number. Reinstalling a compute node into a different node bay can have unintended consequences. If you reinstall the compute node into a different node bay, you might have to reconfigure the compute node.
>
> 2. To maintain proper system cooling, do not operate the Lenovo ThinkServer n400 Enclosure Type 5495 chassis without a compute node, or node bay filler in each node bay.

Step 2.   Install the air baffle properly in the position before sliding the compute node.

Step 3.   Slide the compute node into the node bay until it stops.

> **Note:** The time required for a compute node to initialize varies by system configuration. The power LED flashes rapidly; the power button on the compute node does not respond until the power LED flashes slowly, indicating that the initialization process is complete.

Step 4.   Turn on the compute node (see "Turning on the server" on page 23 for instructions).

Step 5.   Make sure that the power LED on the compute node control panel is lit continuously, indicating that the compute node is receiving power and is turned on.

Step 6.   If you have other compute nodes to install, do so now.

Important: If an Attention label is on the front panel of the compute node above the power button, read it; then, remove the label and discard it before turning on the compute node.

If this is the initial installation of the compute node in the chassis, you must configure the compute node through the Setup utility and install the compute node operating system. See for details.

If you have changed the configuration of the compute node or if you are installing a different compute node from the one that you removed, you must configure the compute node through the Setup utility, and you might have to install the compute node operating system (see "Using the Setup utility" on page 28).

Removing and replacing structural parts

This section provides information for removing and replacing structural parts in the server.

Replacement of structural parts is your responsibility. If Lenovo installs a structural part at your request, you will be charged for the installation.

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

Removing the shipping brackets kit

Use this information to remove the shipping brackets kit from the server.

To remove the shipping brackets kit, complete the following steps.

Step 1. Turn off the server (see "Turning off the server" on page 23 for instructions) and all attached peripheral devices. Disconnect all power cords; then, disconnect all external cables from the server.

Step 2. Remove the two (one on each side) 10–32 screws from the brackets on the rear of the chassis.
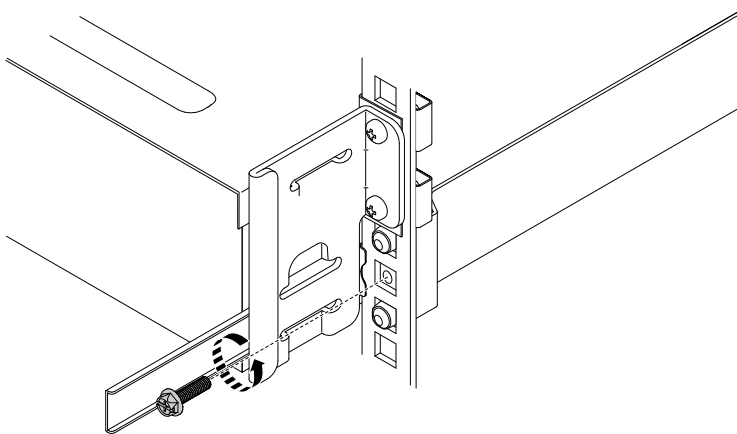
Figure 18. Removing the two 10–32 screws

Step 3. Remove the four (two on each side) M6 screws from the brackets on the rear of the chassis and remove the shipping brackets.
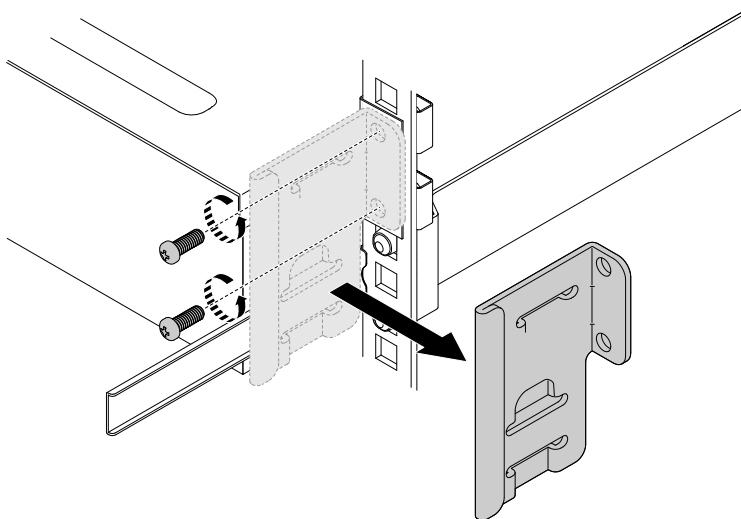
Figure 19. Removing the four M6 screws

Step 4. Remove the four (two on each side) C-clips from the rack on the rear of the chassis.
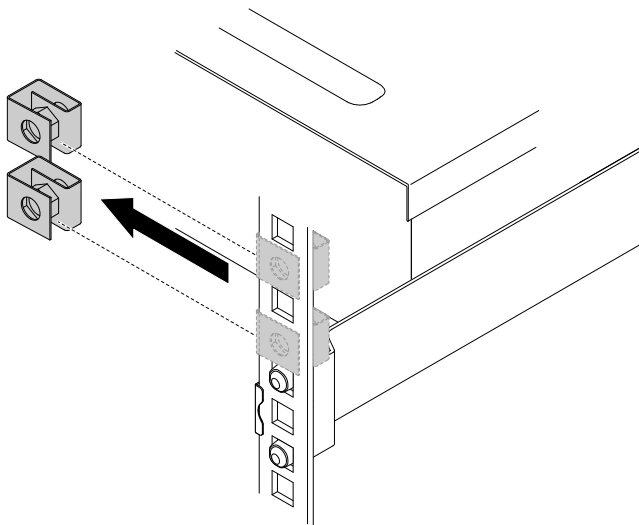
Figure 20. Removing the four C-clips

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

Installing the shipping brackets kit

Use this information to install the shipping brackets kit into the server.

Note: If you plan to transport the rack to another location, you must install the support brackets that come with the chassis. You can replace the shipping brackets kit by either via "Replaceable server components" on page 61, or you can order it as an option.

To install the shipping brackets kit, complete the following steps.

Step 1. Turn off the server (see "Turning off the server" on page 23 for instructions) and all attached peripheral devices. Disconnect all power cords; then, disconnect all external cables from the server.

Step 2. Install the four (two on each side) C-clips to the rack on the rear of the chassis. Make sure that the thinner face is displayed outwards.
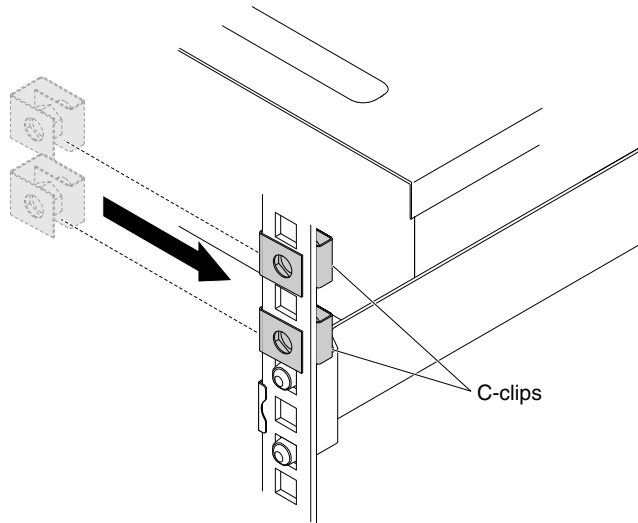
Figure 21. Installing the four C-clips

Step 3. Align the shipping brackets with the flanges and rails and install the four (two on each side) M6 screws to the brackets on the rear of the chassis.
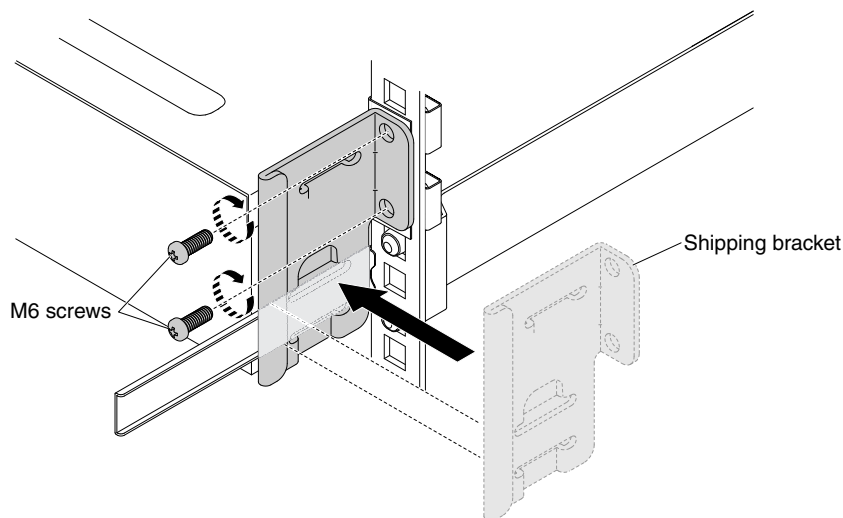
Figure 22. Installing the shipping brackets

Step 4. Install the two (one on each side) 10–32 screws to the brackets on the rear of the chassis.
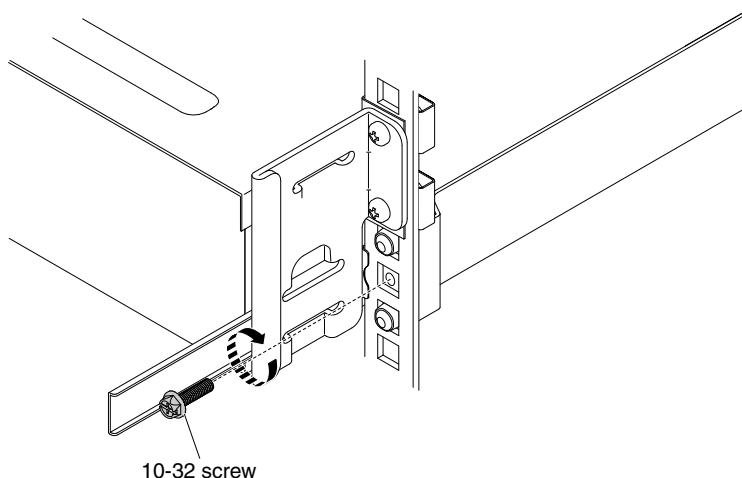
10-32 screw

Figure 23. Installing the two 10–32 screws

Removing the fan cage cover

Use this information to remove the cover from a fan cage.

Before you remove the fan cage cover, complete the following steps:

1. Read "Safety" on page v and "Installation guidelines" on page 69.
2. Turn off the server (see "Turning off the server" on page 23 for instructions) and all attached peripheral devices. Disconnect all power cords; then, disconnect all external cables as necessary to replace the device.

Statement 12

CAUTION:
The following label indicates a hot surface nearby.

Statement 21

**CAUTION:**
Hazardous energy is present when the compute node is connected to the power source. Always replace the compute node cover before installing the compute node.

To remove the fan cage cover, complete the following steps:

Step 1.   Remove the 3 M3 screws.

Step 2.   Lift the cover away from the system.
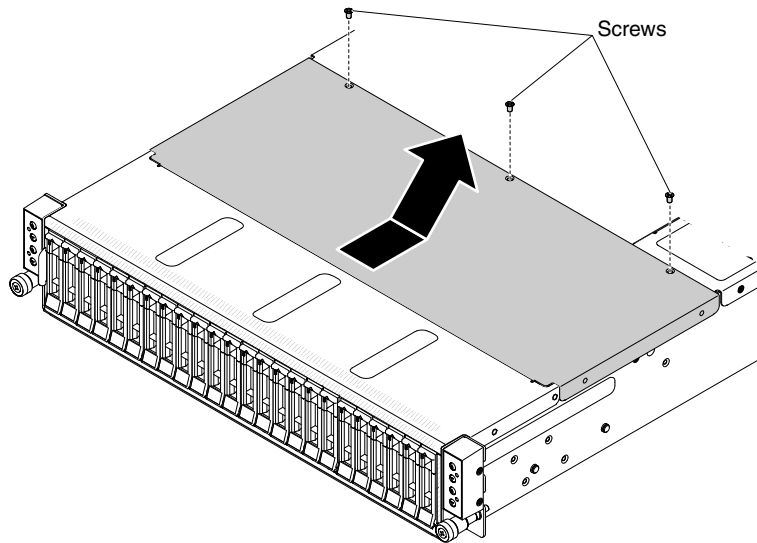
Step 3.   Lay the cover flat or store it for future use.

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 fan cage cover

Use this information to install the fan cage cover.

Before you install the fan cage cover, read "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing the cover, make sure that you have the system service label kit on hand for use during the replacement procedure.

Statement 21

CAUTION:
Hazardous energy is present when the compute node is connected to the power source. Always replace the compute node cover before installing the compute node.

To install the fan cage cover, complete the following steps:

Step 1.   Carefully lay the Lenovo ThinkServer n400 Enclosure Type 5495 on a flat, static-protective surface, orienting the compute node with the bezel pointing toward you.

Step 2.   Orient the cover so that the posts on the inside of the cover slide into the slots on the Lenovo ThinkServer n400 Enclosure Type 5495.

  Note: Before you close the cover, make sure that all components are installed and seated correctly and that you have not left loose tools or parts inside the Lenovo ThinkServer n400 Enclosure Type 5495. Retention clips that secure the I/O expansion adapters must be in the closed position to install the cover.

Screws

Guide pin
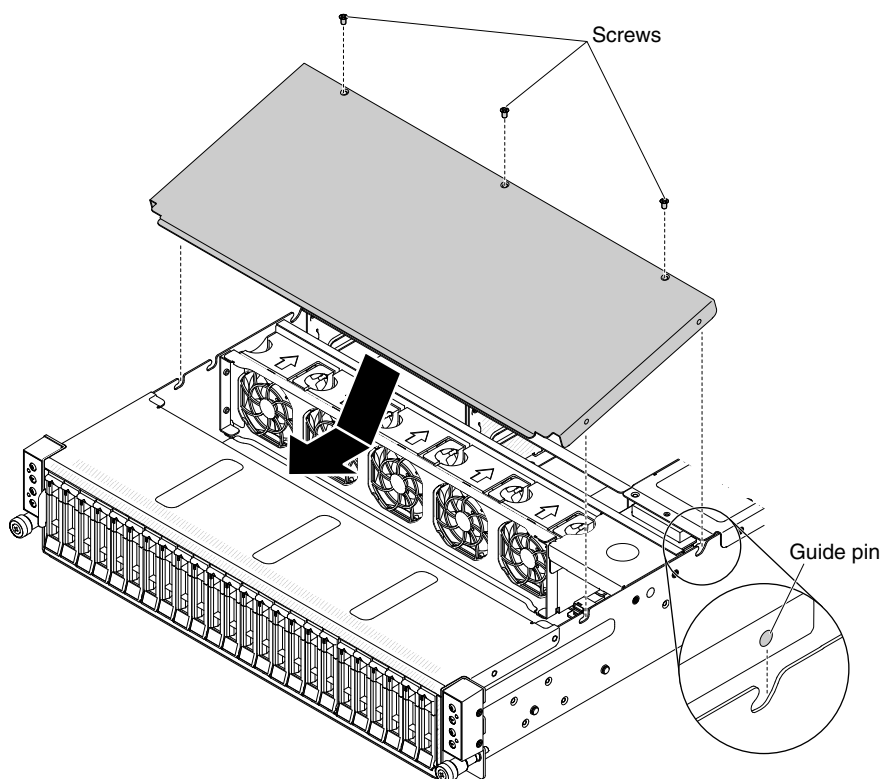
Step 3. Hold the front of the server and slide the cover forward to the closed position, until it clicks into place.

Step 4. Tighten the cover with the 3 M3 screws.

Step 5. To install a system service label (which needs to be ordered separately), align the label on the cover, remove the backing, and press the label on the cover.

Removing the system management board cover

Use this information to remove the cover from a system management board.

Before you remove the system management board cover, complete the following steps:

1. Read "Safety" on page v and "Installation guidelines" on page 69.

2. Turn off the server (see "Turning off the server" on page 23 for instructions) and all attached peripheral devices. Disconnect all power cords; then, disconnect all external cables as necessary to replace the device.

3. Carefully lay the compute node on a flat, static-protective surface, orienting the compute node with the bezel pointing toward you.

Statement 12

CAUTION:
The following label indicates a hot surface nearby.

Statement 21

CAUTION:
Hazardous energy is present when the compute node is connected to the power source. Always replace the compute node cover before installing the compute node.

To remove the system management board cover, complete the following steps:

Step 1.　Remove the fan cover (see "Removing the fan cage cover" on page 76).

Step 2.　Remove the 3 M3 screws.

Step 3.　Lift the cover away from the system.
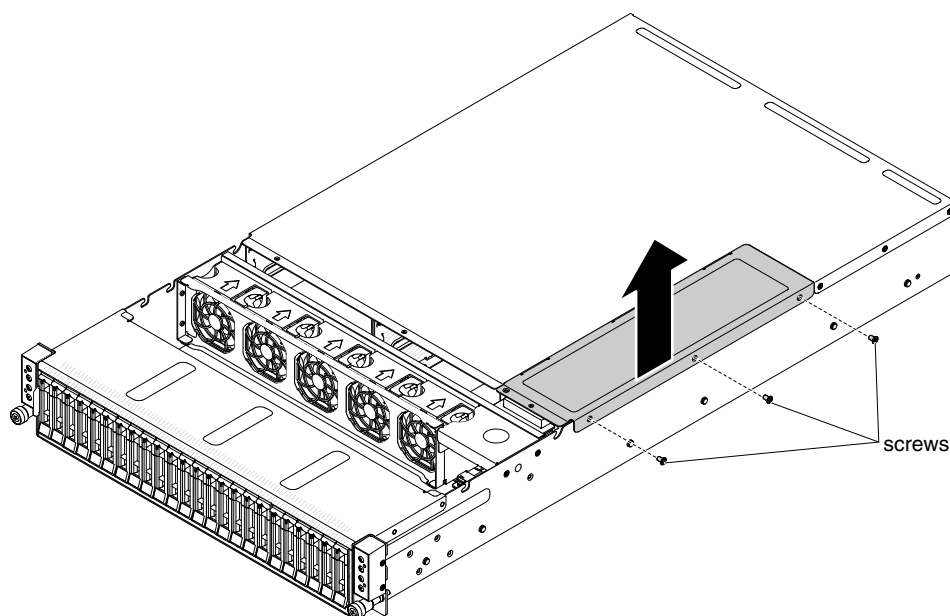
Figure 24. System management board cover removal

Step 4.　Lay the cover flat or store it for future use.

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 system management board cover

Use this information to install the system management board cover.

Before you install the system management board cover, read "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing the cover, make sure that you have the system service label kit on hand for use during the replacement procedure.

Attention: You cannot insert the compute node into the Lenovo ThinkServer n400 Enclosure Type 5495 chassis until the cover is installed and closed. Do not attempt to override this protection.

Statement 21

CAUTION:
Hazardous energy is present when the compute node is connected to the power source. Always replace the compute node cover before installing the compute node.

To install the system management board cover, complete the following steps:

Step 1.   Carefully lay the Lenovo ThinkServer n400 Enclosure Type 5495 on a flat, static-protective surface, orienting the compute node with the bezel pointing toward you.

Step 2.   Orient the system management board cover so that the posts on the inside of the cover slide into the slots on the system.
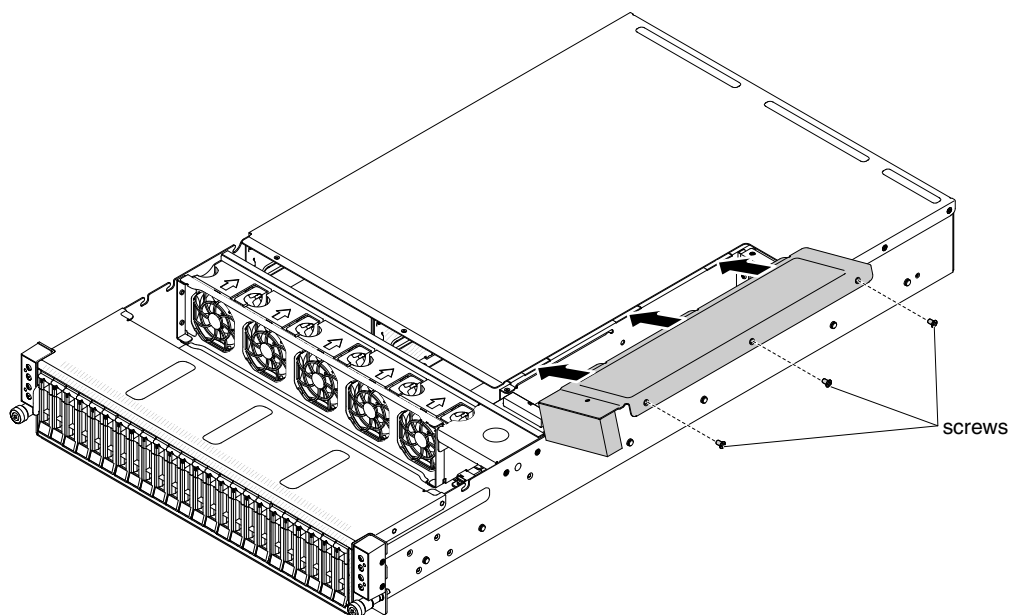
Figure 25. System management board cover installation

Step 3.   Slide the system management board cover inward to the closed position, until it clicks into place.

Step 4.   Tighten the cover with the 3 M3 screws.

Step 5.   Install the fan cage cover (see "Installing the fan cage cover" on page 77).

Removing the air baffle

Use this information to remove the air baffle from the server.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

To remove the air baffle, complete the following steps.

Step 1.   Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 2.   Place your fingers under the front and back of the top of the air baffle; then, lift the air baffle out of the server.
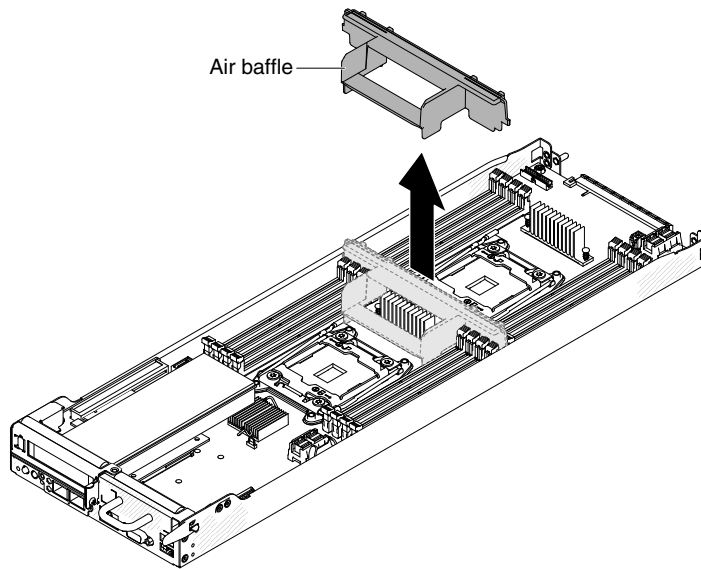
Figure 26. Air baffle removal

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

Installing the air baffle

Use this information to replace the air baffle.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

To replace the air baffle, complete the following steps.

Step 1.   Align the air baffle fin in between the DIMM socket latch.
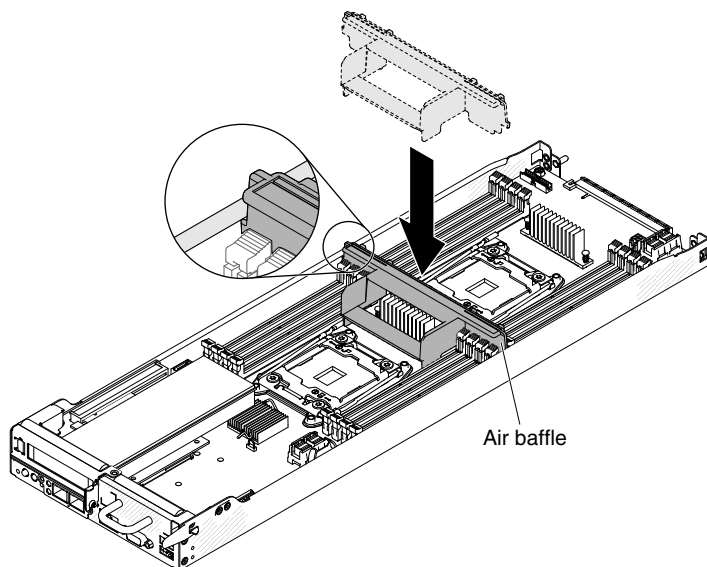
Figure 27. Air baffle installation

Step 2. Make sure the air baffle is installed properly.

Step 3. Reinstall the compute node (see "Installing a compute node in a chassis" on page 71).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.
2. Reconnect any cables that you removed.
3. Turn on the peripheral devices and the server.

Removing and replacing Tier 1 CRUs

This section provides information for removing and replacing Tier 1 CRUs in the server.

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

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

Removing a system fan

Use this information to remove a system fan in the server.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

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

To remove a system fan, complete the following steps.

Step 1. Turn off the server (see "Turning off the server" on page 23 for instructions) and all attached peripheral devices. Disconnect all power cords; then, disconnect all external cables from the server.

Step 2. Remove the fan cage cover (see "Removing the fan cage cover" on page 76).

Step 3. Remove the failed fan from the server by grasping the top of the fan by pressing the release latch with your index finger and thumb and lift the fan out of the server.

