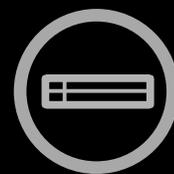**Lenovo**

# ThinkServer Storage SA120
# User Guide and Hardware Maintenance Manual

**ThinkThinkThinkServerThink**

**Machine Types:** 70F0 and 70F1

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

- The *Read Me First* that comes with your product
- "Safety information" on page iii
- Appendix A "Notices" on page 75

電子情報技術産業協会(JEITA) 表示

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

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

# Contents

# Safety information

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**Important:** Ensure that you read and understand all caution and danger statements in this document before you perform the procedures. Read and understand any additional safety information that is included with the storage array or optional device before you install, remove, or replace the device.

**Statement 1**



**DANGER**

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

**To avoid a shock hazard:**

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

| **To connect:** | **To disconnect:** |
|---|---|
| 1. Turn everything OFF. | 1. Turn everything OFF. |
| 2. First, attach all cables to devices. | 2. First, remove power cords from outlets. |
| 3. Attach signal cables to connectors. | 3. Remove signal cables from connectors. |
| 4. Attach power cords to outlets. | 4. Remove all cables from devices. |
| 5. Turn devices ON. | |

**Statement 2**

**DANGER**

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

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

**Do not:**

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

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

**Statement 3**



**CAUTION:**

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

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**

- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

**DANGER**

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

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

**Statement 4**
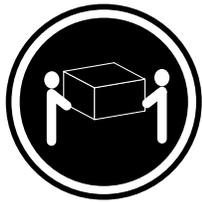


| | | |
|---|---|---|
| ≥ 18 kg (39.7 lb) | ≥ 32 kg (70.5 lb) | ≥ 55 kg (121.2 lb) |
| < 32 kg (70.5 lb) | < 55 kg (121.2 lb) | < 100 kg (220.5 lb) |
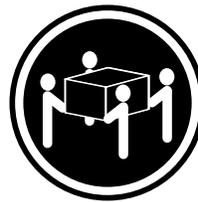
**CAUTION:**
**Use safe practices when lifting.**

**Statement 5**



**CAUTION:**
**The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.**
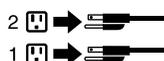
**Statement 6**



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

**Statement 7**



**CAUTION:**
**If the device has doors, ensure that you remove or secure the doors before moving or lifting the device to protect against personal injury. The doors will not support the weight of the device.**

**Statement 8**



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



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

**Statement 9**



**CAUTION:**
**Disconnect the hot-swap fan cables before removing the fan from the device to protect against personal injury.**

**Statement 10**



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

**Statement 11**



**CAUTION:**
The following label indicates a potential heat hazard.



**Statement 12**



**DANGER**

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

**Statement 13**



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

**Statement 14**



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

**Statement 15**



**CAUTION:**
The power-control button on the device may put the device in standby mode instead of turning off the device. In addition, the device might have multiple connections to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.
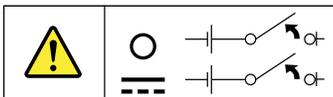
**Statement 16**



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

- **This equipment must be installed by trained service personnel in a restricted-access location, as defined by your local electrical code and the latest edition of IEC 60950.**

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

- **The branch circuit overcurrent protection must be rated in accordance with local electrical code requirements.**

- **Use 1.3 mm$^2$ or 16 American Wire Gauge (AWG) copper conductor only, not exceeding 3 meters in length.**

- **Torque the wiring-terminal screws to 1.4 newton-meters or 12 inch-pounds.**

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

**Statement 17**



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

**Statement 18**



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



**Statement 19**



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

**Statement 20**



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

## Products that are not assessed

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

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

# Chapter 1.  General information

This chapter provides some general information about your product.

This chapter contains the following items:

- "Introduction" on page 1
- "Documentation" on page 2

## Introduction

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

Your product comes with a documentation DVD that contains various documents to help you use and maintain the product.

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

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

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

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

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

For where to find the product information label on the chassis, see "Machine type, model, and serial number label" on page 9.

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

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

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

# Documentation

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

**Printed document**

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

*Read Me First*

This is a multilingual document you should read first. This document provides instructions on how to access the complete safety, warranty, and support information on the documentation DVD that comes with your storage array. This document also provides instructions on how to find the most up-to-date information on the Lenovo Support Web site.

**Documentation DVD**

The documentation DVD, which comes with your storage array, contains various documents for your storage array in Portable Document Format (PDF). To view the documentation, you need to have the Adobe Reader program installed. You can download the desired language version of the latest Adobe Reader program from the Adobe Web site at:
http://www.adobe.com

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

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

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

- *Lenovo License Agreement*

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

- *User Guide and Hardware Maintenance Manual*

  This document provides detailed information to help you get familiar with your storage array and help you use, configure, and maintain your storage array.