Release latch
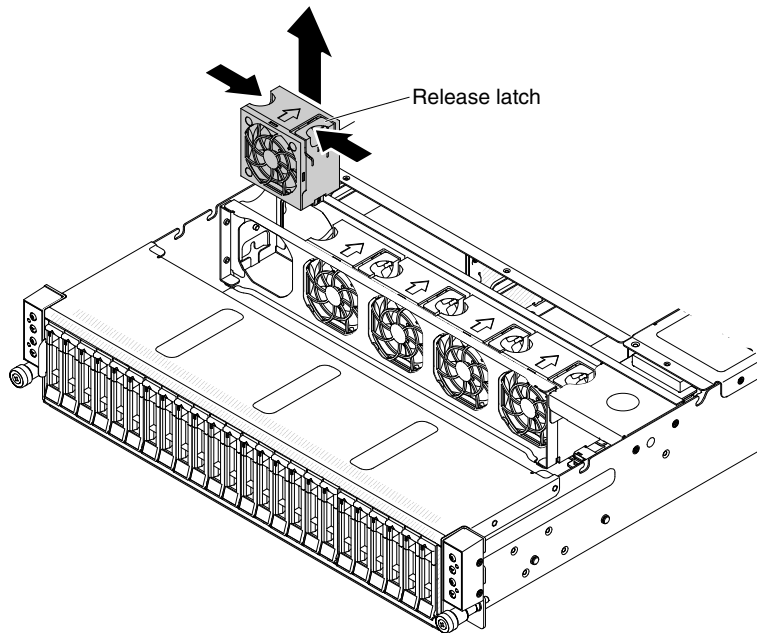
Figure 28. System fans

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

Replacing a system fan

Use this information to replace a system fan in the server.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

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

To replace a system fan, complete the following steps.

Step 1. Position the replacement fan so that the airflow arrow on the fan points toward the rear of the server.

Note: The correct airflow is from the front to the rear of the server.
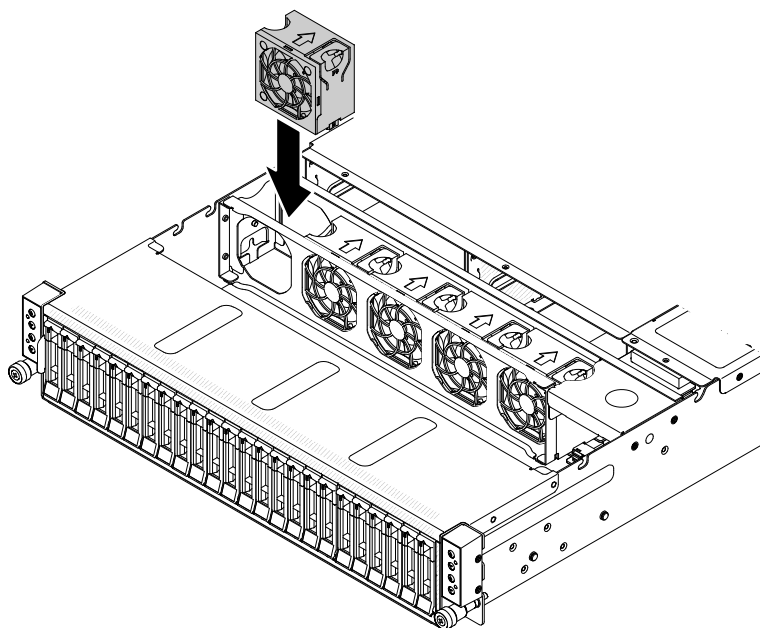
Figure 29. System fan installation

Step 2.   Install the replacement fan in the bracket:

     a.   Insert the fan into the bracket.

     b.   Make sure that each of the locking tabs on the fan is fully seated in its slot in the fan bracket.

Step 3.   Reinstall the fan cage cover (see "Installing the fan cage cover" on page 77).

1. Push the server into the rack until it clicks into place.
2. Reconnect the power cords and any cables that you removed.
3. Turn on the peripheral devices and the server.

Removing a hot-swap hard disk drive

Use this information to remove a hot-swap hard disk drive.

Attention:

- To avoid damage to the hard disk drive connectors, make sure that the server cover is in place and fully closed whenever you install or remove a hard disk drive.
- To make sure that there is adequate system cooling, do not operate the server for more than 2 minutes without either a hard disk drive or a filler panel installed in each bay.
- Before you make changes to disk drives, disk drive controllers (including controllers that are integrated on the system board), disk drive backplanes, or disk drive cables, back up all important data that is stored on hard disks.
- Before you remove any component of a RAID array, back up all RAID configuration information.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

To remove a hot-swap hard disk drive, complete the following steps.

Step 1. Make sure you save the data on your drive, especially if it is part of a RAID array, before you remove it from the server.

Step 2. Slide the release latch (orange) gently to the left to unlock the drive handle.
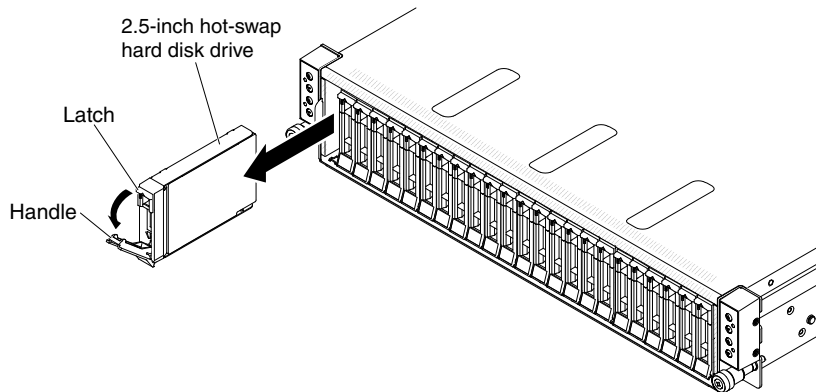
Figure 30. Hot-swap hard disk drive removal

Step 3. Grasp the handle and pull the hot-swap hard disk drive out of the drive bay.
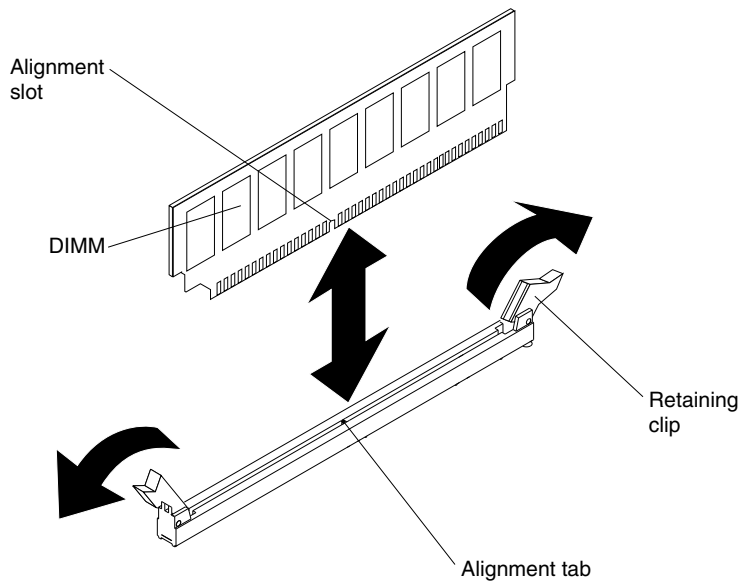
Step 4. Reinstall the drive bay filler panel.

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

Installing a hot-swap hard disk drive

Use this information to install a hot-swap hard disk drive.

The following notes describe the type of hard disk drives that the server supports and other information that you must consider when you install a hard disk drive. For a list of supported hard disk drives, see http://www.lenovo.com/us/en/ serverproven/.

- Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this chapter.
- Make sure that you have all the cables and other equipment that are specified in the documentation that comes with the drive.
- Select the bay in which you want to install the drive.
- Check the instructions that come with the drive to determine whether you have to set any switches or jumpers on the drive. If you are installing a SAS or SATA hard disk drive, be sure to set the SAS or SATA ID for that device.
- You can install up to six 2.5-inch hard disk drives for each node hot-swap SAS or SATA hard disk drives in the server.
- The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all bays and PCI and PCI Express slots covered or occupied. When you install a drive, PCI, or PCI Express adapter, save the EMC shield and filler panel from the bay or PCI or PCI Express adapter slot cover in the event that you later remove the device.
- For a complete list of supported optional devices for the server, see http://www.lenovo.com/us/en/ serverproven/.

The following table describes the hard disk drive slot IDs.

Hard disk drive (HDD) location vs. hard disk drive signal mapping table								
HDD location	(Front HDD) HDD0	(Front HDD) HDD1	(Front HDD) HDD2	(Front HDD) HDD3	(Front HDD) HDD4	(Front HDD) HDD5	(internal connector) SATA1 / SATADOM	(internal connector) SATA2/Not use
PCH SATA mode	SATA port 3	SATA port 4	SATA port 5	SATA port 6	sSATA port 1	sSATA port 2	SATA port 1	SATA port 2 (Not use)
PCH SW RAID mode (RSTe)	ID 2	ID 3	ID 4	ID 5	ID 0	ID 1	SATA port 1	SATA port 2 (Not use)
HBA adapter installed (SAS mode)	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5		
HBA adapter installed (RAID mode)	Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5		

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

To install a hot-swap SAS or SATA hard disk drive, complete the following steps:

Note: If you have only one hard disk drive, you must install it in the left drive bay.

Attention: To avoid damage to the hard disk drive connectors, make sure that the server cover is in place and fully closed whenever you install or remove a hard disk drive.

Step 1. Remove the filler panel from the empty drive bay. Keep the filler panel in a safe place.

Step 2. Touch the static-protective package that contains the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.

Step 3. Install the hard disk drive in the drive bay:

   a. Make sure that the tray handle is in the open (unlocked) position.

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

2.5-inch hot-swap hard disk drive

Handle

Filler panel handle
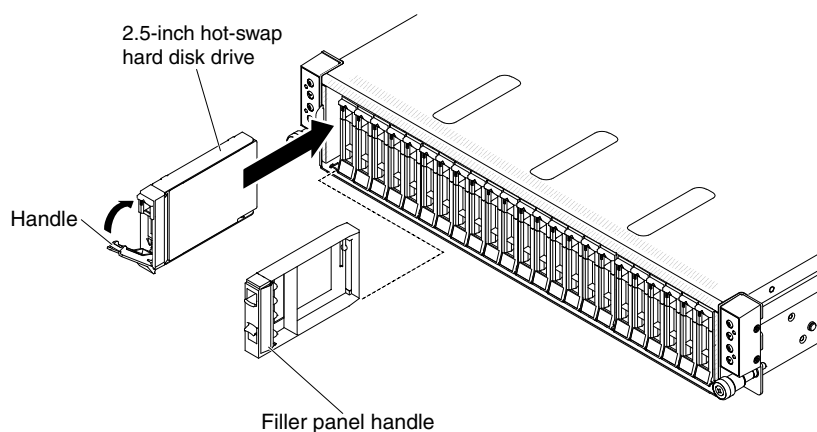
Figure 31. Hot-swap hard disk drive installation

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

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

    e.   Check the hard disk drive status LED to verify that the hard disk drive is operating correctly. If the yellow hard disk drive status LED of 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: If the server is configured for RAID operation using a RAID adapter, you might have to reconfigure your disk arrays after you install hard disk drives. See the RAID adapter documentation for additional information about RAID operation and complete instructions for using the RAID adapter.

Step 4.   If you are installing additional hot-swap hard disk drives, do so now.

Removing a DIMM

Use this information to remove a memory module.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

To remove a dual inline memory module (DIMM), complete the following steps.

Step 1.   Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 2.   Remove the air baffle (see "Removing the air baffle" on page 80).

Step 3.   Carefully open the retaining clips on each end of the DIMM connector and remove the DIMM.

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

Figure 32. DIMM removal

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

Memory module installation

The following notes describe the types of DIMMs that the server supports and other information that you must consider when you install DIMMs.

- Confirm that the server supports the DIMM that you are installing (see http://www.lenovo.com/us/en/serverproven/).
- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message that indicates that the memory configuration has changed. You can use the Setup utility to view the server configuration information, see "Using the Setup utility" on page 28 for more information.
- The server supports only industry-standard double-data-rate 4 (DDR4), 2400 MHz, PC4-19200 (single-rank or dual-rank), unbuffered or synchronous dynamic random-access memory (SDRAM) dual inline memory modules (DIMMs) with error correcting code (ECC).
- The maximum operating speed of the server is determined by the slowest DIMM in the server.
- If you install a pair of DIMMs in DIMM connectors 1 and 3, the size and speed of the DIMMs that you install in DIMM connectors 1 and 3 must match each other. However, they do not have to be the same size and speed as the DIMMs that are installed in DIMM connectors 2 and 4.
- You can use compatible DIMMs from various manufacturers in the same pair.
- The specifications of a DDR4 DIMM are on a label on the DIMM, in the following format.
- *gggGBpheRxff* PC4-*wwwwaa-mccd-bb*

  where:

  – *gggGB* is the total capacity, in gigabytes, for primary bus (ECC not counted) 4GB, 8GB, 16GB, etc. (no space between digits and units)

  – *pheR* is the number of package ranks of memory installed and number of logical ranks per package rank

    – p =

- 1 = 1 package rank of SDRAMs installed
- 2 = 2 package ranks of SDRAMs installed
- 3 = 3 package ranks of SDRAMs installed
- 4 = 4 package ranks of SDRAMs installed
    - he = blank for monolithic DRAMs, else for modules using stacked DRAM:
        - h = DRAM package type
            - D = multi-load DRAM stacking (DDP)
            - Q = multi-load DRAM stacking (QDP)
            - S = single load DRAM stacking (3DS)
        - e = blank for SDP, DDP and QDP, else modules using 3DS stacks, logical ranks per package rank
            - 2 = 2 logical ranks in each package rank
            - 4 = 4 logical ranks in each package rank
            - 8 = 8 logical ranks in each package rank
    - R = rank(s)
    - xff = Device organization (data bit width) of SDRAMs used on this assembly
        - x4 = x4 organization (4 DQ lines per SDRAM)
        - x8 = x8 organization
        - x16 = x16 organization
- *wwwww* is the DIMM bandwidth, in MBps: 2133, 2400, 2666, 2933, 3200
- *aa* is the SDRAM speed grade
- *m* is the DIMM type
    - E = Unbuffered DIMM (UDIMM), x64 primary + 8 bit ECC module data bus
    - L = Load Reduced DIMM (LRDIMM), x64 primary + 8 bit ECC module data bus
    - R = Registered DIMM (RDIMM), x64 primary + 8 bit ECC module data bus
    - U = Unbuffered DIMM (UDIMM) with no ECC (x64-bit primary data bus)
- *cc* is the reference design file used for this design
- *d* is the revision number of the reference design used
- *bb* is the JEDEC SPD Revision Encoding and Additions level used on this DIMM

The following illustration shows the location of the DIMM connectors on the system board.

DIMM F2
DIMM F1
DIMM E2
DIMM E1

DIMM H2
DIMM H1
DIMM G2
DIMM G1

Microprocessor 2

Microprocessor 1

DIMM A1
DIMM A2
DIMM B1
DIMM B2

DIMM C1
DIMM C2
DIMM D1
DIMM D2
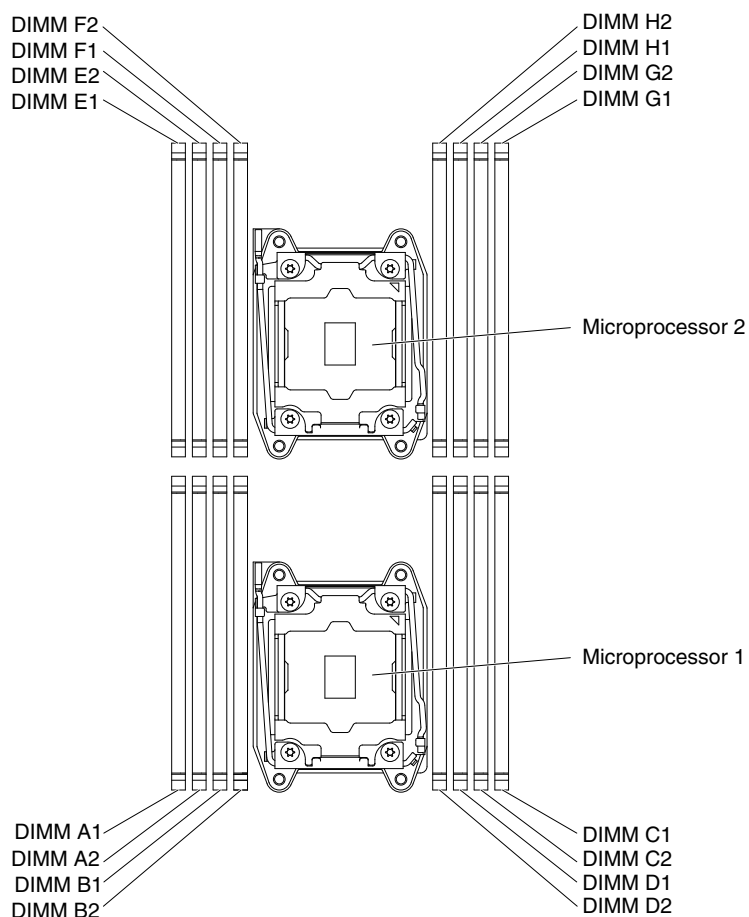
Figure 33. The location of the DIMM connectors on the system board

The following sections provide additional information specific to registered DIMMs that you must consider.

Installing a DIMM

Use this information to install a DIMM.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

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

The following illustration shows the location of the DIMM connectors on the system board.

DIMM F2
DIMM F1
DIMM E2
DIMM E1

DIMM H2
DIMM H1
DIMM G2
DIMM G1

Microprocessor 2

Microprocessor 1

DIMM A1
DIMM A2
DIMM B1
DIMM B2

DIMM C1
DIMM C2
DIMM D1
DIMM D2
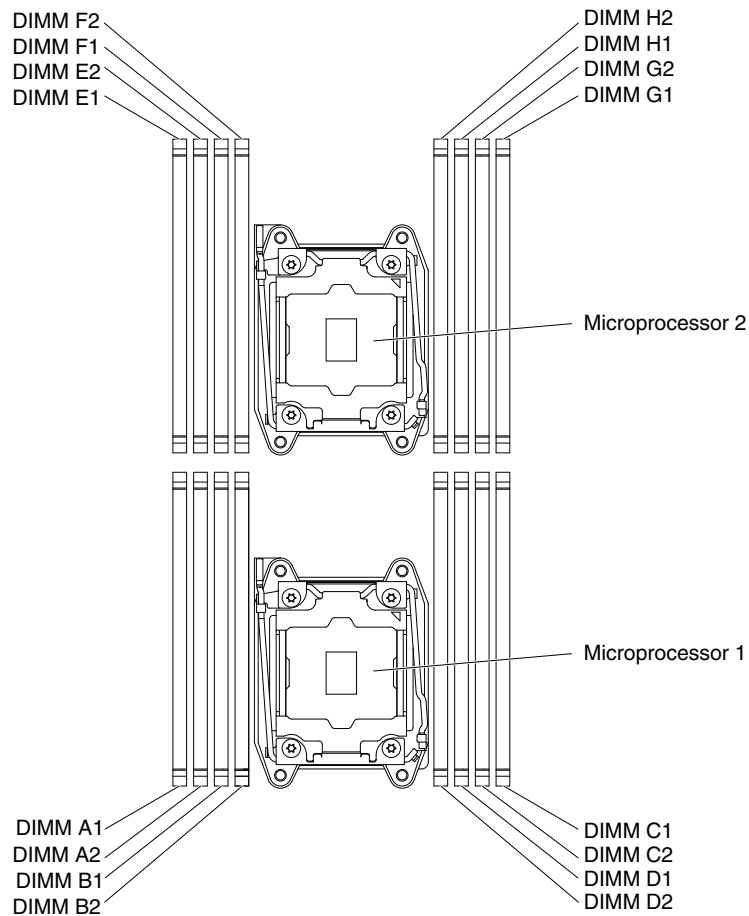
Figure 34. The location of the DIMM connectors on the system board

To install a DIMM, complete the following steps.

Step 1.   Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 2.   Remove the air baffle if installed (see "Removing the air baffle" on page 80).

Step 3.   Locate the DIMM connectors on the system board. Determine the connectors into which you will install the DIMMs. Install the DIMMs in the sequence shown in the following table.

Table 18. DIMM installation sequence (normal mode)

Number of DIMMs	Installation sequence (connectors)
Microprocessor 1 installed	A1, C1, B1, D1, A2, C2, B2, D2
Microprocessor 1 and 2 installed	A1, E1, C1, G1, B1, F1, D1, H1, A2, E2, C2, G2, B2, F2, D2, H2

Table 19. DIMM installation sequence (sparing mode)

Number of DIMMs	Installation sequence (connectors)
Microprocessor 1 installed	A1, A2, C1, C2, B1, B2, D1, D2
Microprocessor 1 and 2 installed	A1, A2, E1, E2, C1, C2, G1, G2, B1, B2, F1, F2, D1, D2, H1, H2

Table 20. DIMM installation sequence (mirror mode/lockstep mode)

Number of DIMMs	Installation sequence (connectors)
Microprocessor 1 installed	A1, B1, C1, D1, A2, B2, C2, D2
Microprocessor 1 and 2 installed	A1, B1, E1, F1, C1, D1, G1, H1, A2, B2, E2, F2, C2, D2, G2, H2

Step 4. Open the retaining clip on each end of the DIMM connector.

Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
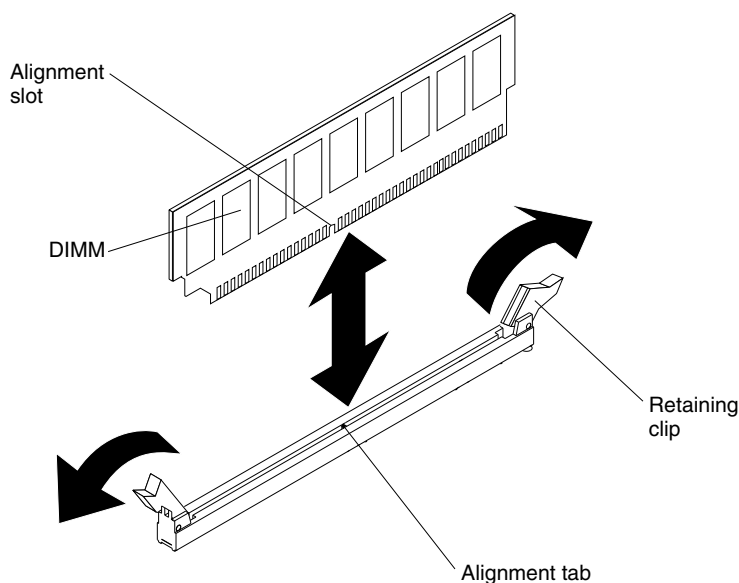
Figure 35. DIMM installation

Step 5. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the outside of the server. Then, remove the DIMM from the package.

Step 6. Turn the DIMM so that the alignment slot align correctly with the alignment tab.

Step 7. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector.

Step 8. 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.

Note: 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.

Step 9. Reconnect any cable that you removed.

Step 10. Reinstall the air baffle (see "Installing the air baffle" on page 81).

Step 11. Reinstall compute node (see "Installing a compute node in a chassis" on page 71).

If you have replaced a server component or installed an optional device in the server, you need slide the server into the rack, reconnect the power cords and all external cables, and turn on the server and peripheral devices.

Removing a hot-swap power supply

Use this information to remove a hot-swap power supply.

When you remove or install a hot-swap power supply, observe the following precautions.

Statement 5

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

Statement 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.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

To remove a hot-swap power supply, complete the following steps.

Attention: If only one hot-swap power supply is installed in the server, you must turn off the server before removing the power supply.

Step 1.   If the server is in a rack, at the back of the server, pull back the cable management arm to gain access to the rear of the server and the power supply.

Step 2.   Disconnect the power cord from the connector on the back of the power supply.

Step 3.   Press and hold the orange release tab to the left.
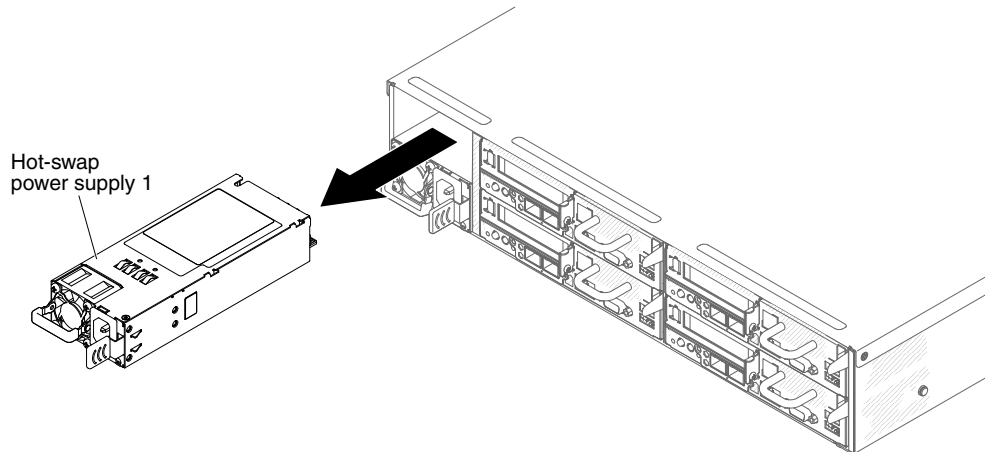
Figure 36. Hot-swap power supply removal

Step 4.   Grasp the handle and pull the power supply out of the bay.