- *MegaRAID SAS Software User Guide*

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

- Other documents

  You might find other documents for the Host Bus Adapter (HBA), Ethernet card, or other optional parts on the documentation DVD.

# Chapter 2. Product overview

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

This chapter contains the following items:

# Product package

The product package includes the storage array, rail kit, power cords, cables, ear caps, printed documentation, and a documentation DVD.

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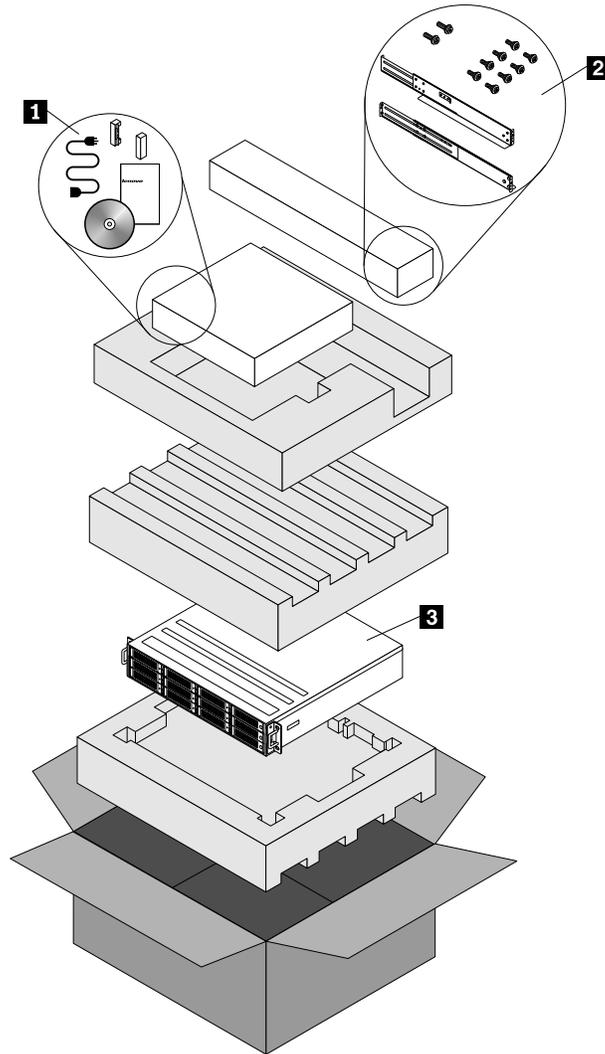


*Figure 1. Product package*

**1** Material box

**2** Rail kit

**3** Storage array

# Features

This topic provides information about the storage array features for various models. Depending on your specific model, some features might vary or not be available.

**Power supply**

Your storage array comes with one or two 550-watt hot-swap power supplies.

**System fans**

Your storage array comes with two fan assemblies.

**Internal drives**

Internal drives are devices that your storage array uses to read and store data. Your storage array supports the following types of internal drives:

- In the front: up to twelve 3.5-inch hot-swap Serial Attached SCSI (SAS) hard disk drives (SCSI is the acronym for Small Computer System Interface)
- In the rear: up to four 2.5-inch hot-swap Serial Advanced Technology Attachment (SATA 2.0) solid-state drives. The speed of the rear drives is limited to 3 Gbps.

**Attention:** To avoid damage to your storage array, ensure that you install the correct type of drive into a drive bay.

To locate the internal drives or drive bays, see "Storage array components" on page 12.

**Input/Output (I/O) features**

Your storage array comes with one or two I/O modules supporting in-band and out-of-band management. For detailed information, see "Rear view of the storage array" on page 10.

**Status light-emitting diodes (LEDs)**

Your storage array comes with various status LEDs on the front and rear panels. For the location and status information about the status LEDs, refer to the related topics in "LEDs on the front panel" on page 15 and "Rear view of the storage array" on page 10.

**Connecting modes**

Your storage array can be connected to a server in two modes: basic mode and cascading mode. In cascading mode, up to eight storage arrays can be connected to the same server. See "Connecting the storage arrays" on page 19.

**Note:** To connect storage arrays to a server, the target server must have a RAID card or a Host Bus Adapter installed.

**Tool-less design**

The tool-less design of the storage array enables you to install, remove, or replace hardware components easily . See Chapter 6 "Installing, removing, or replacing hardware" on page 31.

# Specifications

This topic lists the physical specifications for your storage array.

**Dimensions**

    Width without rack handles: 447.2 mm (17.6 inches)

    Width with rack handles: 482.6 mm (19 inches)

    Depth without rack handles: 385.85 mm (15.19 inches)

    Depth with rack handles: 394.05 mm (15.51 inches)

    Height: 86.6 mm (3.4 inches)

**Weight**

The product weight varies depending on different model configurations.