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

Replacing a hot-swap power supply

Use this information to replace a hot-swap power supply.

Note: Make sure that the devices that you are installing are supported. For a list of supported optional devices for the server, see http://www.lenovo.com/us/en/ serverproven/.

Statement 5

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

Statement 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.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

To replace or install a hot-swap power supply, complete the following steps.

Step 1.   Slide the hot-swap power supply into the bay until the release latch clicks into place.

> **Important:** During normal operation, each power-supply bay must contain either a power supply or power-supply filler panel for proper cooling.
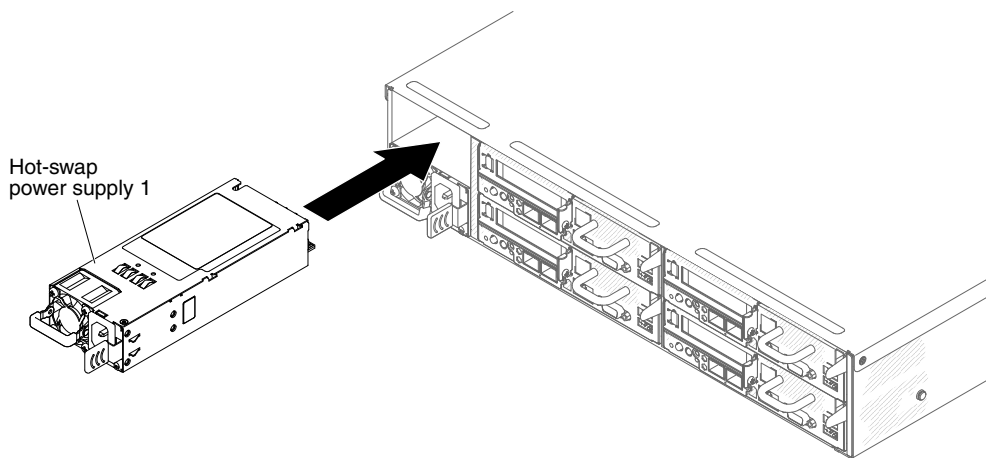
Figure 37. Hot-swap power supply installation

Step 2.   Connect one end of the power cord for the new power supply into the ac connector on the back of the power supply; then, connect the other end of the power cord into a properly grounded electrical outlet.

Step 3.   If the server is turned off, turn on the server.

Step 4. Make sure that the ac power LED on the power supply is lit, indicating that the power supply is operating correctly. If the server is turned on, make sure that the dc power LED on the power supply is lit also.

Removing the system battery

Use this information to remove the CMOS battery.

Before you remove the system battery, complete the following steps:

1. Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.
2. If the compute node is installed in a Lenovo ThinkServer n400 Enclosure Type 5495, remove it (see "Removing a compute node from a chassis" on page 71 for instructions).
3. Carefully lay the compute node on a flat, static-protective surface, orienting the compute node with the bezel pointing toward you.

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

- Lenovo has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you replace the battery, you must adhere to the following instructions.

- 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.

- After you replace the battery, you must reconfigure the server and reset the system date and time.

   Statement 2

   ⚠️

   CAUTION:
   When replacing the lithium battery, use only Lenovo Part Number 33F8354 or an equivalent type 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 system battery, complete the following steps:

Step 1. Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 2. If necessary, lift the node and SATA cable out of the way (see "Removing the node SATA cable" on page 142).

Step 3. Remove the system battery:

a. Use a fingernail to press the top of the battery clip away from the battery. The battery pops up when it is released.

b. Use your thumb and index finger to lift the battery from the socket.
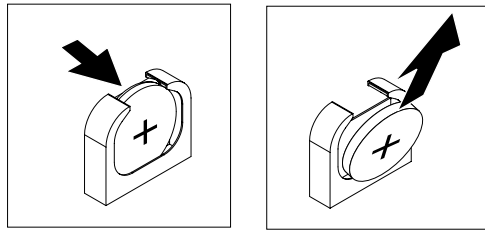
Figure 38. System battery removal

Attention: Do not lift the battery by using excessive force. Failing to remove the battery properly may damage the socket on the system board. Any damage to the socket may require replacing the system board.

Step 4. Dispose of the battery as required by local ordinances or regulations.

Replacing the system battery

Before you install the system battery, complete the following steps:

1. Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

2. If the compute node is installed in a Lenovo ThinkServer n400 Enclosure Type 5495, remove it (see "Removing a compute node from a chassis" on page 71 for instructions).

3. Carefully lay the compute node on a flat, static-protective surface, orienting the compute node with the bezel pointing toward you.

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

- When replacing the system battery, you must replace it with a lithium battery of the same type from the same manufacturer.

- After you replace the system-board 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 only Lenovo Part Number 33F8354 or an equivalent type 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 install the replacement system battery, complete the following steps:

Step 1. Follow any special handling and installation instructions that come with the replacement battery.

Step 2. Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 3. If necessary, lift the node and SATA cable out of the way (see "Removing the node SATA cable" on page 142).

Step 4. Insert the new battery:

    a. Orient the battery so that the positive side faces up.

    b. Tilt the battery so that you can insert it into the socket on the side opposite the battery clip.

Figure 39. System battery installation

    c. Press the battery down into the socket until it clicks into place. Make sure that the battery clip holds the battery securely.

Step 5. Reinstall the node SATA cable (see "Installing the node SATA cable" on page 143).

Step 6. Reinstall compute node (see "Installing a compute node in a chassis" on page 71).

Step 7. Slide the server into the Lenovo ThinkServer n400 Enclosure Type 5495.

Step 8. Turn on the server.

Removing and replacing Tier 2 CRUs

This section provides information for removing and replacing Tier 2 CRUs in the server.

You may install a Tier 2 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 fan cage

Use this information to remove the fan cage from the server.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To remove the fan cage, complete the following steps.

Step 1.   Remove the fan cage cover (see "Removing the fan cage cover" on page 76).

Step 2.   Remove the system fan (see "Removing a system fan" on page 82).

Step 3.   Remove the 5 (two on the right, three on the left) M3 screws from the fan cage.

Step 4.   Lift the fan cage out of the server.
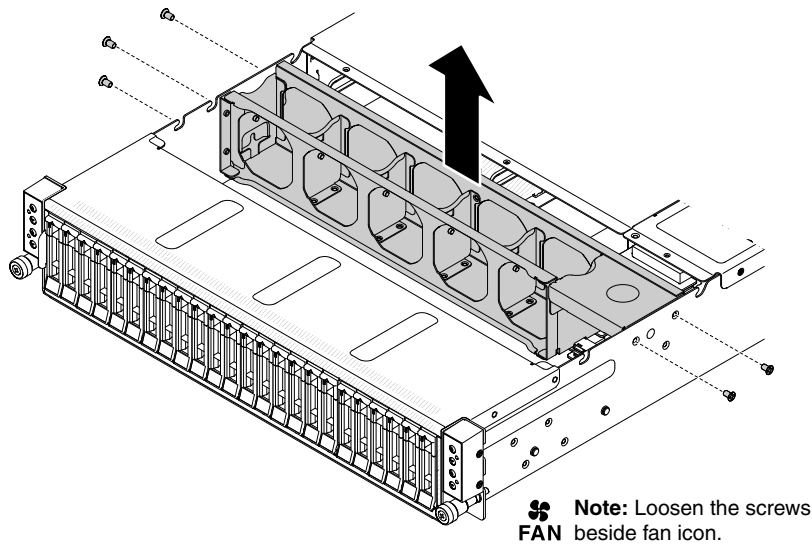
Figure 40. Fan cage removal

Replacing the fan cage

Use this information to replace the fan cage.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To replace the fan cage, complete the following steps.

Step 1.   Align the fan cage pins with the cage pin holes on the server chassis.

Step 2.   Lower the fan cage into the server. Press the fan cage inward until it is securely seated. Be careful that do not damage the cables.

Alignment pin

Alignment pin

FAN **Note:** Tighten the screws beside fan icon.
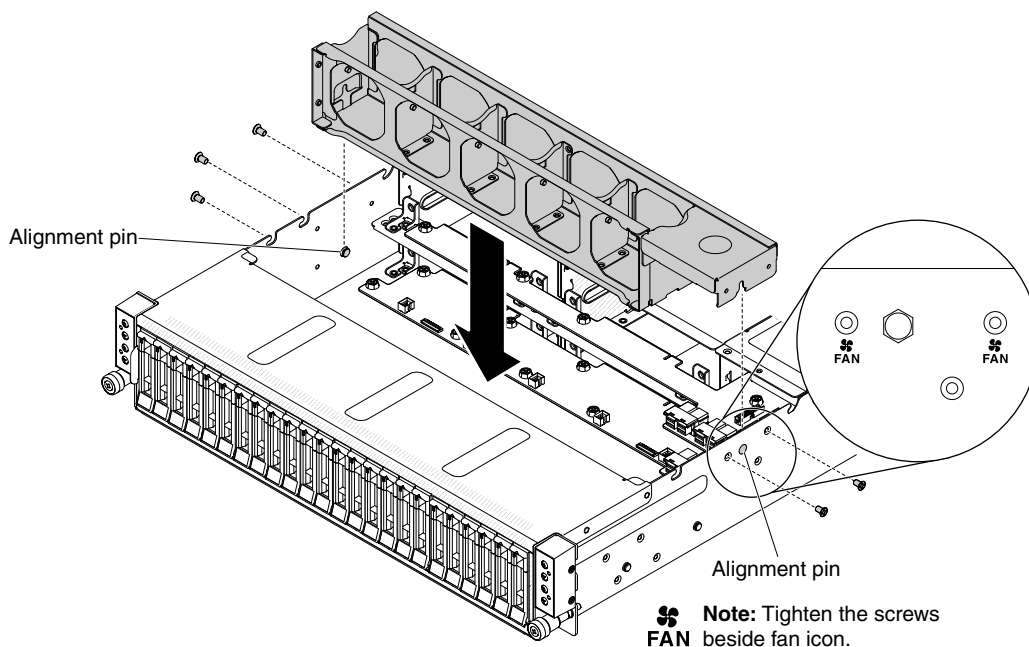
Figure 41. Fan cage installation

Step 3.   Tighten the fan cage with 5 M3 screws.

Step 4.   Reinstall the system fan (see "Replacing a system fan" on page 83).

Step 5.   Reinstall the fan cage cover (see "Installing the fan cage cover" on page 77).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.

2. Reconnect the power cords and any cables that you removed.

3. Turn on the peripheral devices and the server.

Removing the hot-swap hard disk drive backplane

Use this information to remove the hot-swap hard disk drive backplane.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To remove the hot-swap hard disk drive backplane, complete the following steps:

Step 1.   Remove the fan cage cover (see "Removing the fan cage cover" on page 76).

Step 2.   Pull the hard disk drives or fillers out of the server slightly to disengage them from the hard disk drive backplane (see "Removing a hot-swap hard disk drive" on page 84).

Step 3.   Disconnect all of the cables from the hard disk drive backplane.

Step 4.   Turn the thumb screws counterclockwise and lift the blue tab on the backplane to disengage and remove the backplane from the chassis.
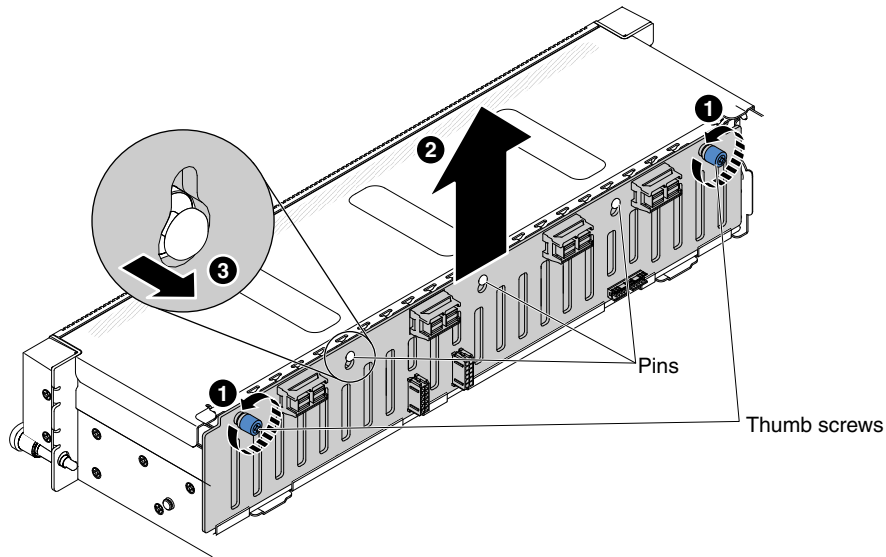
Figure 42. Hot-swap hard disk drive backplane removal

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

Installing the hot-swap hard disk drive backplane

Use this information to replace the hot-swap hard disk drive backplane.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To replace the hot-swap hard disk drive backplane, complete the following steps:

Step 1. Align the backplane with the backplane alignment slots in the chassis.

Step 2. Lower the backplane into the slot in the chassis and turn the thumb screws clockwise.
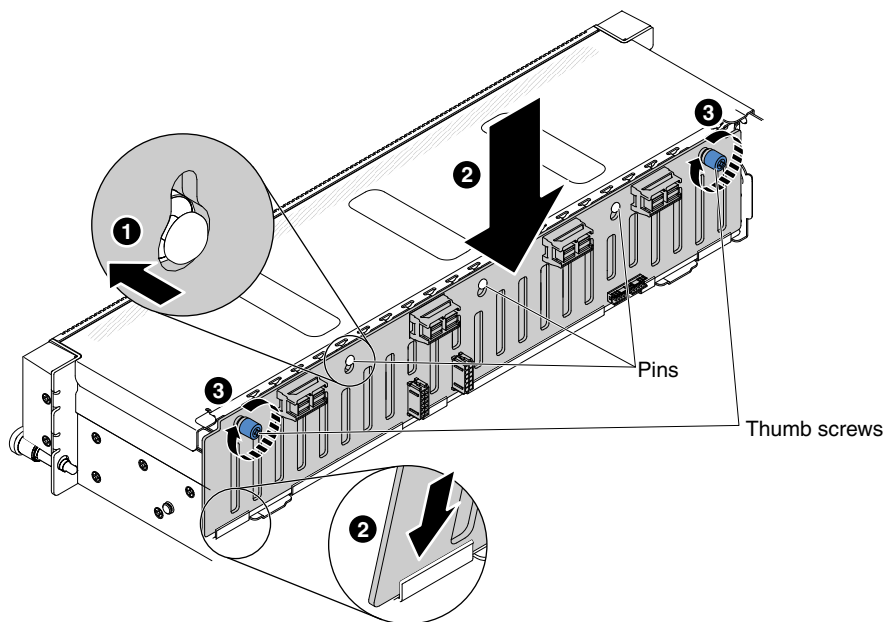
Figure 43. Hot-swap hard disk drive backplane installation

Step 3.   Reinstall the hard disk drives and filler panels (see "Installing a hot-swap hard disk drive" on page 85).

Step 4.   Reconnect all cables that you removed from the hard disk drive backplane (see "Internal cable routing and connectors" on page 138).

Step 5.   Reinstall the fan cage cover (see "Installing the fan cage cover" on page 77).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.
2. Reconnect the power cords and any cables that you removed.
3. Turn on the peripheral devices and the server.

Removing an adapter

Use this information to remove an adapter.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

To remove an adapter, complete the following steps.

Step 1.   Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 2.   Remove the PCI riser-card assembly (see "Removing the PCI riser-card assembly" on page 111).

Step 3.   Disconnect the cables from the adapter if any.

Step 4.   Place the PCI riser-card assembly on a flat, static-protective surface.

Step 5.   Remove the screw.

Step 6.   Carefully grasp the adapter by its top edge or upper corners, and pull the adapter from the PCI riser-card assembly.
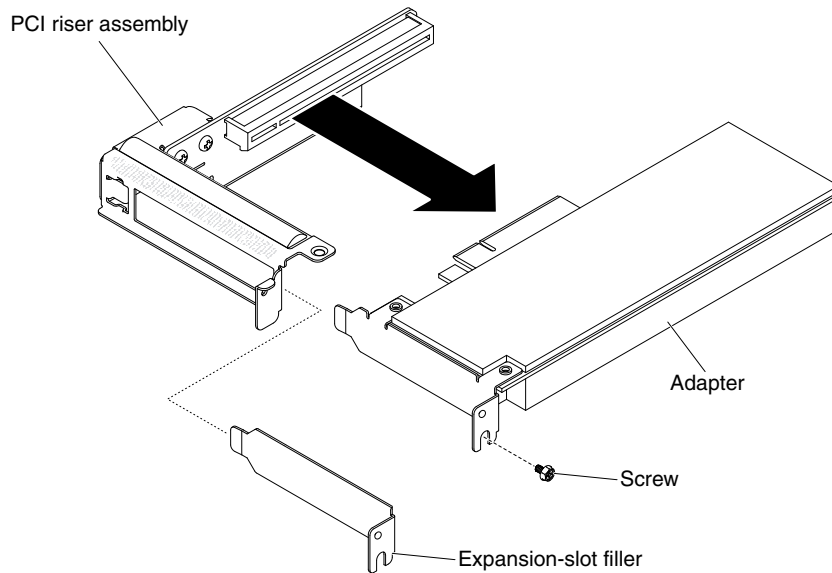
Figure 44. Adapter removal

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

Replacing an adapter

Use this information to replace an adapter.

The following notes describe the types of adapters that the server supports and other information that you must consider when you install an adapter:

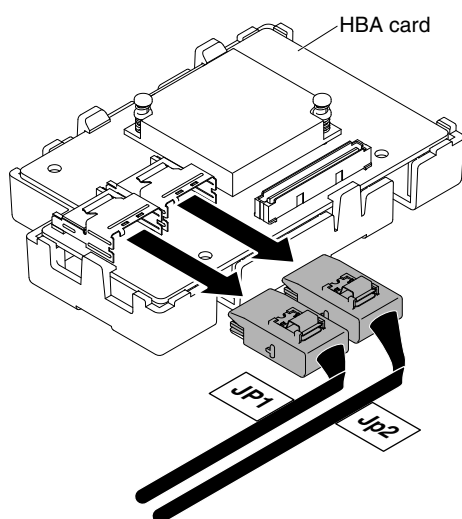- To confirm that the server supports the adapter that you are installing, see http://www.lenovo.com/us/en/ serverproven/.
- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section.
- The adapter slots are on the PCI riser-card assembly. You must first remove the PCI riser-card assembly to access the adapter slots.
- The expansion slots on the PCI riser-card assembly accommodate the various form factors of the non-hot-plug adapters of PCI Express Gen3 x16 half-length, half-height
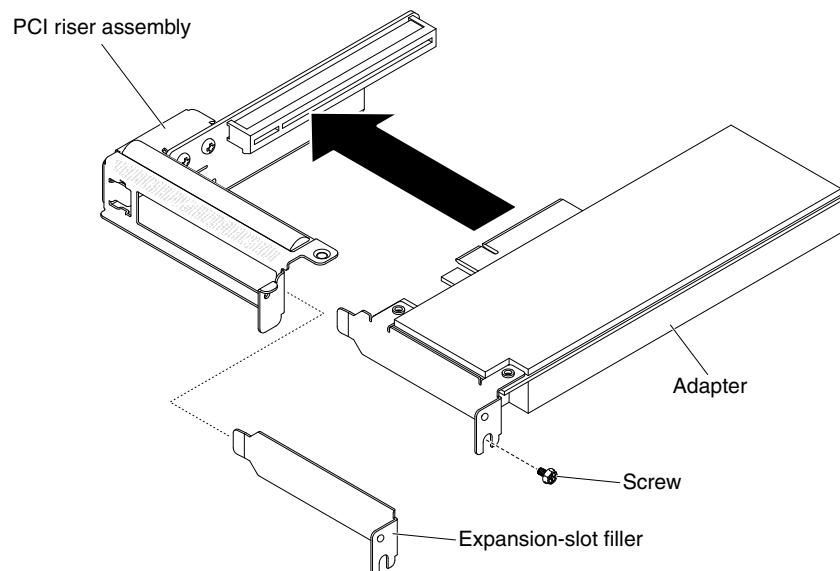
Figure 45. PCI riser-card assembly

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component in the server, you need to turn off the server and peripheral devices and disconnect all external cables.

To replace an adapter, complete the following steps.

Note: If your adapter was previously configured, backup or record its configuration information, if possible, before replacing the adapter. See the documentation for your adapter for information and instructions.

Step 1. Touch the static-protective package that contains the adapter to any unpainted metal surface on the server; then, remove the adapter from the package.

Step 2. Place the adapter, component side up, on a flat, static-protective surface and set any jumpers or switches as described by the adapter manufacturer, if necessary.

Step 3. Follow the cabling instructions, if any come with the adapter. Route the adapter cables before you install the adapter.

Step 4. Align the gold finger on the adapter with the connector on the PCI riser-card assembly, then, insert the adapter into the PCI riser-card assembly. Press the edge of the connector *firmly* into the PCI riser-card assembly. Make sure that the adapter is securely installed in the PCI riser-card assembly.

   Important: Make sure that the U-shaped opening in the metal adapter bracket engages the tab on the expansion-slot filler.

PCI riser assembly

Adapter

Screw

Expansion-slot filler
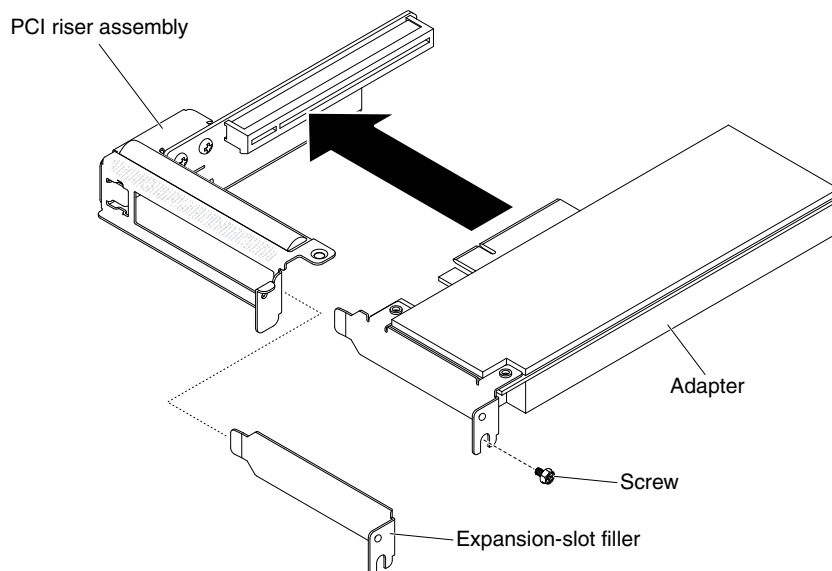
Figure 46. Adapter installation

Step 5. Tighten the screw.

Step 6. Reconnect the cables to the adapter that you removed earlier.

Step 7. Reinstall the PCI riser-card assembly (see "Replacing the PCI riser-card assembly" on page 112).

Attention: When you install an adapter, make sure that the adapter is correctly seated in the PCI riser-card assembly and that the PCI riser-card assembly is securely seated in the riser-card connector on the system board before you turn on the server. An incorrectly seated adapter might cause damage to the system board, the PCI riser-card assembly, or the adapter.

Step 8. Reinstall compute node (see "Installing a compute node in a chassis" on page 71).

Step 9. If you are replacing a ServeRAID adapter, import your RAID configuration to the replacement adapter as a foreign configuration. See the *ServeRAID-M Software User Guide* at http://www.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5086126 for instructions.

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.

2. Reconnect any cables that you removed.

3. Turn on the peripheral devices and the server.

Note: If the server is configured for RAID operation through an optional RAID adapter, you might have to reconfigure your disk arrays after you install an adapter. See the RAID documentation on the *Lenovo RAID Support* CD for additional information about RAID operation and complete instructions for using RAID Manager.

Removing an HBA adapter

Use this information to remove an HBA adapter.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

To remove an HBA adapter, complete the following steps.

Step 1. Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 2. Remove the air baffle (see "Removing the air baffle" on page 80).

Step 3. Remove the HBA screws (x4).