    Range of product weight without package: From 16 kg (35.27 lb) to 22 kg (48.5 lb)

    Range of product weight with package: From 19 kg (41.89 lb) to 32.5 kg (71.65 lb)

**Environment**

- Air temperature:

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

    Storage: -40°C to 70°C (-40°F to 158°F) in original shipping package

- Altitude: From 0 m (0 ft) to 3048 m (10 000 ft) in an unpressurized environment
- Humidity:

    Operating: 8% to 80% (non-condensing)

    Storage without package: 8% to 80% (non-condensing)

    Storage with package: 8% to 90% (non-condensing)

**Electrical input**

- Universal input:
  - Low range:

    Minimum: 100 V ac

    Maximum: 127 V ac

    Input frequency range: 50 to 60 Hz

  - High range:

    Minimum: 200 V ac

    Maximum: 240 V ac

    Input frequency range: 50 to 60 Hz

# Software: 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.

# Locations

This topic provides information to help you locate the components of your storage array.

## Machine type, model, and serial number label

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

The following illustration is a sample of the machine type, model, and serial number label on the storage array.

**Note:** Depending on the model type, your storage array might look slightly different from the following illustration.
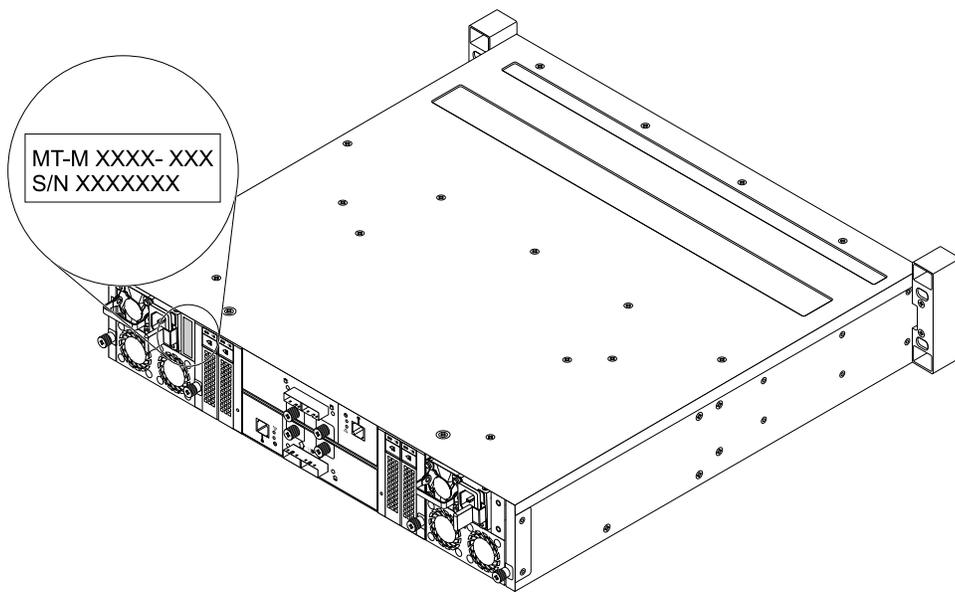


*Figure 2.  Machine type, model, and serial number label*

# Front view of the storage array

The following illustration shows the front view of the storage array.

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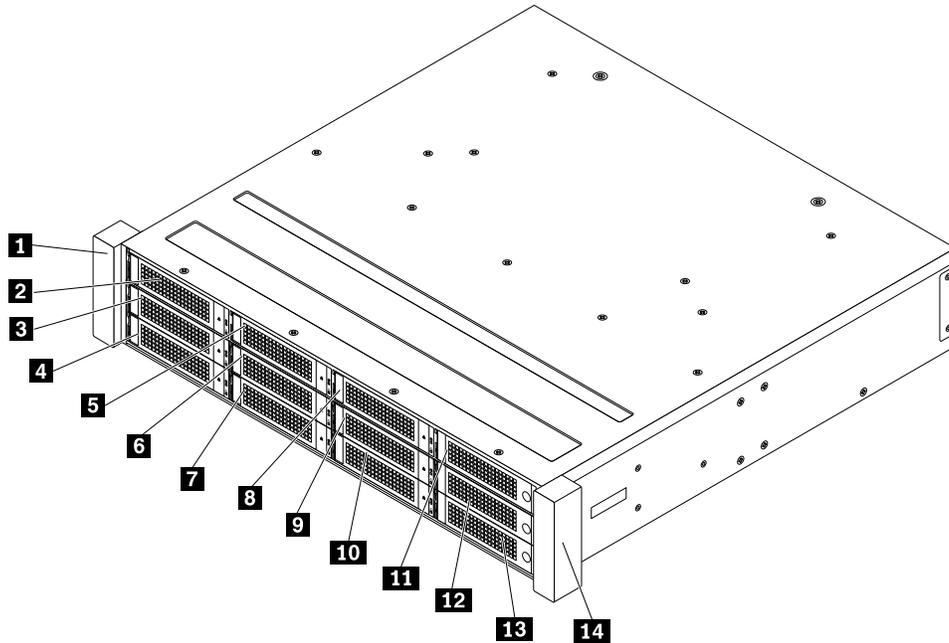