Step 4. Carefully grasp both ends of the HBA adapter and the end of its cable, and pull the HBA adapter from the compute node.
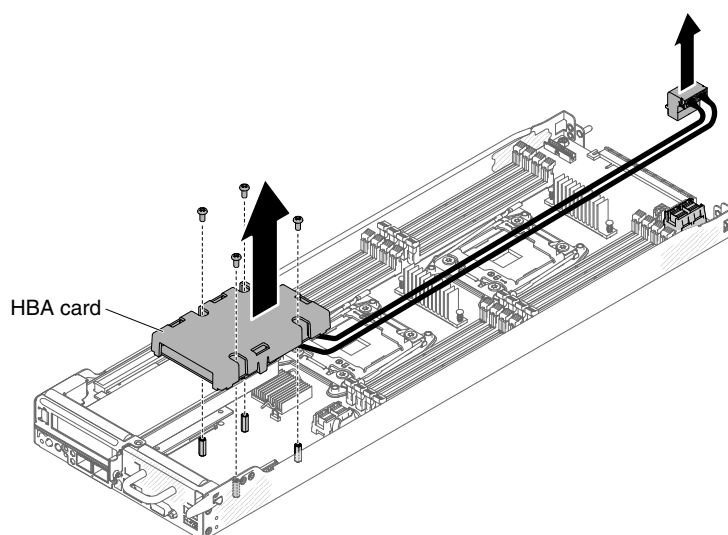
Figure 47. Adapter removal

Step 5. Remove the HBA cables from the HBA adapters.
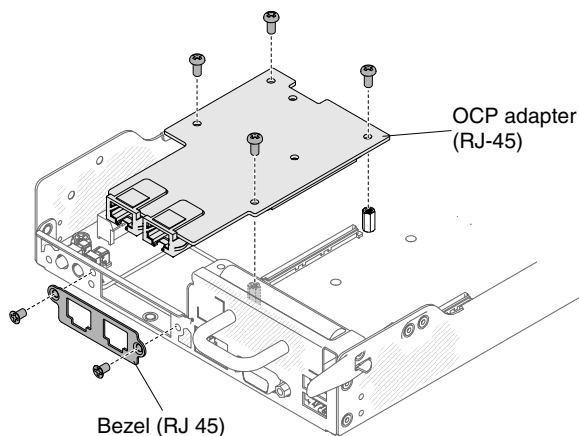

Figure 48. Adapter cables removal

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

Replacing an HBA adapter

Use this information to replace an HBA adapter.

The following notes describe the types of HBA adapters that the server supports and other information that you must consider when you install an adapter:

- To confirm that the server supports the HBA adapter that you are installing, see http://www.lenovo.com/us/en/ serverproven/.
- Locate the documentation that comes with the HBA adapter and follow those instructions in addition to the instructions in this section.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component in the server, you need to turn off the server and peripheral devices and disconnect all external cables.

To replace an HBA adapter, complete the following steps.

Step 1. Touch the static-protective package that contains the HBA adapter to any unpainted metal surface on the server; then, remove the HBA adapter from the package.

Step 2. Re-connect the HBA adapter cables into the HBA adapters that you removed earlier. Make sure you have folded the cables before connecting into the cables.
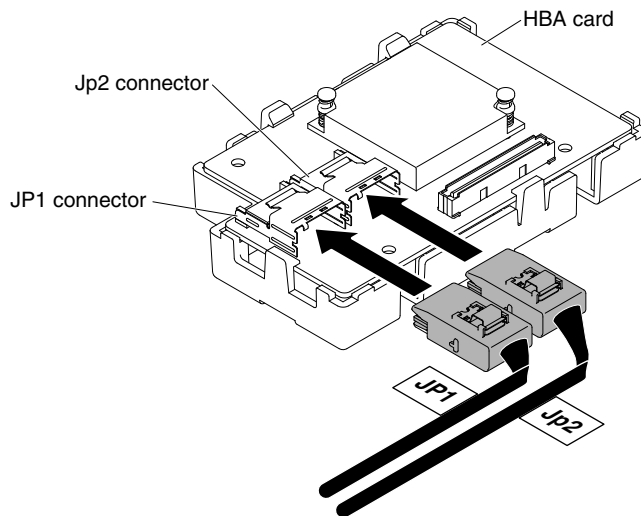
Figure 49. Connecting the HBA cables into the adapter

Step 3. Place the HBA adapter, component side up, on a flat, static-protective surface and set any jumpers or switches as described by the adapter manufacturer, if necessary.

Step 4. Align the gold finger on the HBA adapter, then, insert the HBA adapter into the compute node. Press the edge of the connector *firmly* into the compute node. Make sure that the HBA adapter is securely installed in the compute node.
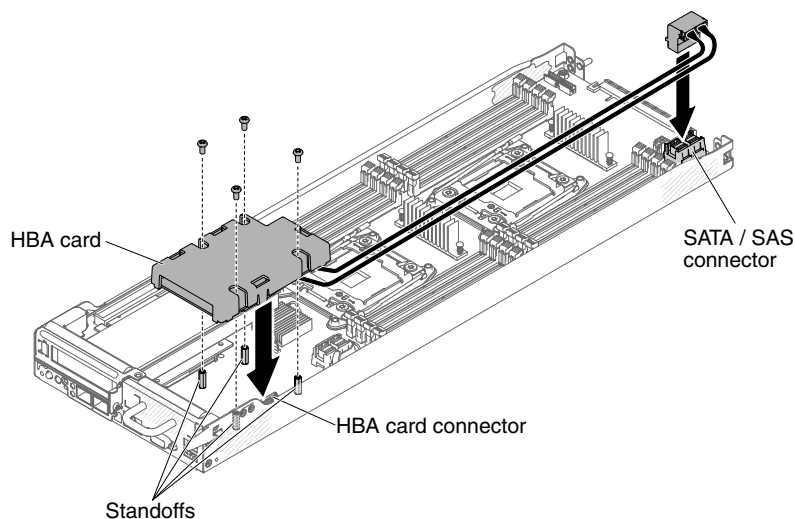
Figure 50. HBA adapter installation

Step 5.   Insert the connectors and follow the cabling instructions to route the HBA adapter cables.
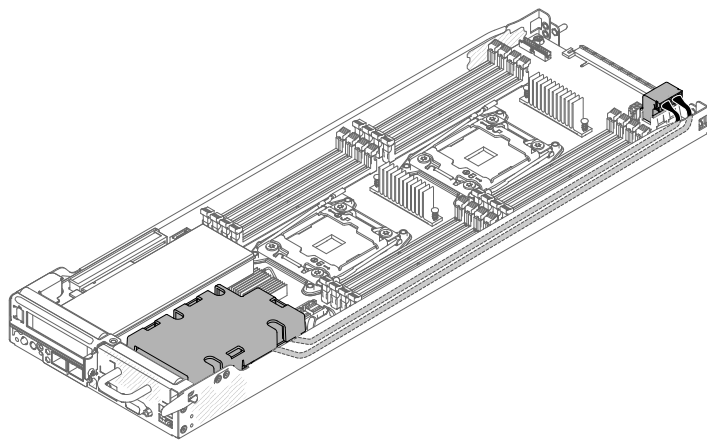
Figure 51. HBA adapter cable-routing

Step 6.   Reinstall compute node (see "Installing a compute node in a chassis" on page 71).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.
2. Reconnect any cables that you removed.
3. Turn on the peripheral devices and the server.

Note: If the server is configured for RAID operation through an optional RAID adapter, you might have to reconfigure your disk arrays after you install an adapter. See the RAID documentation on the *Lenovo RAID Support* CD for additional information about RAID operation and complete instructions for using RAID Manager.

Removing a LAN Mezz adapter

Use this information to remove a LAN Mezz adapter.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

To remove a LAN Mezz adapter, complete the following steps.

Step 1. Disconnect the external cables from the adapter.

Step 2. Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 3. Remove the PCI riser-card assembly (see "Removing the PCI riser-card assembly" on page 111).

Step 4. Remove the 2 screws of the front bezel and remove the bezel.

Step 5. Remove the 4 screws from the adapter.

Step 6. Carefully grasp the adapter by its top edge or upper corners, and pull the adapter out of the compute node.
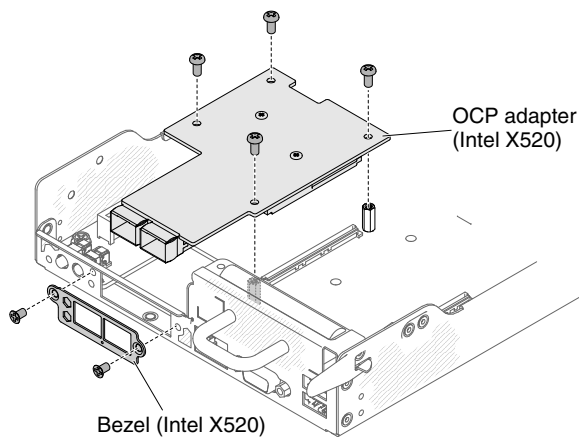
Figure 52. LAN Mezz adapter removal (Intel X520)

Figure 53. LAN Mezz adapter removal (RJ 45)

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

Replacing a LAN Mezz adapter

Use this information to replace a LAN Mezz adapter.

The following notes describe the types of adapters that the server supports and other information that you must consider when you install a LAN Mezz adapter:

- To confirm that the server supports the LAN Mezz adapter that you are installing, see http://www.lenovo.com/us/en/ serverproven/.
- To confirm that the server supports the LAN Mezz adapter that you are installing, see http://www.lenovo.com/us/en/ serverproven/.
- If you are installing a different LAN Mezz adapter, make sure you also need to replace the standoffs which come from the package.

Standoff
(For RJ-45)

Standoff
(For Intel X520)
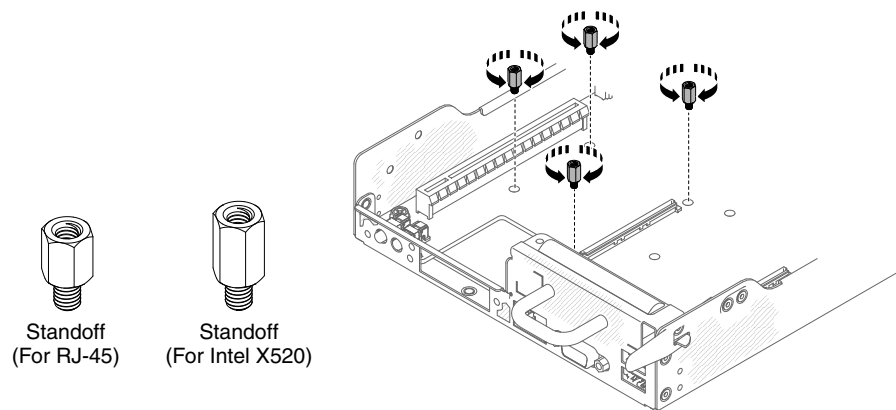
Figure 54. The standoffs of the LAN Mezz adapters

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component in the server, you need to turn off the server and peripheral devices and disconnect all external cables.

To replace a LAN Mezz adapter, complete the following steps.

Step 1.   Touch the static-protective package that contains the adapter to any unpainted metal surface on the server; then, remove the adapter from the package.

Step 2.   Install the 4 stand offs.

Step 3.   Install the LAN Mezz adapter.

Step 4.   Tighten the 4 screws.
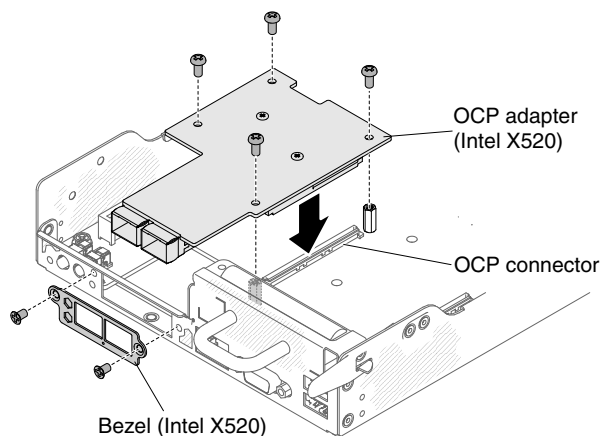
Figure 55. LAN Mezz adapter installation (Intel X520)
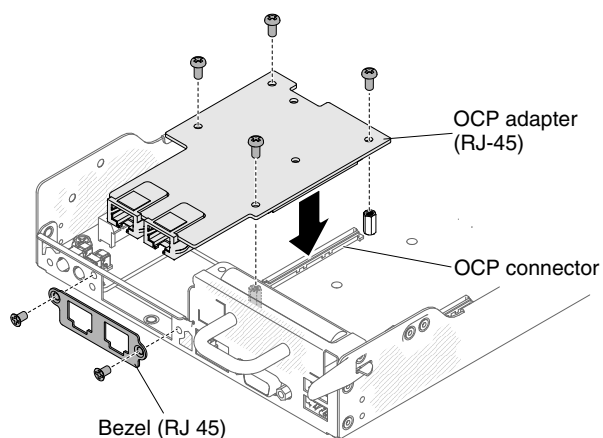
Figure 56. LAN Mezz adapter installation (RJ 45)

Step 5. Reinstall the bezel by tighten the 2 screws.

Step 6. Reinstall compute node (see "Installing a compute node in a chassis" on page 71).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.

2. Reconnect any cables that you removed.

3. Turn on the peripheral devices and the server.

Note: If the server is configured for RAID operation through an optional RAID adapter, you might have to reconfigure your disk arrays after you install an adapter. See the RAID documentation on the *Lenovo RAID Support* CD for additional information about RAID operation and complete instructions for using RAID Manager.

Removing the PCI riser-card assembly

Use this information to remove the PCI riser-card assembly.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

To remove the PCI riser-card assembly, complete the following steps.

Step 1.   Remove the compute node (see "Removing a compute node from a chassis" on page 71).
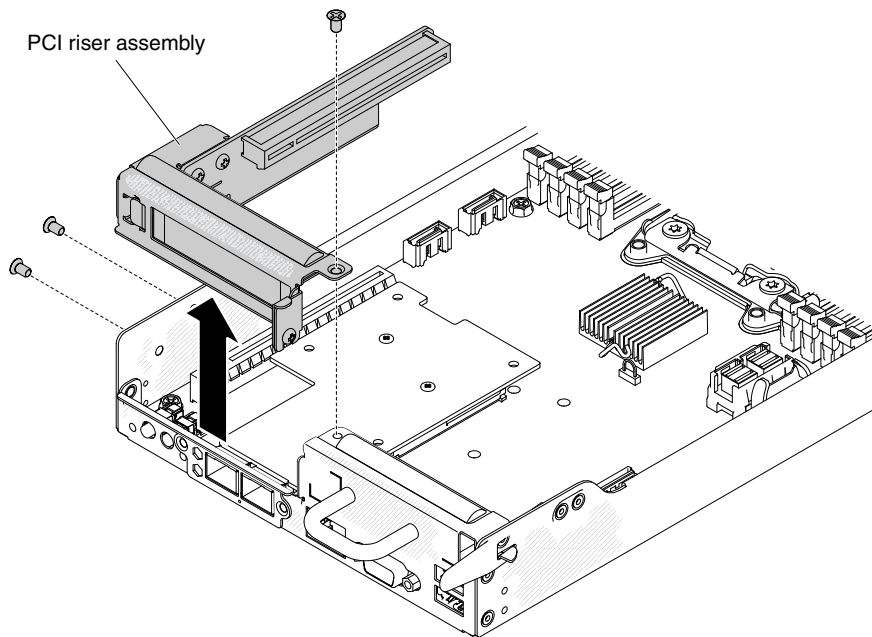
PCI riser assembly

Figure 57. PCI riser-card assembly removal

Step 2.   Remove the 3 M3 screws.

Step 3.   Grasp the PCI riser-card assembly at the front and rear edges (blue tabs) and lift to remove it from the server.

Step 4.   Disconnect any cables from the adapters in the PCI riser-card assembly.

Step 5.   Remove the adapter from the PCI riser-card assembly (see "Removing an adapter" on page 102).

Step 6.   Place the PCI riser-card assembly on a flat, static-protective surface.

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

Replacing the PCI riser-card assembly

Use this information to replace the PCI riser-card assembly.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

To replace the PCI riser-card assembly, complete the following steps.

Step 1. Install the adapter in the PCI riser-card assembly (see "Replacing an adapter" on page 103).

Step 2. Reconnect any adapter cables that you disconnected when you removed the PCI riser-card assembly.

Step 3. Carefully align the PCI riser-card assembly with the guides on the rear of the server and with the PCI riser-card connector on the system board; then, press down on the PCI riser-card assembly. Make sure that the riser-card assembly is fully seated in the connector on the system board.
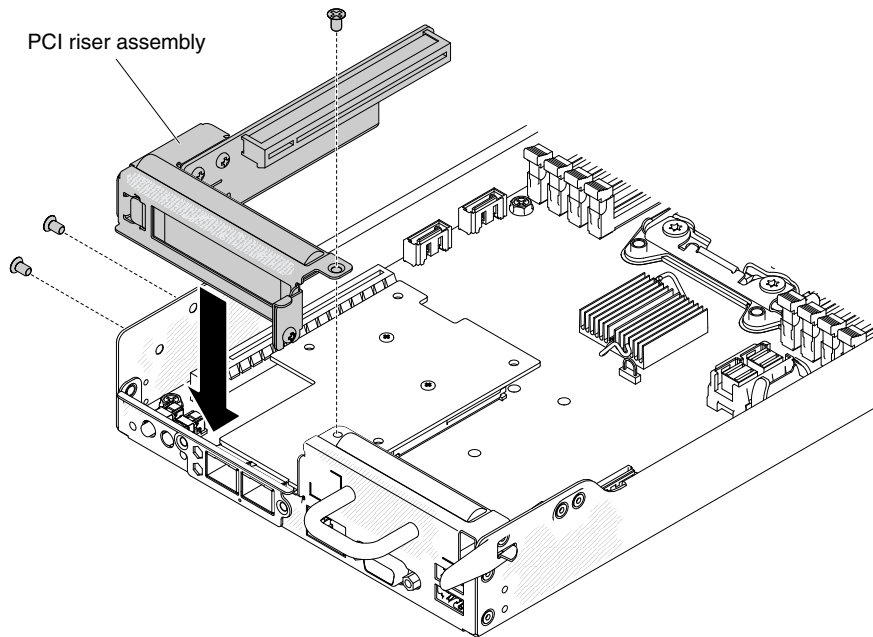
Figure 58. PCI riser-card assembly installation

Step 4. Tighten the PCI riser-card assembly with 3 M3 screws.

Step 5. Reinstall compute node (see "Installing a compute node in a chassis" on page 71).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.
2. Reconnect any cables that you removed.
3. Turn on the peripheral devices and the server.

Removing a SATADOM

Use this information to remove a SATADOM.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

To remove a SATADOM, complete the following steps.

Step 1. Disconnect the external cables from the compute node.

Step 2. Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 3. Press the latch of the SATADOM.

Step 4.   Carefully grasp the SATADOM by its top edge or upper corners, and pull the SATADOM out of the connector.
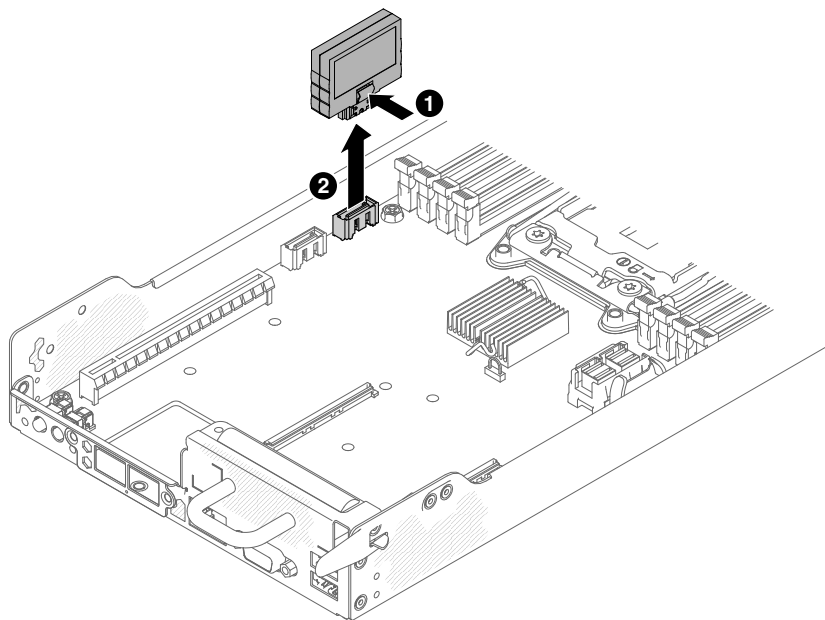
Figure 59.   SATADOM removal

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

Replacing a SATADOM

Use this information to replace a SATADOM.

To replace a SATADOM, complete the following steps.

Step 1.   Touch the static-protective package that contains the adapter to any unpainted metal surface on the server; then, remove the adapter from the package.

Step 2.   Install the SATADOM.
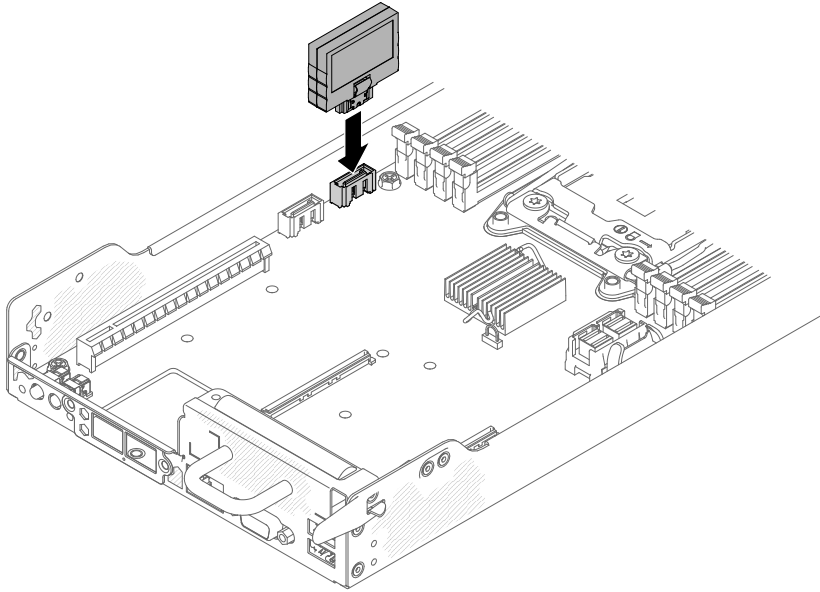
Figure 60. SATADOM installation

Step 3. Reinstall compute node (see "Installing a compute node in a chassis" on page 71).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.
2. Reconnect any cables that you removed.
3. Turn on the peripheral devices and the server.

Removing and replacing FRUs

This section provides information for removing and replacing FRUs in the server.

FRUs must be installed only by trained service technicians.

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

Removing the fan board

Use this information to remove the fan board from the server.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To remove the fan board, complete the following steps.

Step 1. Remove all the nodes (see "Removing a compute node from a chassis" on page 71).
Step 2. Remove the fan cage cover (see "Removing the fan cage cover" on page 76).
Step 3. Remove the system fan (see "Removing a system fan" on page 82).
Step 4. Remove the fan cage (see "Removing the fan cage" on page 98).

Step 5.   Remove the cables from the power interface board.

Step 6.   Remove the power interface board (see "Removing the power interface board" on page 132).

Step 7.   Remove the power interface board bracket (see "Removing the power interface board bracket" on page 134).

Step 8.   Remove the cables from the fan board.

Step 9.   Remove the 10 6#32 screws from the fan board.

Step 10. Lift the fan board out of the server.
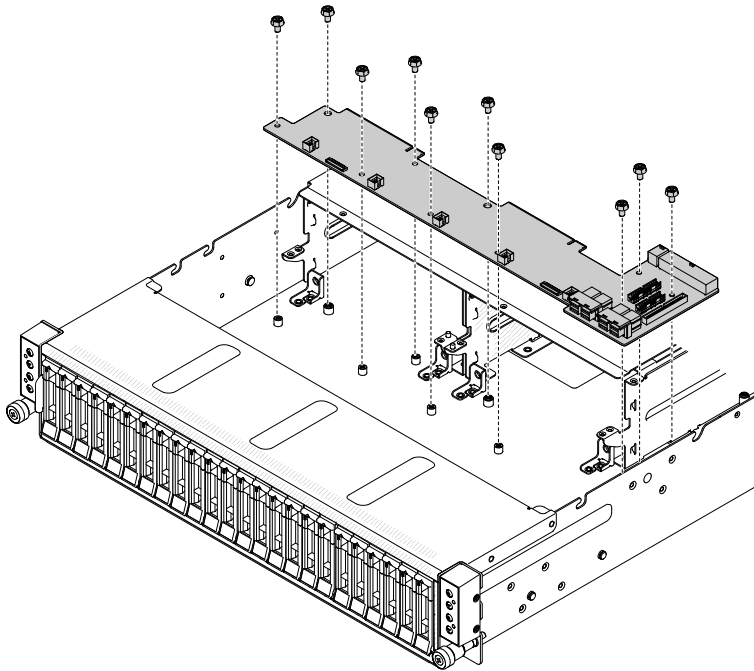
Figure 61. Fan board removal

Installing the fan board

Use this information to install the fan board.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To install the fan board, complete the following steps.

Step 1.   Align the fan board holes with the cage holes on the server chassis.

Step 2.   Lower the fan board into the server.
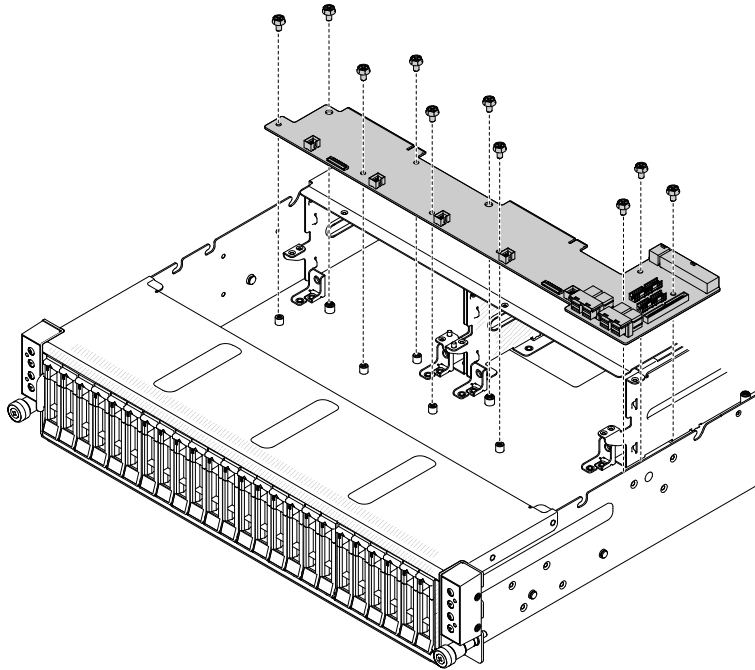
Figure 62. Fan board installation

Step 3. Tighten the fan board with 10 6#32 screws.

Step 4. Reinstall the cable on the fan board.

Step 5. Reinstall the power interface board bracket (see "Installing the power interface board bracket" on page 135).

Step 6. Reinstall the power interface board (see "Installing the power interface board" on page 133).

Step 7. Reinstall the cables on the power interface board.

Step 8. Reinstall the fan cage (see "Replacing the fan cage" on page 99).

Step 9. Reinstall the system fan (see "Replacing a system fan" on page 83).

Step 10. Reinstall the fan cage cover (see "Installing the fan cage cover" on page 77).

Step 11. Reinstall compute node (see "Installing a compute node in a chassis" on page 71).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.

2. Reconnect the power cords and any cables that you removed.

3. Turn on the peripheral devices and the server.

Removing the hard disk drive cage assembly

Use this information to remove the hard disk drive cage assembly from the server.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To remove the hard disk drive cage, complete the following steps.

Step 1. Remove the fan cage cover (see "Removing the fan cage cover" on page 76).

Step 2. Remove the fans (see "Removing a system fan" on page 82).

Step 3. Remove the fan cage (see "Removing the fan cage" on page 98).

Step 4. Remove the system management board cover (see "Removing the system management board cover" on page 78).

Step 5. Disconnect the hard disk drive backplane configure cable (x1), hard disk drive backplane power cable (x2), SAS cables (x8), thermal sensor cable (x1) and front I/O cable (x2).

Step 6. Remove the hard disk drive (see "Removing a hot-swap hard disk drive" on page 84).

Step 7. Remove the hard disk drive backplane (see "Removing the hot-swap hard disk drive backplane" on page 100).

Step 8. Remove the 10 (5 on each side) M3 screws from the hard disk drive cage.

Step 9. Slide the hard disk drive cage out of the server.
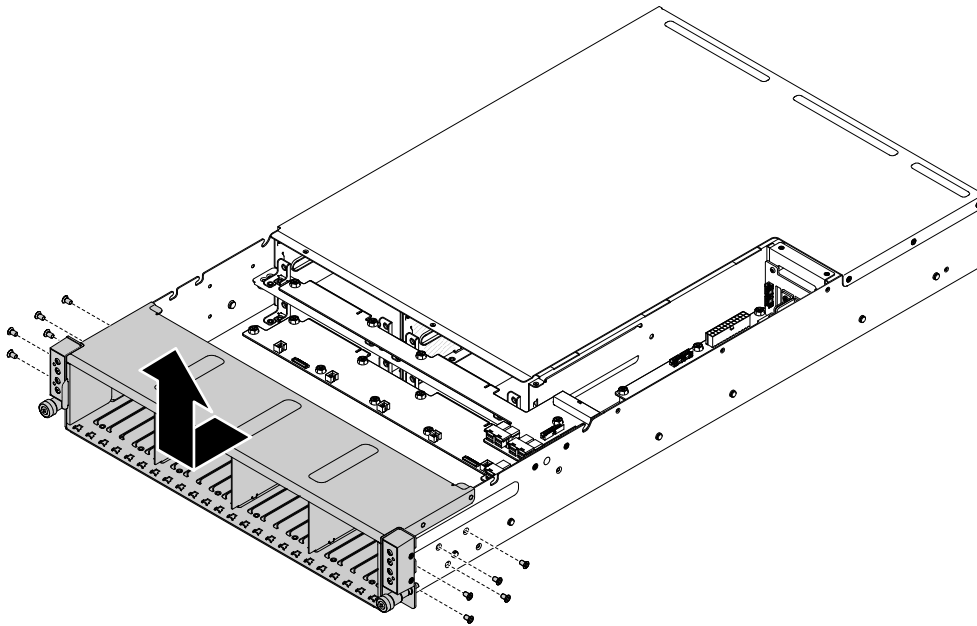
Figure 63. Hard disk drive cage removal

Replacing the hard disk drive cage assembly

Use this information to replace the hard disk drive cage assembly.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To replace the hard disk drive cage assembly, complete the following steps.

Step 1. Make sure the front I/O cable and the thermal sensor cable are placed properly on the hard disk drive cage.

Step 2. Do not damage the cables including the front I/O cable and thermal sensor cable during the installation.

Step 3. Align the hard disk drive cage assembly bottom with the cage pin holes on the server chassis.

Step 4. Lower the hard disk drive cage assembly into the server. Press the hard disk drive cage assembly inward until it is securely seated.
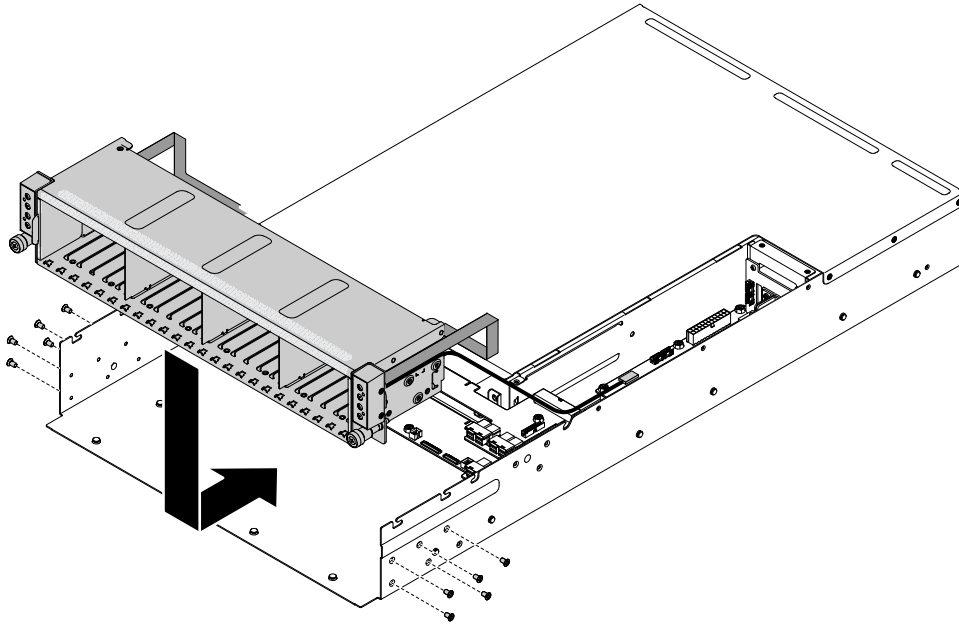
Figure 64. Hard disk drive cage installation

Step 5. Tighten the hard disk drive cage with 10 M3 screws.

Step 6. Reinstall the hard disk drive backplane and connect the cables.

Step 7. Reinstall the cables, including hard disk drive backplane configure cable (x1), hard disk drive backplane power cable (x2), SAS cables (x8), thermal sensor cable (x1) and front I/O cable (x2).

Step 8. Reinstall the system fan (see "Replacing a system fan" on page 83).

Step 9. Reinstall the system management board cover (see "Installing the system management board cover" on page 79).

Step 10. Reinstall the fan cage cover (see "Installing the fan cage cover" on page 77).

Step 11. Reinstall the hard disk drive (see "Installing a hot-swap hard disk drive" on page 85).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.

2. Reconnect the power cords and any cables that you removed.

3. Turn on the peripheral devices and the server.

Removing a microprocessor and heat sink

Use this information to remove a microprocessor and heat sink.

• Microprocessors are to be removed only by trained technicians.

Important: Always use the microprocessor installation tool to remove a microprocessor. Failing to use the microprocessor installation tool may damage the microprocessor sockets on the system board. Any damage to the microprocessor sockets may require replacing the system board.

- Be extremely careful, the microprocessor socket contacts are very fragile. Do not touch the microprocessor socket contacts. Contaminants on the microprocessor contacts or microprocessor socket contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.
- Do not allow the thermal grease on the microprocessor and heat sink to come in contact with anything. Contact with any surface can contaminate the thermal grease and the microprocessor socket.
- Do not use any tools or sharp objects to lift the locking levers on the microprocessor socket. Doing so might result in permanent damage to the system board.
- Each microprocessor socket must always contain either a socket cover or a microprocessor and heat sink.
- Be sure to use only the installation tools provided with the new microprocessor to remove or install the microprocessor. Do not use any other tool.
- When installing multiple microprocessors, open one microprocessor socket at a time to avoid damaging other microprocessor socket contacts.
- The microprocessor installation tool has the microprocessor installed on the tool, and may have a protective cover over the microprocessor. Do not use the tool, or remove the cover until you are instructed to do so.

Note: Be sure to use the installation tool that comes with your microprocessor installation tool assembly. The tool has two settings for installing two different sizes of microprocessors. The settings that are marked on the tool are "L" for smaller low core microprocessors, and "H" for larger high core microprocessors.
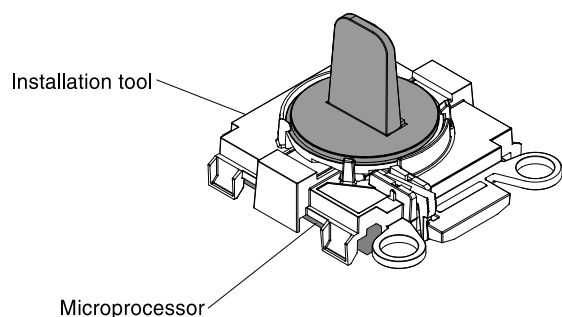
Microprocessor Installation Tool

Figure 65. Microprocessor installation tool

To remove a microprocessor and heat sink, complete the following steps:

Step 1.   Read the safety information that begins on "Safety" on page v and "Installation guidelines" on page 69.

Step 2.   Turn off the server and peripheral devices.

Step 3.   Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 4.   Remove the air baffle (see "Removing the air baffle" on page 80).

Step 5.   Remove the two DIMMs located next to the heat sink (see "Removing a DIMM" on page 87).

Step 6.   Locate the microprocessor to be removed (see "System-board internal connectors" on page 17).

Step 7.   Remove the heat sink.

> **Attention:** Do not touch the thermal material on the bottom of the heat sink. Touching the thermal material will contaminate it. If the thermal material on the microprocessor or heat sink becomes contaminated, you must wipe off the contaminated thermal material on the microprocessor or heat sink with the alcohol wipes and reapply clean thermal grease to the heat sink.

a. Use a screwdriver to loosen the captive screw on one side of the heat sink to break the seal with the microprocessor.

b. Loosen all the captive screws on the heat sink, rotating each screw one full turn until each screw is loose.

c. Gently lift the heat sink from the microprocessor. After removal, place the heat sink (with the thermal grease side up) on a clean, flat surface.

Heat sink for cpu 1

Heat sink for cpu 2
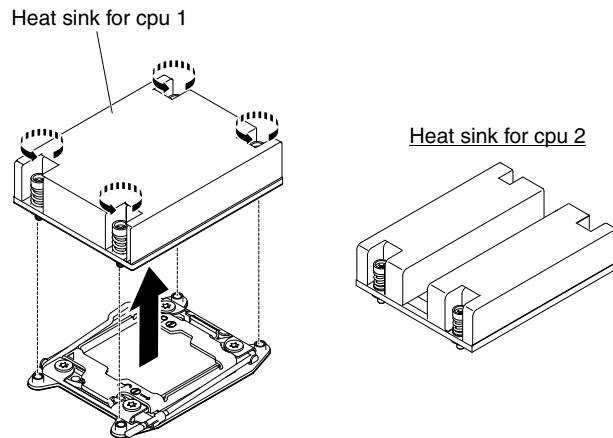
Figure 66. Heat sink removal

Step 8. Open the microprocessor socket release levers and retainer.

Microprocessor release lever

Microprocessor release lever
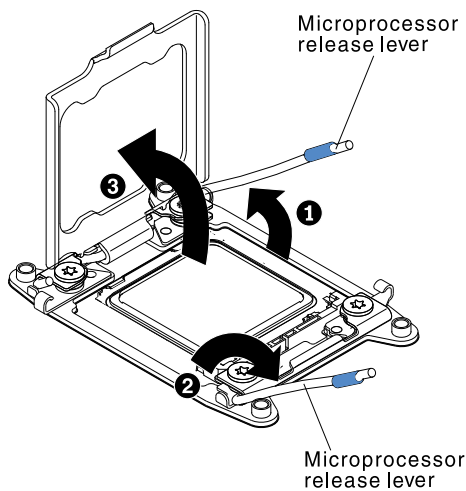
Figure 67. Microprocessor socket levers and retainer disengagement

a. Identify which release lever is labeled as the first release lever to open and open it.

b. Open the second release lever on the microprocessor socket.

c. Open the microprocessor retainer.

   Attention: Do not touch the microprocessor contacts. Contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

Step 9. Remove the microprocessor from the socket.

    a.   Select the empty installation tool and ensure that the handle is in the open position. If the installation tool handle is not in the open position, use the following instructions for your installation tool:

- When using the installation tool, **1** lift the interlock latch and hold it up while you **2** twist the microprocessor installation tool handle counterclockwise to the open position, and then release the interlock latch. The following illustration of the installation tool shows the location of the interlock latch and counterclockwise rotation of the handle before loading the microprocessor.
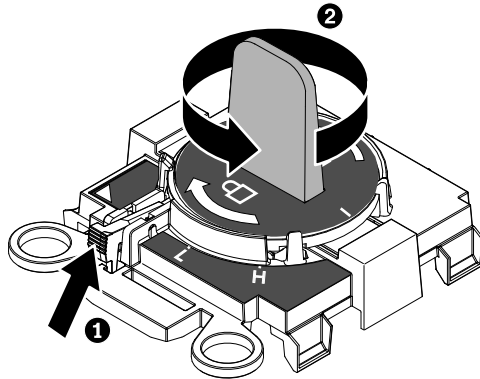
Figure 68. Installation tool handle adjustment

    b.   Align the installation tool with the screws, as shown in the following graphic, and lower the installation tool on the microprocessor. The installation tool rests flush on the socket only when it is aligned correctly.
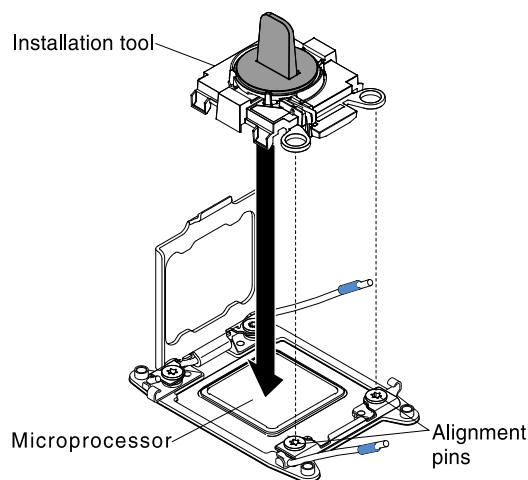
Figure 69. Installation tool alignment

    c.   Using the following instructions for your installation tool to remove the microprocessor.

- When using the installation tool, gently twist the handle of the installation tool clockwise until it locks in the "H" or "L" position, depending on the size of microprocessor, and then lift the microprocessor out of the socket.
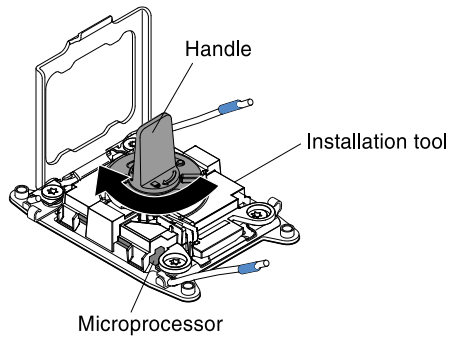
Figure 70. Installation tool handle adjustment

Lock Position **Unlock Position**
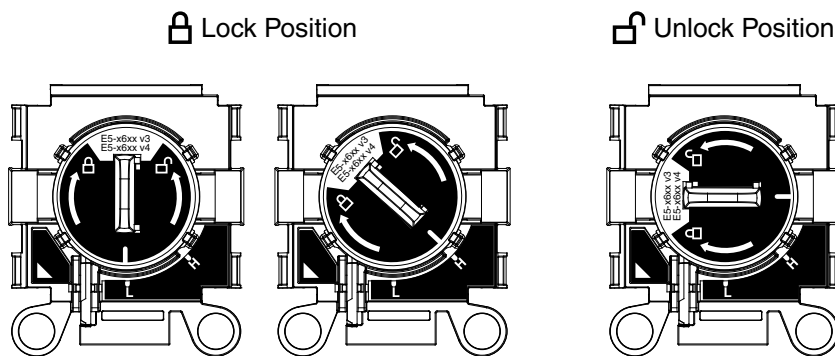
Figure 71. Installation Tool

d. Lift the microprocessor out of the socket.
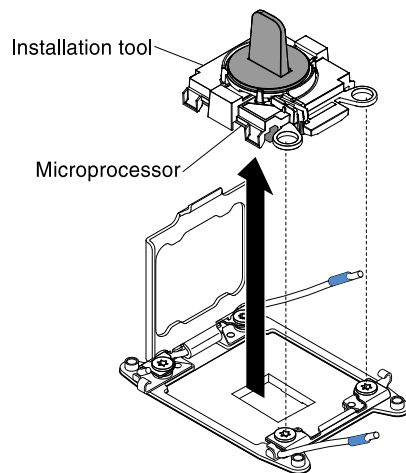
Figure 72. Installation tool removal

Step 10. Install the new microprocessor (see "Replacing a microprocessor and heat sink" on page 124).

Attention: If you are replacing a microprocessor, use the empty installation tool that comes with the new microprocessor to remove the microprocessor.

Step 11. If you do not intend to install a microprocessor on the socket, install the socket cover that you removed in Step 7 on page 127 on the microprocessor socket.

> **Attention:** The pins on the socket are fragile. Any damage to the pins may require replacing the system board.

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

Replacing a microprocessor and heat sink

The following notes describe the type of microprocessor that the server supports and other information that you must consider when you install a microprocessor and heat sink.

- Microprocessors are to be installed only by trained technicians.

  Important: Always use the microprocessor installation tool to install a microprocessor. Failing to use the microprocessor installation tool may damage the microprocessor sockets on the system board. Any damage to the microprocessor sockets may require replacing the system board.

- Be extremely careful, the microprocessor socket contacts are very fragile. Do not touch the microprocessor socket contacts. Contaminants on the microprocessor contacts or microprocessor socket contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

- Do not mix the heat sink for microprocessor 1 and microprocessor 2 to avoid the thermal issue.

- Do not allow the thermal grease on the microprocessor and heat sink to come in contact with anything. Contact with any surface can contaminate the thermal grease and the microprocessor socket.

- Do not use any tools or sharp objects to lift the locking levers on the microprocessor socket. Doing so might result in permanent damage to the system board.

- Each microprocessor socket must always contain either a socket cover or a microprocessor and heat sink.

- Be sure to use only the installation tools provided with the new microprocessor to remove or install the microprocessor. Do not use any other tool.

- When installing multiple microprocessors, open one microprocessor socket at a time to avoid damaging other microprocessor socket contacts.

- The server supports up to two multi-core microprocessors. See http://www.lenovo.com/us/en/serverproven/ for a list of supported microprocessors.

- The first microprocessor must always be installed in microprocessor socket 1 on the system board.

- When one microprocessor is installed, the air baffle must be installed to provide proper system cooling.

- Do not remove the first microprocessor from the system board when you install the second microprocessor.

- Do not mix microprocessors with different cores in the same server.

- To ensure proper server operation when you install an additional microprocessor, use microprocessors that have the same QuickPath Interconnect (QPI) link speed, integrated memory controller frequency, core frequency, power segment, internal cache size, and type.

- Mixing microprocessors of different stepping levels within the same server model is supported.

- When mixing microprocessors with different stepping levels within the same server model, you do not have to install the microprocessor with lowest stepping level and features in microprocessor socket 1.

- Both microprocessor voltage regulator modules are integrated on the system board.

- Read the documentation that comes with the microprocessor to determine whether you have to update the server firmware. To download the latest level of server firmware and other code updates for your server, go to http://www.lenovo.com/support.

- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.

- If the thermal-grease protective cover (for example, a plastic cap or tape liner) is removed from the heat sink, do not touch the thermal grease on the bottom of the heat sink or set down the heat sink. For more information about applying or working with thermal grease, see "Thermal grease" on page 131.

  Note: Removing the heat sink from the microprocessor destroys the even distribution of the thermal grease and requires replacing the thermal grease.

- To order an additional optional microprocessor, contact your Lenovo sales representative or Lenovo reseller.

- The microprocessor installation tool has the microprocessor installed on the tool, and may have a protective cover over the microprocessor. Do not use the tool, or remove the cover until you are instructed to do so.

  Note: Be sure to use the installation tool that comes with your microprocessor installation tool assembly. The tool has two settings for installing two different sizes of microprocessors. The settings that are marked on the tool are "L" for smaller low core microprocessors, and "H" for larger high core microprocessors.

Installation tool
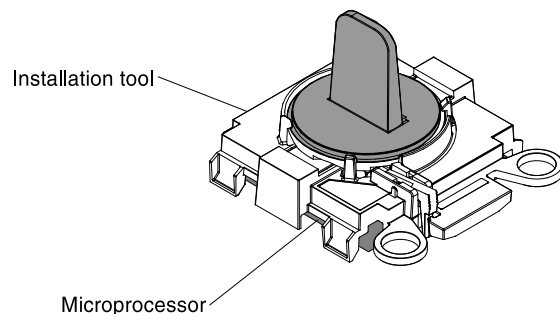
Microprocessor

Microprocessor Installation Tool

Figure 73. Microprocessor installation tool

To replace a microprocessor and heat sink, complete the following steps:

Step 1. Read the safety information that begins on "Safety" on page v and "Installation guidelines" on page 69.

Step 2. Turn off the server and peripheral devices and disconnect all external cables.
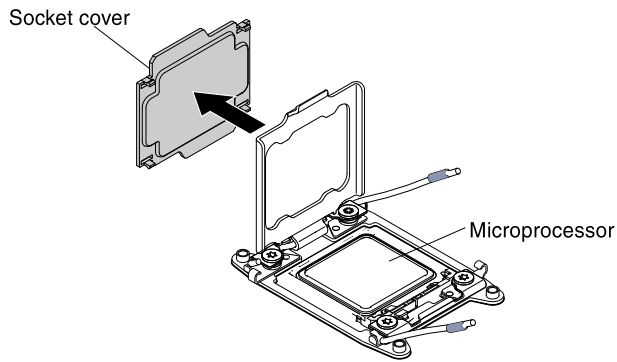
  Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see "Handling static-sensitive devices" on page 70.

Step 3. Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 4. Remove the air baffle (see "Removing the air baffle" on page 80).

Step 5. Open the microprocessor socket release levers and retainer:
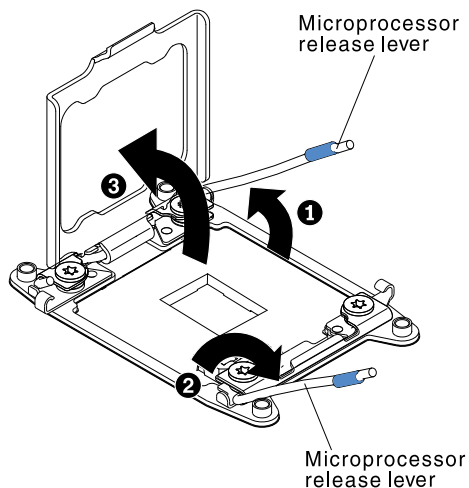
Figure 74. Microprocessor socket levers and retainer disengagement

    a.   Identify which release lever is labeled as the first release lever to open and open it.

    b.   Open the second release lever on the microprocessor socket.

    c.   Open the microprocessor retainer.

    Attention: Do not touch the connectors on the microprocessor and the microprocessor socket.

Step 6.   Install the microprocessor in the microprocessor socket:

    a.   Open the packaging that contains the new microprocessor installation tool assembly and carefully remove the installation tool assembly from the package. The microprocessor is preinstalled on the installation tool.

    Note: Do not touch the microprocessor contacts. Contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

    b.   Align the installation tool with the microprocessor socket. The installation tool rests flush on the socket only if properly aligned.
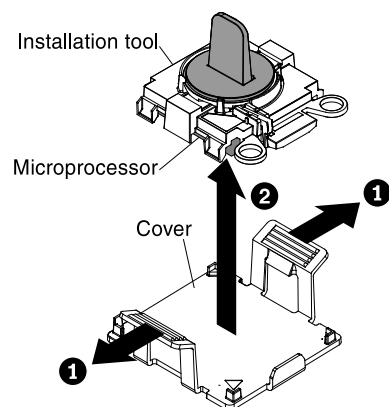
Figure 75. Installation tool alignment

    c.   Install the microprocessor using the following instructions for your installation tool.

- When using the installation tool, twist the handle of the installation tool assembly counterclockwise until the microprocessor is inserted into the socket, and lift the installation tool out of the socket.

Handle

Installation tool
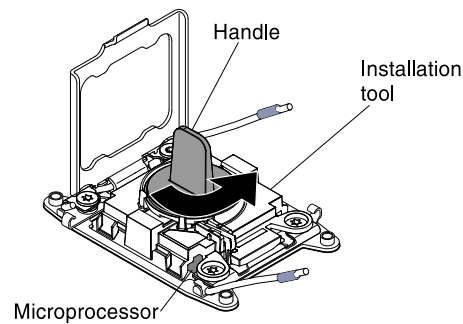
Microprocessor

Figure 76. Installation tool handle adjustment

🔒 Lock Position   🔓 Unlock Position
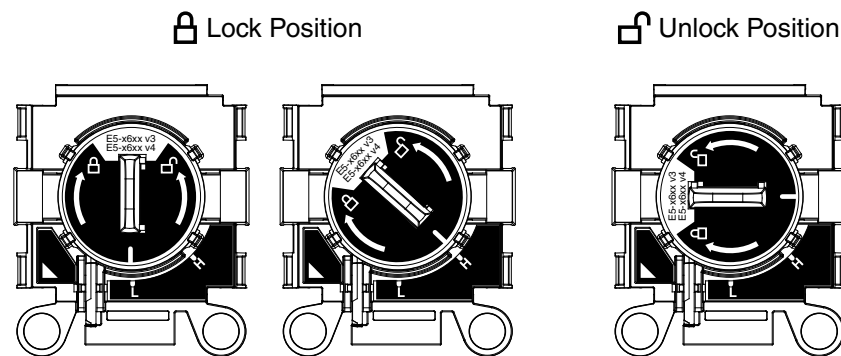
Figure 77. Installation Tool

Attention:

- Do not press the microprocessor into the socket.
- Make sure that the microprocessor is oriented and aligned correctly in the socket before you try to close the microprocessor retainer.
- Do not touch the thermal material on the bottom of the heat sink or on top of the microprocessor. Touching the thermal material will contaminate it.

Step 7. Remove the microprocessor cover, tape, or label from the surface of the microprocessor socket, if one is present. Store the cover in a safe place.

Figure 78. Socket cover removal

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see "Handling static-sensitive devices" on page 70.

Step 8. Close the microprocessor socket release levers and retainer:
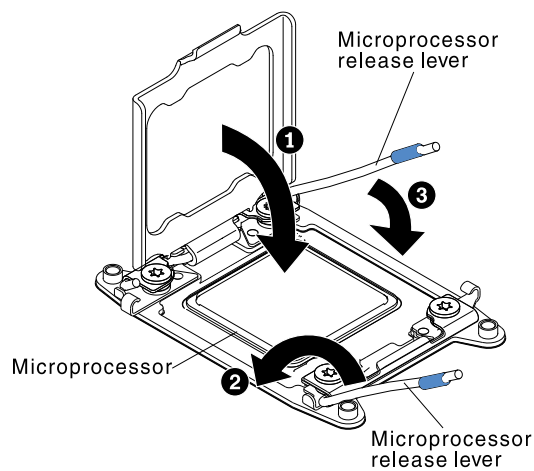
Figure 79. Microprocessor socket levers and retainer engagement

a. Close the microprocessor retainer on the microprocessor socket.

b. Identify which release lever is labeled as the first release lever to close and close it.

c. Close the second release lever on the microprocessor socket.

Step 9. Install the heat sink.

Attention:

- Do not mix the heat sink for microprocessor 1 and microprocessor 2 to avoid the thermal issue.

- Do not set down the heat sink after you remove the plastic cover.

- Do not touch the thermal grease on the bottom of the heat sink after you remove the plastic cover. Touching the thermal grease will contaminate it. See "Thermal grease" on page 131 for more information.
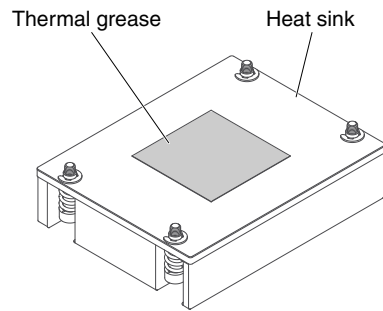
Figure 80. Thermal grease

a. Remove the plastic protective cover from the bottom of the heat sink.

b. Position the heat sink over the microprocessor. The heat sink is keyed to assist with proper alignment.

Main power connector

JPT1 (SATA / SAS) connector

DIMM F2
DIMM F1
DIMM E2
DIMM E1

DIMM H2
DIMM H1
DIMM G2
DIMM G1

Microprocessor 2

DIMM B2
DIMM B1
DIMM A2
DIMM A1

DIMM D2
DIMM D1
DIMM C2
DIMM C1

Microprocessor 1

SATA 1 connector

JP18 (SATA) connector

SATA 2 connector

HBA mezzanine connector

PCIe riser connector

OCP mezzanine connector
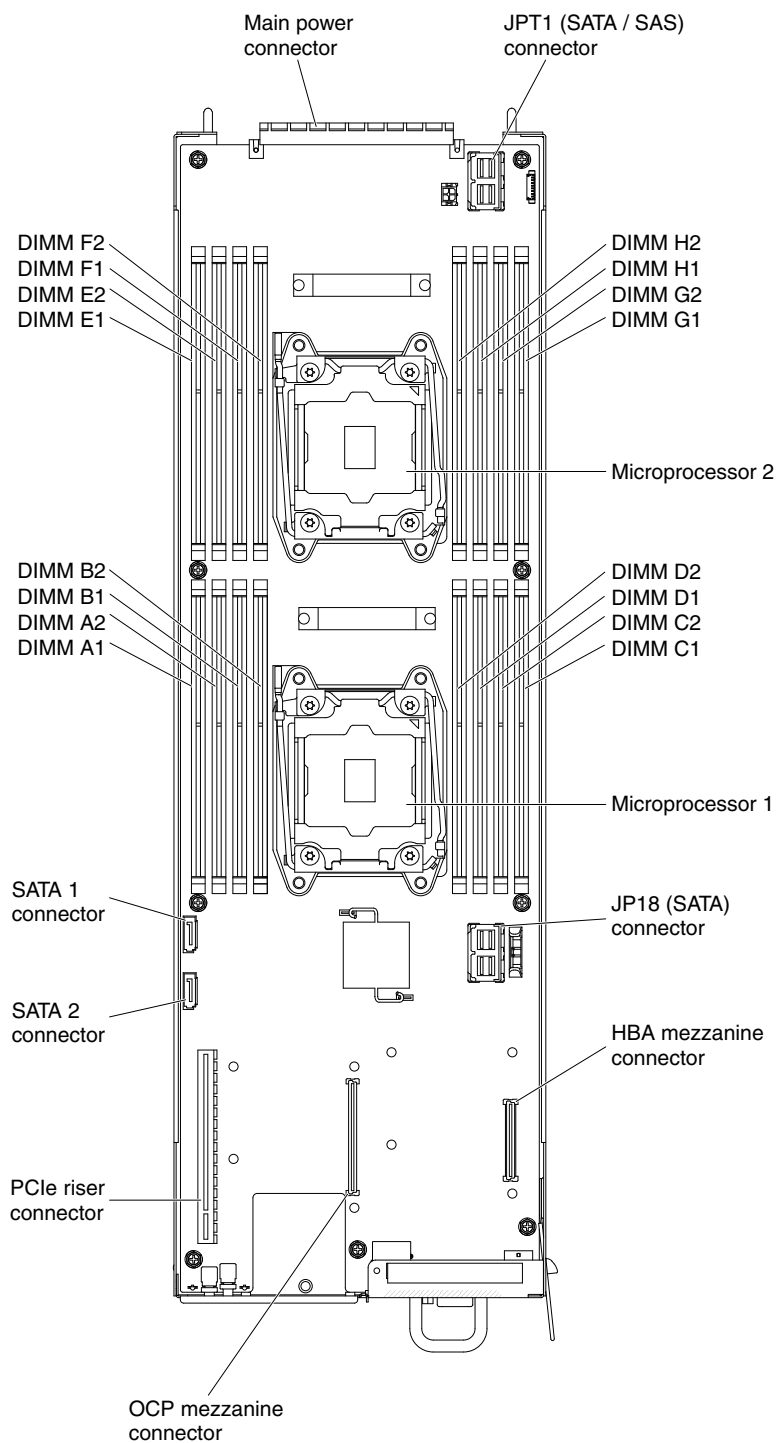
Figure 81. Internal connectors on the system board
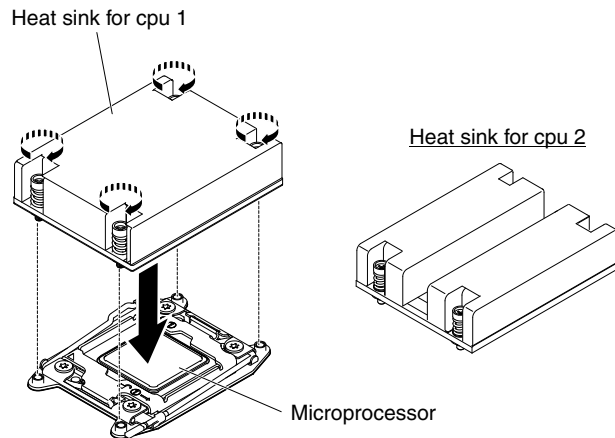
Figure 82. Heat sink installation

   c.   Align and place the heat sink on top of the microprocessor in the retention bracket, thermal material side down.

   d.   Press firmly on the heat sink.

   e.   Press down on the center of the heat sink; then, press firmly on the captive screws and tighten them, alternating between the screws in a figure-8 pattern as illustrated on the heat sink label until they are tightened. You can cause damage to the microprocessor if you tighten the screws on one side first, rather than rotating. Rotate each screw one full rotation at a time. Repeat this process until the screws are tightened.

Step 10. Reinstall the air baffle (see "Installing the air baffle" on page 81).

Step 11. Reinstall compute node (see "Installing a compute node in a chassis" on page 71).

Step 12. Slide the server into the rack.

Step 13. Reconnect any cable that you removed.

Step 14. Turn on the peripheral devices and the server.

Thermal grease

The thermal grease must be replaced whenever the heat sink has been removed from the top of the microprocessor and is going to be reused or when debris is found in the grease.

When you are installing the heat sink on the same microprocessor that it was removed from, make sure that the following requirements are met:

- The thermal grease on the heat sink and microprocessor is not contaminated.

- Additional thermal grease is not added to the existing thermal grease on the heat sink and microprocessor.

Notes:

- Read the safety information that begins on "Safety" on page v.

- Read the "Installation guidelines" on page 69.

- Read "Handling static-sensitive devices" on page 70.

To replace damaged or contaminated thermal grease on the microprocessor and heat sink, complete the following steps:

Step 1. Place the heat sink on a clean work surface.

Step 2.   Remove the cleaning pad from its package and unfold it completely.

Step 3.   Use the cleaning pad to wipe the thermal grease from the bottom of the heat sink.

Note: Make sure that all of the thermal grease is removed.

Step 4.   Use a clean area of the cleaning pad to wipe the thermal grease from the microprocessor; then, dispose of the cleaning pad after all of the thermal grease is removed.

Step 5.   Use the thermal-grease syringe to place 9 uniformly spaced dots of 0.02 ml each on the top of the microprocessor. The outermost dots must be within approximately 5 mm of the edge of the microprocessor; this is to ensure uniform distribution of the grease.
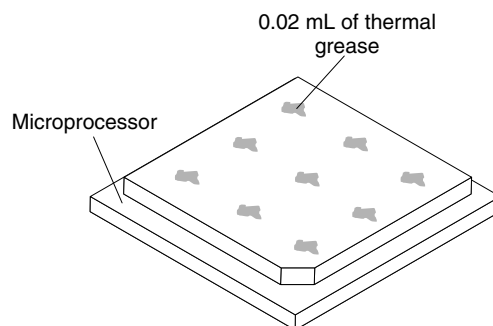
Figure 83. Thermal grease distribution

Note: If the grease is properly applied, approximately half of the grease will remain in the syringe.
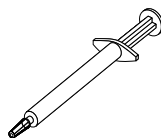
Figure 84. Syringe

Step 6.   Install the heat sink onto the microprocessor.

Removing the power interface board

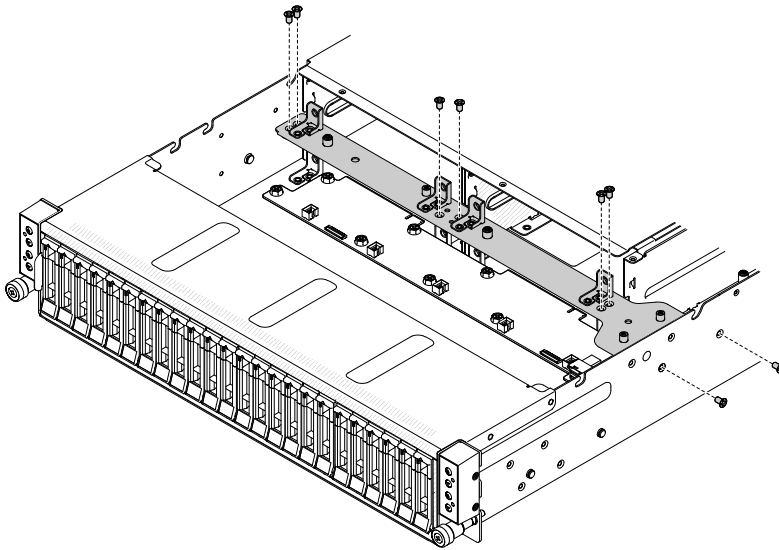Use this information to remove the power interface board from the server.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To remove the power interface board, complete the following steps.

Step 1.   Remove the fan cage cover (see "Removing the fan cage cover" on page 76).

Step 2.   Remove the system management board cover (see "Removing the system management board cover" on page 78).

Step 3.   Remove the system fan (see "Removing a system fan" on page 82).

Step 4.   Remove the fan cage (see "Removing the fan cage" on page 98).

Step 5.   Remove the cables from the power interface board.

Step 6.   Remove nodes #3 and #4 (see "Removing a compute node from a chassis" on page 71).

Step 7.   Remove the 5 6#32 screws from the power interface board.

Step 8.   Lift the power interface board out of the server.
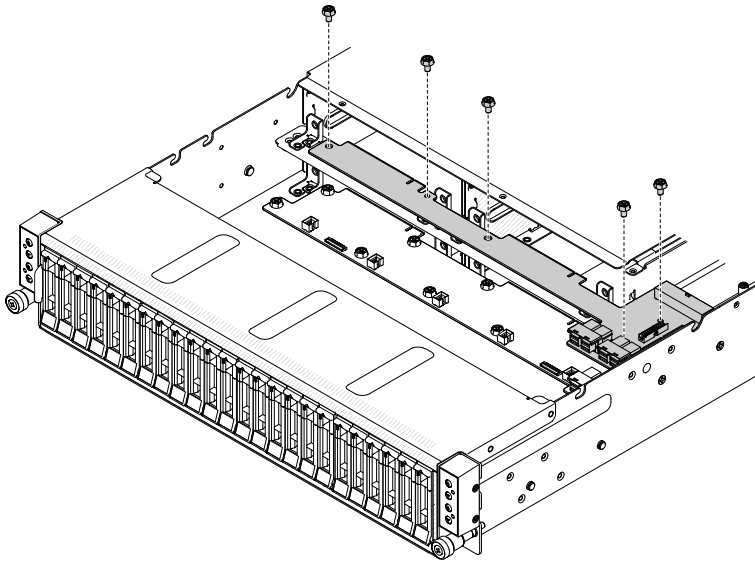
Figure 85. Power interface board removal

Installing the power interface board

Use this information to replace the power interface board.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To replace the power interface board, complete the following steps.

Step 1.   Align the power interface board holes with the cage holes on the server chassis.

Step 2.   Lower the power interface board into the server.
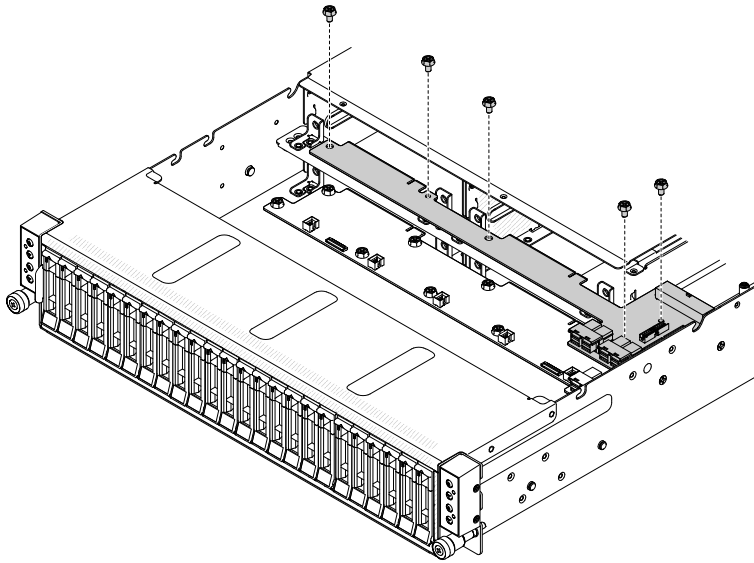
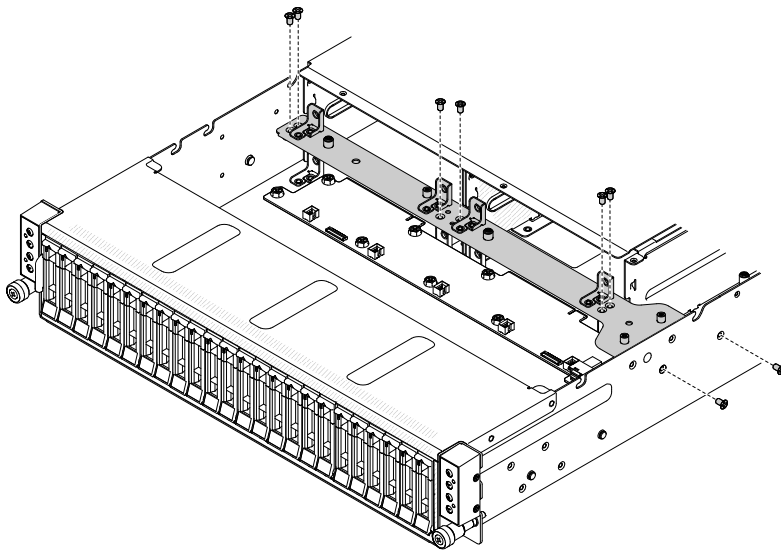*Figure 86. Power interface board installation*

Step 3. Tighten the power interface board with 5 6#32 screws.

Step 4. Reinstall the cables on the power interface board.

Step 5. Reinstall the fan cage (see "Replacing the fan cage" on page 99).

Step 6. Reinstall the system fan (see "Replacing a system fan" on page 83).

Step 7. Reinstall the system management board cover (see "Installing the system management board cover" on page 79).

Step 8. Reinstall the fan cage cover (see "Installing the fan cage cover" on page 77).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.

2. Reconnect the power cords and any cables that you removed.

3. Turn on the peripheral devices and the server.

Removing the power interface board bracket

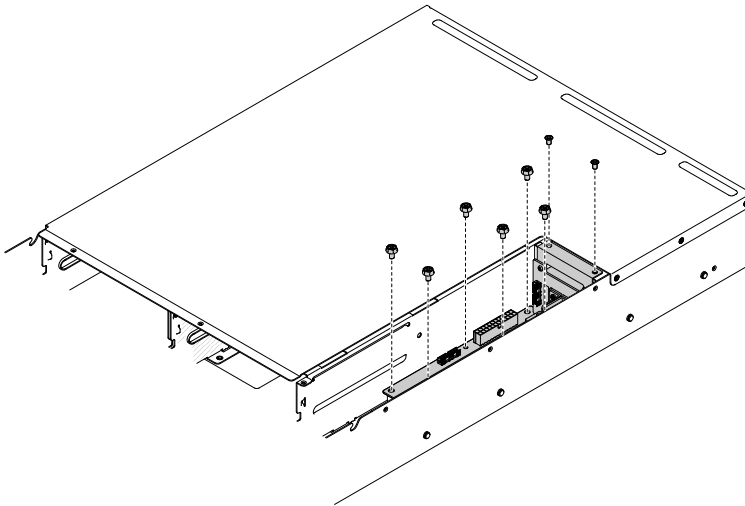Use this information to remove the power interface board bracket from the server.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To remove the power interface board bracket, complete the following steps.

Step 1. Remove compute node #3 and #4.

Step 2. Remove the fan cage cover (see "Removing the fan cage cover" on page 76).

Step 3. Remove the system fan (see "Removing a system fan" on page 82).

Step 4. Remove the fan cage (see "Removing the fan cage" on page 98).

Step 5. Remove the power interface board (see "Removing the power interface board" on page 132).

Step 6.   Remove the 8 M3 screws from the power interface board bracket.

Step 7.   Lift the power interface board bracket out of the server.

Figure 87. Power interface board bracket removal

Installing the power interface board bracket

Use this information to replace the power interface board bracket.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To replace the power interface board bracket, complete the following steps.

Step 1.   Align the power interface board bracket holes with the cage holes on the server chassis.

Step 2.   Lower the power interface board bracket into the server.

Figure 88. Power interface board bracket installation

Step 3. Tighten the power interface board bracket with 8 M3 screws.

Step 4. Reinstall the power interface board (see "Installing the power interface board" on page 133).

Step 5. Reinstall the cables (see "Internal cable routing and connectors" on page 138).

Step 6. Reinstall the fan cage (see "Replacing the fan cage" on page 99).

Step 7. Reinstall the system fan (see "Replacing a system fan" on page 83).

Step 8. Reinstall the fan cage cover (see "Installing the fan cage cover" on page 77).

Step 9. Reinstall compute node #3 and #4.

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.
2. Reconnect the power cords and any cables that you removed.
3. Turn on the peripheral devices and the server.

Removing the system management board and backplane assembly

Use this information to remove the system management board and backplane assembly from the server.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To remove the system management board and backplane assembly, complete the following steps.

Step 1. Remove the power supplies (see "Removing a hot-swap power supply" on page 93).

Step 2. Remove the fan cage cover (see "Removing the fan cage cover" on page 76).

Step 3. Remove the system management board cover (see "Removing the system management board cover" on page 78).

Step 4. Disconnect all of the cables from the system management board.

Step 5. Remove the 6 6#32 screws from the system management board.

Step 6. Remove the 2 M3 screws from the system management board bracket.

Step 7. Place your fingers under the front and back of the top of the system management board and backplane assembly; then, lift the system management board and backplane assembly out of the server.

Figure 89. System management board and backplane assembly removal

Installing the system management board and backplane assembly

Use this information to replace the system management board and backplane assembly.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component in the server, you need to take out the server out from the rack enclosure, turn off the server and peripheral devices, and disconnect the power cords and all external cables.

To replace the system management board and backplane assembly, complete the following steps.

Step 1. Align the system management board and backplane assembly pins with the pin holes on the server chassis; then, lower the system management board and backplane assembly into the server. Press the system management board and backplane assembly down until it is securely seated.
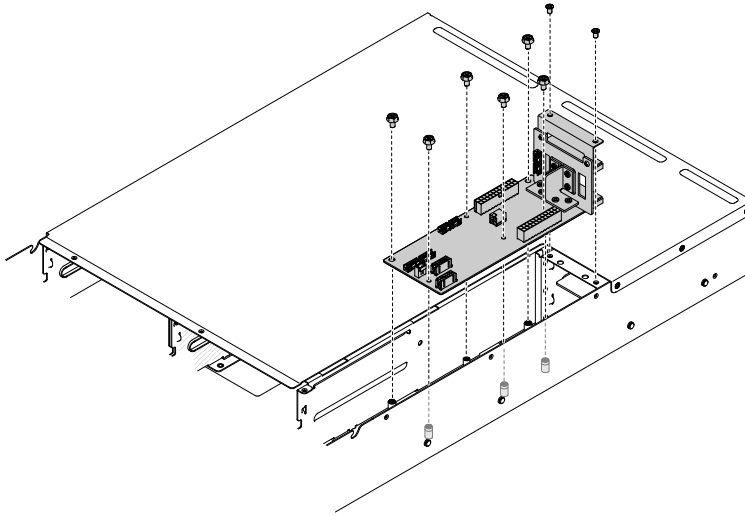
Figure 90. system management board and backplane assembly installation

Step 2.   Tighten the system management board with 6 6#32 screws.

Step 3.   Tighten the system management board with 2 M3 screws.

Step 4.   Reinstall the cables (see "Internal cable routing and connectors" on page 138).

Step 5.   Reinstall the system management board cover (see "Installing the system management board cover" on page 79).

Step 6.   Reinstall the fan cage cover (see "Installing the fan cage cover" on page 77).

Step 7.   Reinstall the power supplies (see "Replacing a hot-swap power supply" on page 94).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.

2. Reconnect the power cords and any cables that you removed.

3. Turn on the peripheral devices and the server.

Internal cable routing and connectors

This section provides information about routing the cables when you install some components in the server.

Notes:

• Turn off the server and peripheral devices and disconnect the power cords and all external cables before routing the cables.

• Always match the numbers on the printed circuit boards and the numbers on the cables to connect the cables.

For more information about the requirements for cables and connecting devices, see the documentation that comes with these devices.

The following illustration displays the cabling information on the fan board:
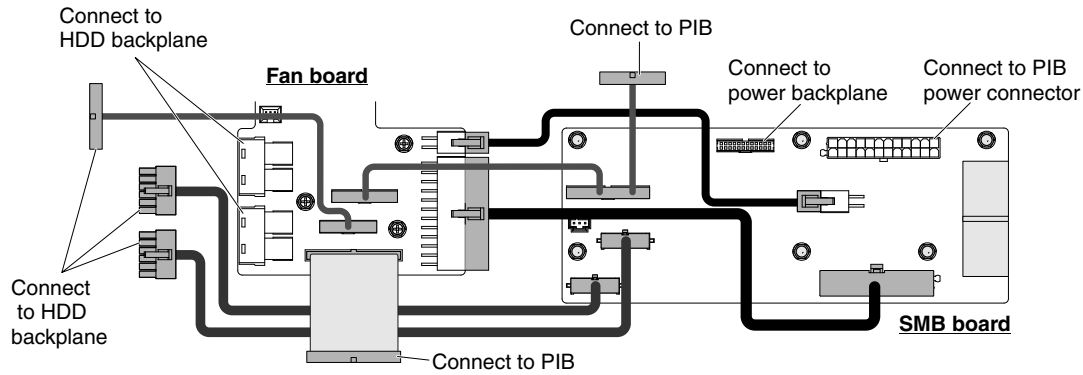
Figure 91. Internal cable routing and connectors on the fan board

The following illustration displays the cabling information on the power interface board:
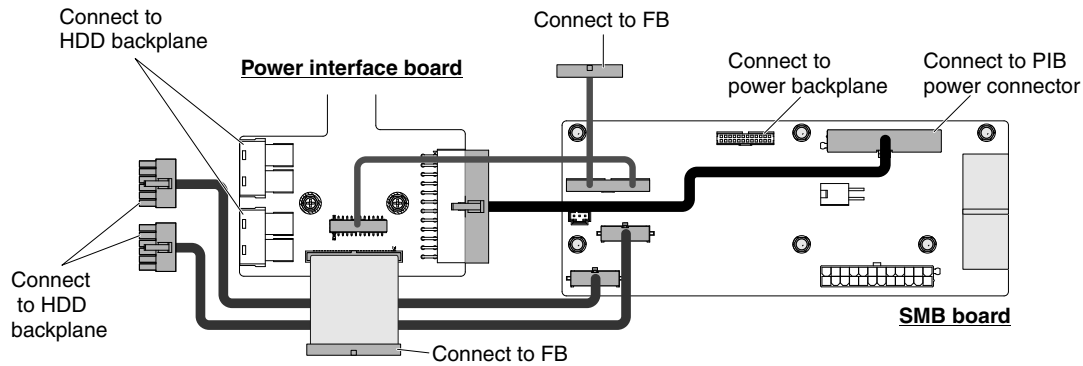
Figure 92. Internal cable routing and connectors on the power interface board

The following illustration displays the cabling information on the hard disk drive backplane:

HDD backplane

Connect to FB

Connect to FB

Connect to SMB

Connect to PIB
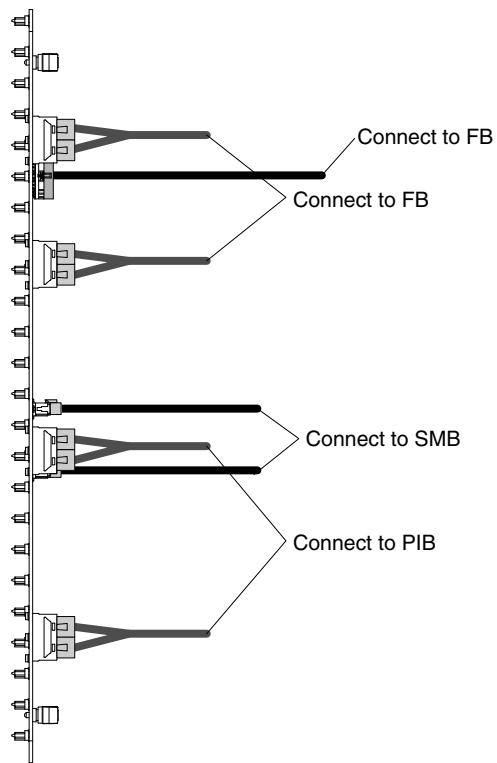
Figure 93. Internal cable routing and connectors on the hard disk drive backplane

The following illustration displays the cabling information on the hard disk drive backplane and the power interface board:

HDD backplane
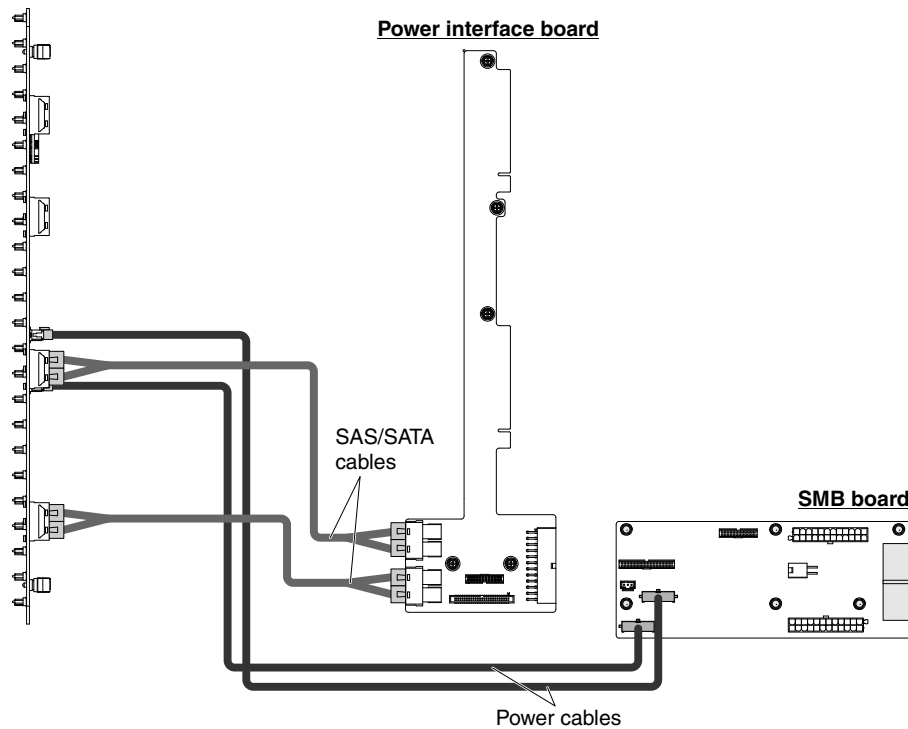
Figure 94. Internal cable routing and connectors on the hard disk drive backplane and the power interface board

The following illustration displays the cabling information on the hard disk drive backplane and the fan board:

HDD backplane
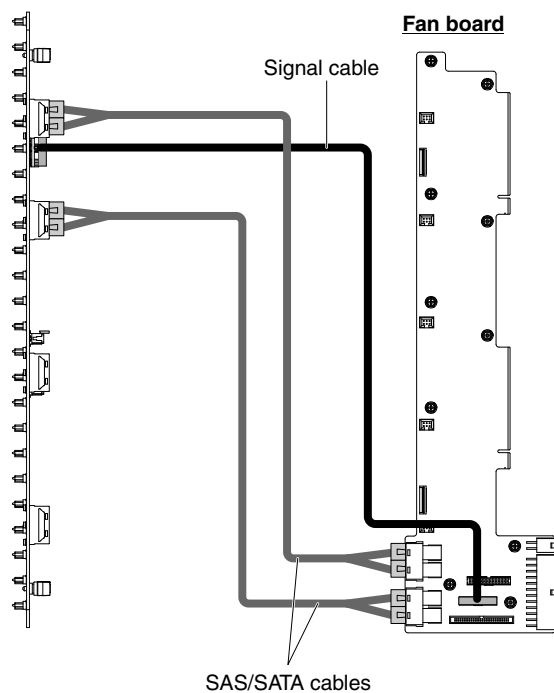
Figure 95. Internal cable routing and connectors on the hard disk drive backplane and the fan board

The following illustration displays the cabling information on the front I/O and the fan board:

Front I/O (left)
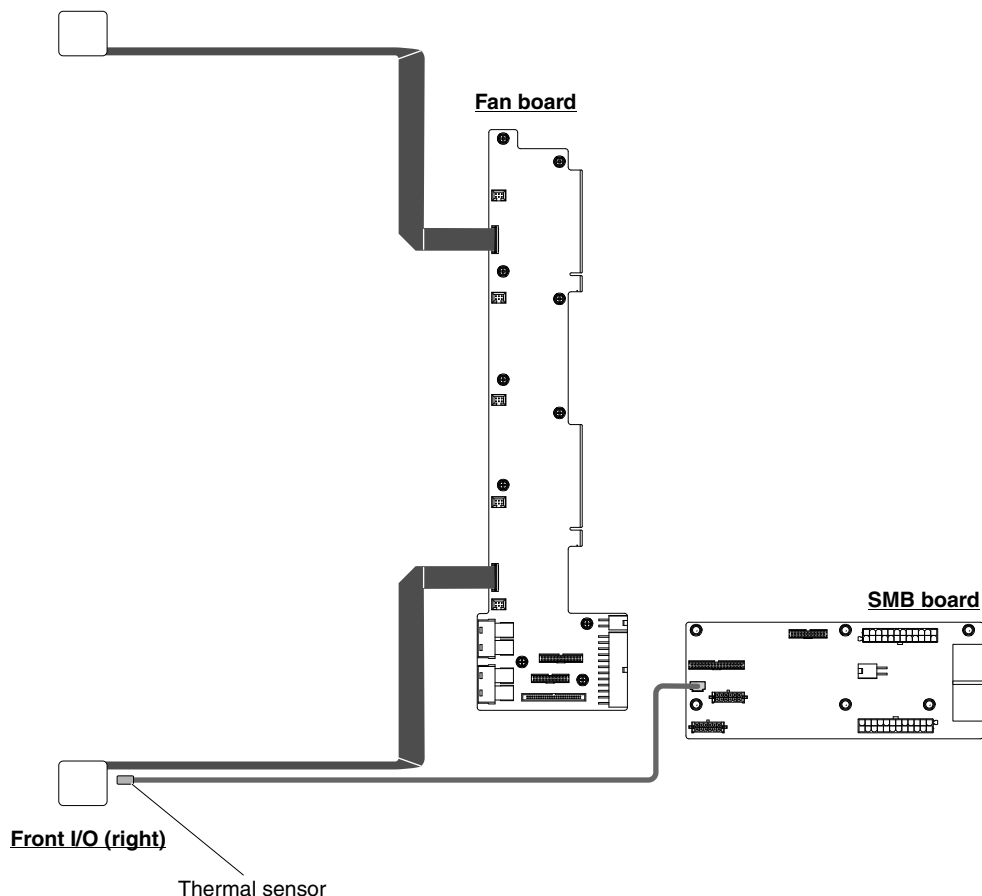
Figure 96. Internal cable routing and connectors on the front I/O and the fan board

The following illustration displays the location of the thermal sensor.
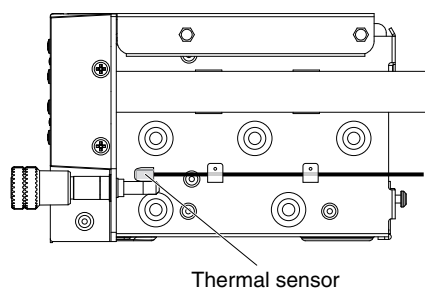
Figure 97. The location of the thermal sensor

Removing the node SATA cable

Use this information to remove the node SATA cable from the server.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

To remove the node SATA cable, complete the following steps.

Step 1.   Remove the compute node (see "Removing a compute node from a chassis" on page 71).

Step 2.   Remove the air baffle (see "Removing the air baffle" on page 80).

Step 3.   Place your fingers on both ends of JPT1 and JP18; then, lift the SATA cable out of the server.
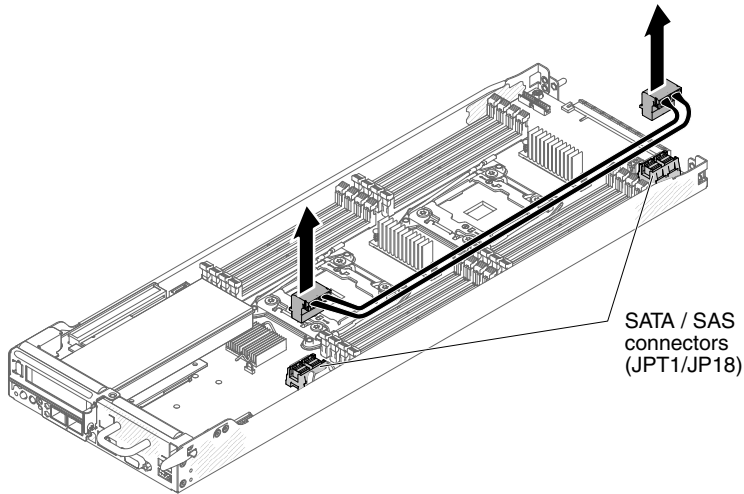
Figure 98. SATA cable removal

Installing the node SATA cable

Use this information to replace the node SATA cable.

Read the safety information in "Safety" on page v and "Installation guidelines" on page 69.

If you are replacing a server component or installing an optional device in the server, you need to take out the node out from the rack enclosure, turn off the server and peripheral devices, and disconnect all external cables.

To replace the node SATA cable, complete the following steps.

Step 1.   Align the node SATA cable in the proper locations and install it.
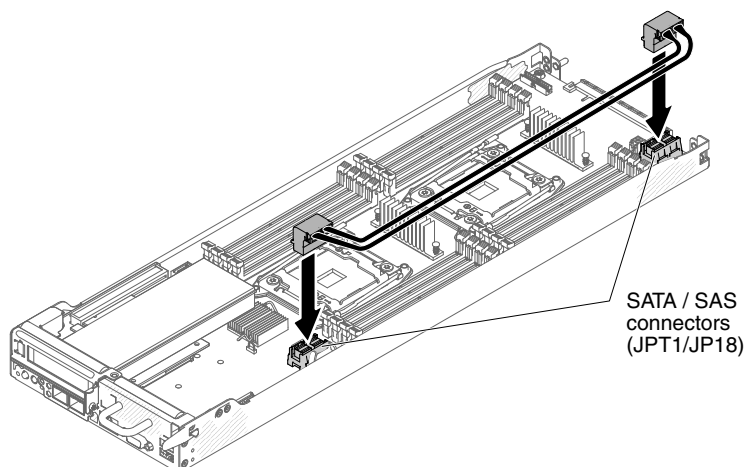
Figure 99. SATA cable installation

SATA / SAS
connectors
(JPT1/JP18)

Step 2.   Make sure the node SATA cable is installed properly.
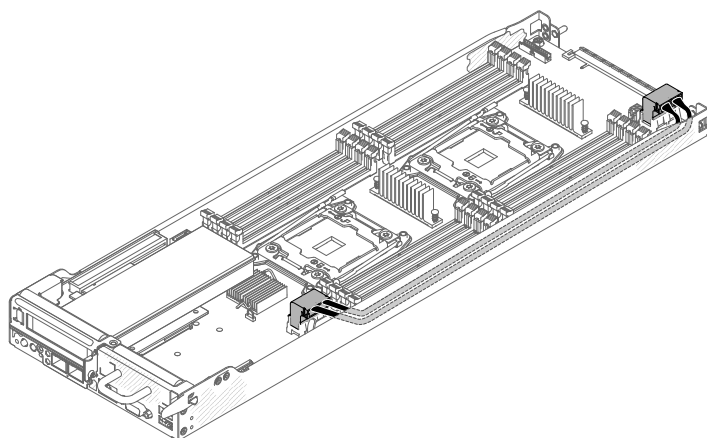
Figure 100. SATA cable location

Step 3.   Reinstall the air baffle (see "Installing the air baffle" on page 81).

Step 4.   Reinstall the compute node (see "Installing a compute node in a chassis" on page 71).

1. Install the server into the rack enclosure and push the server into the rack until it clicks into place.
2. Reconnect any cable that you removed.
3. Turn on the peripheral devices and the server.

Appendix A. TMM error messages

This section details the TMM error messages.

When a hardware event is detected by the TMM on the server, the TMM logs that event in the system-event log in the server.

For each event code, the following fields are displayed:

Event identifier
> A hexadecimal identifier that uniquely identifies an event or class of events. In this documentation, the event identifiers are prefixed with 0x and followed by eight characters.

Event description
> The logged message string that appears for an event. When the event string is displayed in the event log, information such as a specific component is displayed. In this documentation, that additional information appears as variables, such as [arg1] or [arg2].

Explanation
> Provides additional information to explain why the event occurred.

Severity
> An indication of the level of concern for the condition. In the system-event log, severity is abbreviated to the first character. The following severities can be displayed.

> **Info:**
>> The event was recorded for audit purposes, usually a user action or a change of states that is normal behavior.

> **Warning:**
>> The event is not as severe as an error, but if possible, the condition should be corrected before it becomes an error. It might also be a condition that requires additional monitoring or maintenance.

> **Error:**
>> The event is a failure or critical condition that impairs service or an expected function.

Alert Category
> Similar events are grouped together in categories. The alert category is in the following format:

> *severity - device*

> *severity* is one of the following severity levels:

> - **Critical:** A key component in the server is no longer functioning.
> - **Warning:** The event might progress to a critical level.
> - **System:** The event is the result of a system error or a configuration change.

> *device* is the specific device in the server that caused the event to be generated.

Serviceable
> Specifies whether user action is required to correct the problem.

CIM Information
> Provides the prefix of the message ID and the sequence number that is used by the CIM message registry.

SNMP Trap ID
   The SNMP trap ID that is found in the SNMP alert management information base (MIB).

Automatically contact Service
   If this field is set to **Yes**, and you have enabled Electronic Service Agent (ESA), Lenovo Support will be
   notified automatically if the event is generated.

   While you wait for IBM Support to call, you can perform the recommended actions for the event.

User response
   Indicates what actions you should perform to solve the event.

   Perform the steps listed in this section in the order shown until the problem is solved. After you perform
   all of the actions that are described in this field, if you cannot solve the problem, contact IBM Support.

   Note: This list includes error codes and messages that might not apply to this machine type and model.

The following is the list of TMM error messages and suggested actions to correct the detected server
problems. For more information about TMM, see the *TMM User's Guide*.

TMM error messages

Use this information to resolve any issues that were found.

Diagnostic Code	Full Sensor Name (Sensor Name In SDR)	Message	Description	Action
04010401 04010402 04010403 04010404 04010405	Fan%_Speed (% = Fan number)	Sensor Type: Fan Event Severity: Critical Description: Lower Non-Recoverable - Going Low - Asserted	Fan% speed is too low.	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
04010B01 04010B02 04010B03 04010B04 04010B05		Sensor Type: Fan Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	Fan% speed is too high.	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010410	SYS_12V	Sensor Type: Voltage Event Severity: Critical Description: Lower Non-Recoverable - Going Low - Asserted	12V voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010210		Sensor Type: Voltage Event Severity: Critical Description: Lower Critical - Going Low - Asserted	12 voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010010		Sensor Type: Voltage Event Severity: Warning Description: Lower Non-Critical - Going Low - Asserted	12V voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010B10		Sensor Type: Voltage Event Severity: Critical Description: Upper	12V voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies

		Non-Recoverable - Going High - Asserted		to this error. 2. Contact your Lenovo service representative for support
02010910		Sensor Type: Voltage Event Severity: Critical Description: Upper Critical - Going High - Asserted	12V voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010710		Sensor Type: Voltage Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	12V voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010411	SYS_5V	Sensor Type: Voltage Event Severity: Critical Description: Lower Non-Recoverable - Going Low - Asserted	5V voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010211		Sensor Type: Voltage Event Severity: Critical Description: Lower Critical - Going Low - Asserted	5V voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010011		Sensor Type: Voltage Event Severity: Warning Description: Lower Non-Critical - Going Low - Asserted	5V voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010B11		Sensor Type: Voltage Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	5V voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010911		Sensor Type: Voltage Event Severity: Critical Description: Upper Critical - Going High - Asserted	5V voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010711		Sensor Type: Voltage Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	5V voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010412	SYS_3.3.V	Sensor Type: Voltage Event Severity: Critical Description: Lower Non-Recoverable - Going Low - Asserted	3.3V voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010212		Sensor Type: Voltage Event Severity: Critical Description: Lower Critical - Going Low - Asserted	3.3V voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support

		Sensor Type: Voltage Event Severity: Warning Description: Lower Non-Critical - Going Low - Asserted	3.3V voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010012		Sensor Type: Voltage Event Severity: Warning Description: Lower Non-Critical - Going Low - Asserted	3.3V voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010B12		Sensor Type: Voltage Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	3.3V voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010912		Sensor Type: Voltage Event Severity: Critical Description: Upper Critical - Going High - Asserted	3.3V voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010712		Sensor Type: Voltage Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	3.3V voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010413 02010414		Sensor Type: Voltage Event Severity: Critical Description: Lower Non-Recoverable - Going Low - Asserted	CPU% VCORE voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010213 02010214		Sensor Type: Voltage Event Severity: Critical Description: Lower Critical - Going Low - Asserted	CPU% VCORE voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010013 02010014		Sensor Type: Voltage Event Severity: Warning Description: Lower Non-Critical - Going Low - Asserted	CPU% VCORE voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010B13 02010B14	CPU%_VCORE (% = CPU number)	Sensor Type: Voltage Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	CPU% VCORE voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010913 02010914		Sensor Type: Voltage Event Severity: Critical Description: Upper Critical - Going High - Asserted	CPU% VCORE voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010713 02010714		Sensor Type: Voltage Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	CPU% VCORE voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support

02010415 02010416	CPU%_DDR_VDD (% = CPU number)	Sensor Type: Voltage Event Severity: Critical Description: Lower Non-Recoverable - Going Low - Asserted	CPU% DDR_VDD voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010215 02010216		Sensor Type: Voltage Event Severity: Critical Description: Lower Critical - Going Low - Asserted	CPU% VCORE voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010015 02010016		Sensor Type: Voltage Event Severity: Warning Description: Lower Non-Critical - Going Low - Asserted	CPU% VCORE voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010B15 02010B16		Sensor Type: Voltage Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	CPU% VCORE voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010915 02010916		Sensor Type: Voltage Event Severity: Critical Description: Upper Critical - Going High - Asserted	CPU% VCORE voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
02010715 02010716		Sensor Type: Voltage Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	CPU% VCORE voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
01010B20	Inlet_Temp	Sensor Type: Temperature Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	Inlet temperature is too high	1. Check ambient temperature is within environment spec. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
01010920		Sensor Type: Temperature Event Severity: Critical Description: Upper Critical - Going High - Asserted	Inlet temperature is too high	1. Check ambient temperature is within environment spec. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
01010720		Sensor Type: Temperature Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	Inlet temperature is too high	1. Check ambient temperature is within environment spec. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support

		Sensor Type: Temperature Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	Outlet temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
01010B21	Outlet_Temp	Sensor Type: Temperature Event Severity: Critical Description: Upper Critical - Going High - Asserted	Outlet temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
01010921		Sensor Type: Temperature Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	Outlet temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
01010721				
01010B22 01010B23	CPU0%_Temp (% = CPU number)	Sensor Type: Temperature Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	CPU% temperature is too high	1. Check contact condition of CPU heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
01010922 01010923		Sensor Type: Temperature Event Severity: Critical Description: Upper Critical - Going High - Asserted	CPU% temperature is too high	1. Check contact condition of CPU heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
01010722 01010723		Sensor Type: Temperature Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	CPU% temperature is too high	1. Check contact condition of CPU heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
01010424 01010425	CPU%_Margin_Temp (% = CPU number)	Sensor Type: Temperature Event Severity: Critical Description: Lower Non-Recoverable - Going Low - Asserted	CPU% margin temperature is too low	1. Check contact condition of CPU heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
01010224 01010225		Sensor Type: Temperature Event Severity: Critical Description: Lower Critical - Going Low - Asserted	CPU% margin temperature is too low	1. Check contact condition of CPU heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
01010024 01010025		Sensor Type: Temperature Event Severity: Warning Description: Lower	CPU% margin temperature is too low	1. Check contact condition of CPU heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if

		Non-Critical - Going Low - Asserted		Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
01010B26 01010B27		Sensor Type: Temperature Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	CPU% VR temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
01010926 01010927	CPU%_VR_Temp (% = CPU Number)	Sensor Type: Temperature Event Severity: Critical Description: Upper Critical - Going High - Asserted	CPU% VR temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
01010726 01010727		Sensor Type: Temperature Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	CPU% VR temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
01010B28		Sensor Type: Temperature Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	Power IC is over temperature	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
01010928	Node_PBP_Temp	Sensor Type: Temperature Event Severity: Critical Description: Upper Critical - Going High - Asserted	Power IC is over temperature	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
01010728		Sensor Type: Temperature Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	Power IC is over temperature	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
01010B29		Sensor Type: Temperature Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	PCH temperature is too high	1. Check contact condition of PCH heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
01010929	PCH_Temp	Sensor Type: Temperature Event Severity: Critical Description: Upper Critical - Going High - Asserted	PCH temperature is too high	1. Check contact condition of PCH heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
01010729		Sensor Type: Temperature Event Severity: Warning	PCH temperature is too high	1. Check contact condition of PCH heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that

		Description: Upper Non-Critical - Going High - Asserted		applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
01010B2A 01010B2B		Sensor Type: Temperature Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	DIMM Group% temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
0101092A 0101092B	DIMMG%_Temp (% = Group number)	Sensor Type: Temperature Event Severity: Critical Description: Upper Critical - Going High - Asserted	DIMM Group% temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
0101072A 0101072B		Sensor Type: Temperature Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	DIMM Group% temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
01010B2C 01010B2D 01010B2E 01010B2F		Sensor Type: Temperature Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	DIMM Group% VR temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
0101092C 0101092D 0101092E 0101092F	DIMM%_VR_Temp (% = Channel number)	Sensor Type: Temperature Event Severity: Critical Description: Upper Critical - Going High - Asserted	DIMM Group% VR temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
0101072C 0101072D 0101072E 0101072F		Sensor Type: Temperature Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	DIMM Group% VR temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
0B010B91		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	Node input current is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010991	Node_IIN	Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Critical - Going High - Asserted	Node input current is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010791		Sensor Type: Other Units-based sensor Event Severity: Warning Description: Upper	Node input current is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies

		Non-Critical - Going High - Asserted		to this error. 2. Contact your Lenovo service representative for support
0B010B92		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	Node output current is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010992	Node_IOUT	Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Critical - Going High - Asserted	Node output current is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010792		Sensor Type: Other Units-based sensor Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	Node output current is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010093		Sensor Type: Other Units-based sensor Event Severity: Warning Description: Lower Non-Critical - Going Low - Asserted	Node intput voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010B93		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	Node intput voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010993	Node_VIN	Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Critical - Going High - Asserted	Node intput voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010793		Sensor Type: Other Units-based sensor Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	Node intput voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support

0B010094	Node_VOUT	Sensor Type: Other Units-based sensor Event Severity: Warning Description: Lower Non-Critical - Going Low - Asserted	Node output voltage is too low	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010B94		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	Node output voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010994		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Critical - Going High - Asserted	Node output voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010794		Sensor Type: Other Units-based sensor Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	Node output voltage is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010B95	Node_PIN	Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	Node input power is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010995		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Critical - Going High - Asserted	Node input power is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010795		Sensor Type: Other Units-based sensor Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	Node input power is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010B96	Node_POUT	Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	Node output power is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010996		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Critical - Going High - Asserted	Node output power is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support

		Sensor Type: Other Units-based sensor Event Severity: Warning Description: Upper Non-Critical - Going High - Asserted	Node output power is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010796				
0B010B9A	CPU_Power	Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	CPU power consumption is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B01099A		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Critical - Going High - Asserted	CPU power consumption is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010B9B	Memory_Power	Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	Memory power consumption is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B01099B		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Critical - Going High - Asserted	Memory power consumption is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
086F06A0	PSU_Mismatch	Sensor Type: Power Supply Event Severity: Critical Description: Configuration Error - Asserted	There are different capacity or voltage of PSUs that are plugged in chassis.	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Restart the server. 3. Suggest to use the same type of PSUs. 4. Contact your Lenovo service representative for support
086F01A1 086F01A2	PSU%_Status (% = PSU number)	Sensor Type: Power Supply Event Severity: Critical Description: Power Supply Failure Detected - Asserted	PSU is OCP or OVP	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
086F03A1 086F03A2		Sensor Type: Power Supply Event Severity: Critical Description: Power Supply Input Lost (AC/DC) - Asserted	AC lost	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support

0B010BA3 0B010BA4	PSU%_POUT (% = PSU number)	Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	PSU output power is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B0109A3 0B0109A4		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Critical - Going High - Asserted	PSU output power is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
01010BA5 01010BA6	PSU%_Temp (% = PSU number)	Sensor Type: Temperature Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	PSU ambient temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
010109A5 010109A6		Sensor Type: Temperature Event Severity: Critical Description: Upper Critical - Going High - Asserted	PSU ambient temperature is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
040104A7 040104A8	PSU%_FAN_Speed (% = PSU number)	Sensor Type: Fan Event Severity: Critical Description: Lower Non-Recoverable - Going Low - Asserted	PSU FAN speed is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
04010BA7 04010BA8		Sensor Type: Fan Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	PSU FAN speed is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B010BAA	FAN_BP_Power	Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	FAN backplane power consumption is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B0109AA		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Critical - Going High - Asserted	FAN backplane power consumption is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support

0B010BAB	HDD_BP_Power	Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Non-Recoverable - Going High - Asserted	HDD backplane power consumption is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
0B0109AB		Sensor Type: Other Units-based sensor Event Severity: Critical Description: Upper Critical - Going High - Asserted	HDD backplane power consumption is too high	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Contact your Lenovo service representative for support
160901C0	BMC_Boot_Up	Sensor Type: Microcontroller / Coprocessor Event Severity: Info Description: Device Enabled - Asserted	BMC boot up successfully.	It is just an information. Users don't need to do anything.
226F00C1	ACPI_PWR_Status	Sensor Type: System ACPI Power Event Severity: Info Description: S0/G0 'Working - Asserted	The system is under S0 state.	It is just an information. Users don't need to do anything.
226F05C1		Sensor Type: System ACPI Power Event Severity: Info Description: S4/S5 Soft-Off, Particular S4/S5 State Cannot Be Determined - Asserted	The system is under S5 state.	It is just an information. Users don't need to do anything.
146F00C2	Button_Status	Sensor Type: Button / Switch Event Severity: Info Description: Power Button Pressed - Asserted	Someone pressed the power button	It is just an information. Users don't need to do anything.
106F02C3	SEL_Status	Sensor Type: Event Logging Disabled Event Severity: Info Description: Log Area Reset/Cleared - Asserted	The log area of SEL is cleared.	It is just an information. Users don't need to do anything.
106F05C3		Sensor Type: Event Logging Disabled Event Severity: Info Description: SEL Almost Full - Asserted	The SEL is almost full.	It is just an information. Users don't need to do anything.

236F00C4	IPMI_Watchdog	Sensor Type: Watchdog 2 Event Severity: Info Description: Time Expired - Asserted	The watchdog timer is expired.	It is just an information. Users don't need to do anything.
236F01C4		Sensor Type: Watchdog 2 Event Severity: Info Description: Hard Reset - Asserted	The Hard Reset is triggered by watchdog.	It is just an information. Users don't need to do anything.
236F02C4		Sensor Type: Watchdog 2 Event Severity: Info Description: Power Down - Asserted	The Power Down is triggerred by watchdog.	It is just an information. Users don't need to do anything.
236F03C4		Sensor Type: Watchdog 2 Event Severity: Info Description: Power Cycle - Asserted	The Power Cycle is triggered by watchdog.	It is just an information. Users don't need to do anything.
076F01C5 076F01C6	CPU%_Status (% = CPU number)	Sensor Type: Processor Event Severity: Critical Description: Thermal Trip - Asserted	CPU temperature is too high. At the same time, system will be shutdown.	1. Check contact condition of CPU heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
070301C7	PROC_Hot	Sensor Type: Processor Event Severity: Warning Description: State Asserted - Asserted	CPU begins to throttle because its temperature is too high.	1. Check contact condition of CPU heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
076F0AC7		Sensor Type: Processor Event Severity: Warning Description: Processor Automatically Throttled - Asserted	CPU begins to throttle which is triggered by PSU alert.	1. Check contact condition of CPU heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
CF6F00C9	Chassis_Control	Sensor Type: Customer Sensor Type Event Severity: Info Description: Chassis Control - Asserted	BMC gets "Chassis Control" command.	It is just an information. Users don't need to do anything.
070301D0	CPU_CATERR	Sensor Type: Processor Event Severity: Critical Description: State Asserted - Asserted	Catastrophic error happened.	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Restart the server. 3. Contact your Lenovo service representative for support
070301D1	CPU_VR_Fault	Sensor Type: Processor Event Severity: Critical Description: State Asserted - Asserted	CPU VR fault.	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Restart the server. 3. Contact your Lenovo service representative for support

0C0301D2	Mem_Therm_Trip	Sensor Type: Memory Event Severity: Critical Description: State Asserted - Asserted	Memory temperature is too high. At the same time, system will be shutdown.	1. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 2. Check Fan status. if Fan is broken, please replace the new Fan. 3. Contact your Lenovo service representative for support
196F01D3	PCH_Therm_Trip	Sensor Type: Chipset Event Severity: Critical Description: State Asserted - Asserted	PCH temperature is too high. At the same time, system will be shutdown.	1. Check contact condition of PCH heat sink. 2. Check the Lenovo support website for an applicable tip or firmware update that applies to this error. 3. Check Fan status. if Fan is broken, please replace the new Fan. 4. Contact your Lenovo service representative for support
0D6F01D4	HDD_Status	Sensor Type: Drive Slot (Bay) Event Severity: Critical Description: Drive % Fault - Asserted	HDD % fault. (% = HDD number)	1. Check Lenovo support site for an applicable service bulletin or firmware update that applies to this error. 2. Replace HDD. 3. Contact your Lenovo service representative for support.
1D6F02E0	BIOS_Boot_up	Sensor Type: System Boot / Restart Initiated Event Severity: Info Description: Initiated By Warm Reset - Asserted	BIOS boot up and it's initiated by warm reset.	It is just an information. Users don't need to do anything.
0C6F00E2	Memory_Status	Sensor Type: Memory Event Severity: Critical Description: Correctable ECC - Asserted	A single bit error is occurred In memory. This error will be repaired automatically.	1. If the node has recently been installed, moved, serviced, or upgraded, verify that the DIMM is properly seated and visually verify that there is no foreign material in any DIMM connector on that memory channel. If either of these conditions is found, correct and retry with the same DIMM 2. If problem re-occurs on the same DIMM connector, swap the other DIMMs on the same memory channel across channels one at a time to a different memory channel or Processor. (check service information for this product/Install guide for population requirements for sparing/paring modes). If problem follows a moved DIMM to a different memory channel, replace that DIMM.
0C6F01E2		Sensor Type: Memory Event Severity: Critical Description: Uncorrectable ECC - Asserted	A multiple bits error is occurred in memory. This error will cause system to be hang up.	1. Check the Lenovo support website for an applicable service bulletin or firmware update that applies to this memory error. 2. If the node has recently been installed, moved, serviced, or upgraded, verify that the DIMM is properly seated and visually verify that there is no foreign material in any DIMM connector on that memory channel. If either of these conditions is found, correct and retry with the same DIMM. 3. If no problem is observed on the DIMM connectors and the problem persists, replace the DIMM identified by LightPath and/or event log entry. 4. If problem re-occurs on the same DIMM connector, swap the other DIMMs on the same memory channel across channels one at a time to a different memory channel or Processor. (check service information for this product/Install guide for population

				requirements for sparing/paring modes). If problem follows a moved DIMM to a different memory channel, replace that DIMM. 5. (Trained service technician only) Remove affected Processor and inspect Processor socket pins for damaged or mis-aligned pins. If damage is found, or this is an upgrade Processor, replace the system board. If there are multiple Processor's, swap Processor's to move affected Procesor to another Processor socket and retry. If problem follows the affected Processor (or there is only one Processor), replace the affected Processor. 6. (Trained technician only)If problem stays with the original DIMM connector, re-inspect DIMM connector for foreign material and remove, if found. If connector is damaged, replace system board
0C6F04E2		Sensor Type: Memory Event Severity: Critical Description: Memory Device Disabled - Asserted	Memory fault occurs and it's disabled by BIOS.	1. If the DIMM was disabled because of a memory fault, follow the procedure for that event. 2. If problem persists, Power cycle the node from management console. 3. Reset UEFI to default settings. 4. Swap/reseat the DIMM from the disabled slot with a matching DIMM. If the slot remains disabled, (trained technician only) replace system board
296F00E3	Battery_Status	Sensor Type: Battery Event Severity: Warning Description: Battery Low - Asserted	The battery is too low.	1. If the system was recently installed, moved, or serviced, make sure the battery is properly seated. 2. Check Lenovo support site for an applicable service bulletin or firmware update that applies to this error. 3. Replace CMOS battery. 4. (Trained technician only) Replace the system board.
126F05E4	Timestamp	Sensor Type: System Event Event Severity: Info Description: Timestamp Clock Synch - Asserted	The system time in BMC was synchronized with BIOS.	It is just an information. Users don't need to do anything.
1E6F03E5	Device_OPROM	Sensor Type: Boot Error Event Severity: Warning Description: Invalid Boot Sector - Asserted	Optoin ROMs are full in memory space.	Check the Lenovo support website for any applicable service bulletin or UEFI or adapter firmware update that applies to this error. Note: It may be necessary to disable unused option ROMs from BIOS setup.
136F07E6	PCIE_Status	Sensor Type: Critical Interrupt Event Severity: Critical Description: Bus Correctable Error - Asserted	A single bit error is occurred in PCIe bus. This error will be repaired automatically.	If this node and/or any attached cables were recently installed, moved, serviced or upgraded, a. Reset adapter and any attached cables. b. Reload Device Driver. c. If device is not recognized, reconfiguring slot to Gen1 or Gen2 may be required. Gen1/Gen2 settings can be configured via F1 Setup -> System Settings -> Devices and I/O Ports -> PCIe Gen1/Gen2/Gen3 Speed Selection
136F08E6		Sensor Type: Critical Interrupt Event Severity: Critical Description: Bus Uncorrectable Error - Asserted	A multiple bits error is occurred in PCIe bus. This error will cause system to be hang up.	1. Check the Lenovo support website for an applicable device driver, firmware update, version of service information for this product or other information that applies to this error. Load new device driver and any required firmware updates. 2. if this node and/or any attached cables were recently

				installed, moved, serviced or upgraded, a. Reset adapter and any attached cables. b. Reload Device Driver. c. If device is not recognized, reconfiguring slot to Gen1 or Gen2 may be required. Gen1/Gen2 settings can be configured via F1 Setup -> System Settings -> Devices and I/O Ports -> PCIe Gen1/Gen2/Gen3 Speed Selection. 3. If problem persists, then remove Adapter Card. If system reboots successfully without the adapter, replace that card.

Appendix B. Diagnostic error messages

Use this information to resolve any issues that were found.

Message	Description	Action
Processor Test Failed	CPU Failure has been detected.	1.Please check System Sensor data to verify operational temperature range is maintained. 2.Contact Lenovo Customer Service for further support options.
Memory Test Failed	Memory Failure was detected.	1.Please check ECC and error logs in setup, test reports and verify ECC indicators on system board to identify failing module. ECC circuitry may have recovered the failing module and further data is included in the report under critical error logs for verification test. 2.Reseat firstly. If it still fails, then, replace defective module and contact Lenovo Customer Service for further support options.
Drives Test Failed	Hard disk failure was detected.	1.Please check drive error logs and smart status in test report 2.Replace a new hard disk. 3.If still fails, please contact Lenovo Customer Service for further support options.
Removable Drives Test Aborted	Removable device failure was detected.	1.Please verify if device is connected and was not removed during test. 2.Please verify if device is formatted and supported by system OS.
MotherBoard Test Aborted	A system board warning was detected.	1.Please verify all device drivers are enabled and with appropriate drivers. Missing drivers or hidden devices to the OS may cause the test to display a warning. 2.Please check error logs in this report for critical errors reported by the OS. 3. Replace the system board. 4. If still fails, please contact Lenovo Customer Service for further support options

Message	Description	Action
Video Test Failed	System Video Test has detected one or more errors.	1.It could be a video memory failure or missing video codec drivers. 2.Please verify proper driver for the video card is installed and any OS updates are installed. 3.Verify display is showing legible data and contact Lenovo Customer Service for further options.
Network Test Failed	Network test has detected an error.	1.Please verify drivers are updated and network is visible via device manager. It is possible a live network functionality can interfere with the test. 2.Ask system network administrator for proper network test guideline to avoid any interruption. 3.Please contact Lenovo Customer Service for further options.
USB Test Failed	USB Device test has detected an error.	1.Please verify a valid USB device is connected and visible from the OS. 2.Verify USB device is visible from device manager and system drivers can detect and initialize USB devices. 3.Verify updated system board and usb drivers are installed. 4. Please contact Lenovo Customer Service for further options.
Serial Ports Test Failed	Com Port test has detected an error.	1.Please verify com ports are visible from device manager and updated and working system drivers are installed. 2. If any item is connected to the Com ports, test results may be affected. Remove the connection and rerun the test. 3.Verify updated system board drivers are installed and no missing drivers are reported in test report. 4.Please contact Lenovo Customer Service for further options.

Message	Description	Action
MegaRaid Test Failed	Raid controller test has detected an error.	1.Please refer to drive status in the test results to see if RAID drives are responding. If no response, check installed drivers to see if active. If drive degraded, one of the raid drives has failed and needs to be replaced. 2.Make sure all drive carriers are in place and locked position. Make sure RAID BIOS settings are properly set. 3. Replace a raid card. 4. If still fails, please contact Lenovo Customer Service for further options.
LSI Test Failed	Raid controller test has detected an error.	1.Please refer to drive status in the test results to see if RAID drives are responding. If no response, check installed drivers to see if active. If drive degraded, one of the raid drives has failed and needs to be replaced. 2.Make sure all drive carriers are in place and locked position. Make sure RAID BIOS settings are properly set. 3.Replace a raid card. 4. If still fails, please contact Lenovo Customer Service for further options.
Intel Network Test Failed	Intel Network test has reported an error.	1.Verify updated drivers are installed and device manger is reporting network card to be active. 2. It is possible a live network functionality can interfere with the test. 3.Ask system network administrator for proper network test guideline to avoid any interruption. 4. Replace a network adaptor. 5. If still fails, please contact Lenovo Customer Service for further options.

Message	Description	Action
PCI Test Failed	All PCI devices are polled and checked via PCI Reset.	1.Test verifies all devices connected respond to system access. 2.Please contact Lenovo Customer Service for further options
Emulex Test Failed	Emulex Network test has reported an error.	1.Verify updated drivers are installed and device manger is reporting network card to be active. 2.It is possible a live network functionality can interfere with the test. 3.Ask system network administrator for proper network test guideline to avoid any interruption. 4. Replace a network adaptor. 5. If still fails, please contact Lenovo Customer Service for further options

Appendix C. 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.

Use this information to obtain additional information about Lenovo and Lenovo products, and determine what to do if you experience a problem with your Lenovo system or optional device.

Note: This section includes references to IBM web sites and information about obtaining service. IBM is Lenovo's preferred service provider for the System x, Flex System, and NeXtScale System products.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself.

If you believe that you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare before you call.

- 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.
- Check for updated software, firmware, and operating-system device drivers for your Lenovo product. The Lenovo Warranty terms and conditions state that you, the owner of the Lenovo product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check http://www.lenovo.com/us/en/serverproven/ to make sure that the hardware and software is supported by your product.
- Go to http://www.lenovo.com/support to check for information to help you solve the problem.
- Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.
  - Hardware and Software Maintenance agreement contract numbers, if applicable
  - Machine type number (Lenovo 4-digit machine identifier)
  - Model number
  - Serial number
  - Current system UEFI and firmware levels
  - Other pertinent information such as error messages and logs
- Go to http://www.ibm.com/support/entry/portal/Open_service_request to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The Lenovo product documentation also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs 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 product documentation. That documentation can include printed documents, online documents, readme files, and help files.

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.

Getting help and information from the World Wide Web

Up-to-date information about Lenovo products and support is available on the World Wide Web.

On the World Wide Web, up-to-date information about Lenovo systems, optional devices, services, and support is available at http://www.lenovo.com/support. The most current version of the product documentation is available in the following product-specific Information Centers:

- **Flex System products:**

  http://pic.dhe.ibm.com/infocenter/flexsys/information/index.jsp
- **System x products:**

  http://shop.lenovo.com/us/en/systems/
- **NeXtScale System products:**

  http://pic.dhe.ibm.com/infocenter/nxtscale/documentation/index.jsp

Creating a personalized support web page

You can go to Lenovo's support web page to subscribe products that are of interest to you.

You can obtain up-to-date information about the server and other Lenovo server products at http://www.lenovo.com/support. You will receive notifications about the products which you subscribe.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with your Lenovo products.

For more information about Support Line and other IBM services, see http://www.ibm.com/services or see http://www.ibm.com/planetwide for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

IBM is Lenovo's preferred service provider for the System x, Flex System and NeXtScale System products.

You can receive hardware service through your Lenovo reseller or from IBM. To locate a reseller authorized by Lenovo to provide warranty service, go to http://www.ibm.com/partnerworld and click **Business Partner Locator**. For IBM support telephone numbers, see http://www.ibm.com/planetwide. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

Taiwan product service

Use this information to contact IBM Taiwan product service.

台灣 IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路 7 號 3 樓
電話：0800-016-888

IBM Taiwan product service contact information:

IBM Taiwan Corporation
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

Appendix D. 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.

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

Trademarks

Lenovo, the Lenovo logo, Flex System, System x, NeXtScale System, and x Architecture are trademarks of Lenovo in the United States, other countries, or both.

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Internet Explorer, Microsoft, and Windows are trademarks of the Microsoft group of companies.

Linux is a registered trademark of Linus Torvalds.

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

Important notes

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

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

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

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

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

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

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as `total bytes written` (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. Lenovo is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

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

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

Recycling information

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

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document.

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

Table 21. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days
[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.	
[2] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.	
[3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.	

Telecommunication regulatory statement

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact a Lenovo representative or reseller for any questions.

Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

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.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Lenovo is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 2014/30/EU on the approximation of the laws of the Member States relating to electromagnetic compatibility. Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the installation of option cards from other manufacturers.

This product has been tested and found to comply with the limits for Class A equipment according to European Standards harmonized in the Directives in compliance. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Lenovo, Einsteinova 21, 851 01 Bratislava, Slovakia

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Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Germany Class A statement

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Deutschsprachiger EU Hinweis:Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU (früher 2004/108/EC) zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der Klasse A der Norm gemäß Richtlinie.

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

Deutschland:

Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmittein Dieses Produkt entspricht dem „Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln" EMVG (früher „Gesetz über die elektromagnetische Verträglichkeit von Geräten"). Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU (früher 2004/108/EC) in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EU Richtlinie 2014/30/EU (früher 2004/108/EC), für Geräte der Klasse A.

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

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:**Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.**

Nach der EN 55022: „Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen."

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Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den Handbüchern angegeben, zu installieren und zu betreiben.

Japanese Electrical Appliance and Material Safety Law statement (for detachable AC power cord)

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

JEITA harmonics guideline - Japanese Statement for AC power consumption (W)

定格入力電力表示

(社)電子情報技術参照委員会 家電・汎用品高調波抑制対策ガイドライン
　　実行計画書に基づく定格入力電力値：　　　　W

お手持ちのユニットの定格入力電力値(W)はユニットの電源装置に貼付されている電源仕様ラベルをご参照下さい

JEITA harmonics guideline - Japanese Statement of Compliance for Products Less than or Equal to 20A per phase

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

Japan VCCI Class A statement

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波障害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。　　VCCI－A

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

Korea Communications Commission (KCC) statement

이 기기는 업무용(A급)으로 전자파적합기기로
서 판매자 또는 사용자는 이 점을 주의하시기
바라며, 가정외의 지역에서 사용하는 것을 목
적으로 합니다.

This is electromagnetic wave compatibility equipment for business (Type A). Sellers and users need to pay attention to it. This is for any areas other than home.

Russia Electromagnetic Interference (EMI) Class A statement

ВНИМАНИЕ! Настоящее изделие относится к классу А.
В жилых помещениях оно может создавать радиопомехи, для
снижения которых необходимы дополнительные меры

People's Republic of China Class A electronic emission statement

声　　明
此为 A 级产品。在生活环境中，
该产品可能会造成无线电干扰。
在这种情况下，可能需要用户对其
干扰采取切实可行的措施。

Taiwan Class A compliance statement

警告使用者:
這是甲類的資訊產品,在
居住的環境中使用時,可
能會造成射頻干擾,在這
種情況下,使用者會被要
求採取某些適當的對策。

Taiwan BSMI RoHS declaration

Taiwan BSMI RoHS declaration

設備名稱：伺服器 Equipment name				型號(型式): 5493 Type designation (Type)		
單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛Lead (Pb)	汞Mercury (Hg)	鎘Cadmium (Cd)	六價鉻 Hexavalent chromium (Cr^{+6})	多溴聯苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
機架	○	○	○	○	○	○
外部蓋板	○	○	○	○	○	○
機械組合件	○	○	○	○	○	○
空氣傳動設備	–	○	○	○	○	○
冷卻組合件	–	○	○	○	○	○
內存模塊	–	○	○	○	○	○
處理器模塊	–	○	○	○	○	○
鍵盤	–	○	○	○	○	○
調製解調器	–	○	○	○	○	○
監視器LED	–	○	○	○	○	○
監視器LCD	–	–	○	○	○	○
滑鼠	–	○	○	○	○	○
電纜組合件	–	○	○	○	○	○
電源	–	○	○	○	○	○
儲備設備	–	○	○	○	○	○
電池匣組合件	–	○	○	○	○	○
電池	–	○	○	○	○	○
有mech的電路卡	–	○	○	○	○	○
無mech的電路卡	–	○	○	○	○	○
激光器	–	○	○	○	○	○

備考1.〝超出0.1 wt %〞及〝超出0.01 wt %〞係指限用物質之百分比含量超出百分比含量基準值。

Note1 : "exceeding 0.1wt%" and "exceeding 0.01 wt%" indicate that the percentage content
of the restricted substance exceeds the reference percentage value of presence condition.

備考2.〝○〞係指該項限用物質之百分比含量未超出百分比含量基準值。

Note2 : " ○ "indicates that the percentage content of the restricted substance does not exceed the
percentage of reference value of presence.

備考3.〝－〞係指該項限用物質為排除項目。

Note3 : The "–" indicates that the restricted substance corresponds to the exemption.

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