*Figure 3. Front view of the storage array*

| | |
|---|---|
| **1** Ear cap (left) | **2** 3.5-inch drive bay (bay 0) |
| **3** 3.5-inch drive bay (bay 1) | **4** 3.5-inch drive bay (bay 2) |
| **5** 3.5-inch drive bay (bay 3) | **6** 3.5-inch drive bay (bay 4) |
| **7** 3.5-inch drive bay (bay 5) | **8** 3.5-inch drive bay (bay 6) |
| **9** 3.5-inch drive bay (bay 7) | **10** 3.5-inch drive bay (bay 8) |
| **11** 3.5-inch drive bay (bay 9) | **12** 3.5-inch drive bay (bay 10) |
| **13** 3.5-inch drive bay (bay 11) | **14** Ear cap (right) |

**1 Ear cap (left)**

**14 Ear cap (right)**

**2 – 13 3.5-inch drive bays (bays 0–11)**

You can install up to twelve 3.5-inch hot-swap SAS hard disk drives into the 3.5-inch drive bays in the front of the storage array. To install 2.5-inch hot-swap SATA solid-state drives, see "Rear view of the storage array" on page 10.

# Rear view of the storage array

This topic provides information to help you locate the connectors and components on the rear of your storage array.

**Note:** Depending on the model, your storage array might look slightly different from the following illustration in this topic.
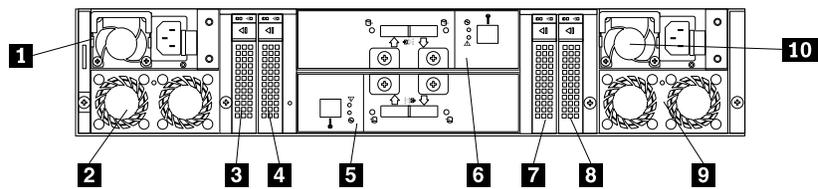


*Figure 4. Rear view of the storage array*

| | |
|---|---|
| **1** Power supply 1 | **2** Fan assembly 1 |
| **3** 2.5-inch drive bay (bay 12) | **4** 2.5-inch drive bay (bay 13) |
| **5** Rear I/O module 1 | **6** Rear I/O module 2 (in some models) |
| **7** 2.5-inch drive bay (bay 14) | **8** 2.5-inch drive bay (bay 15) |
| **9** Fan assembly 2 | **10** Power supply 2 (in some models) |

### **1** **10** Power supply

The hot-swap power supplies help you avoid significant interruption to the operation of the storage array when a power supply fails. You can purchase a power supply option from Lenovo and install the power supply to provide power redundancy without turning off the storage array.

The power-supply-status LED **A** as shown in the following illustration helps you determine the current status of the power supply.
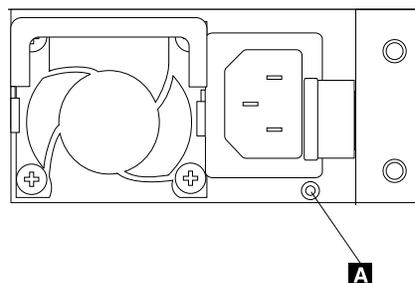


*Figure 5. Power-supply-status LED*

| Status | Color | Description |
|---|---|---|
| On | Amber | The power supply has critical errors. |
| On | Green | The power supply is working normally. |
| Blinking | Amber | The power supply is working, but has potential errors. |
| Blinking | Green | The power supply is disconnected from the ac power source. The other power supply provides power for the whole storage array. |
| Off | None | The power supplies are not connected to the ac power source. |

**2 9 Fan assembly**

The fan assemblies prevent your storage array from overheating problems.

The fan-assembly-status LED **A** as shown in the following illustration helps you determine the current status of the fan assembly.
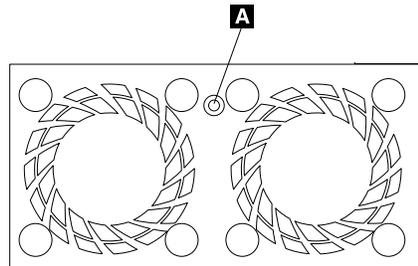


*Figure 6. Fan-assembly-status LED*

| Status | Color | Description |
|--------|-------|-------------|
| On | Amber | The fan assembly has potential errors. |
| Off | None | The fan assembly is working normally. |

**3 4 7 8 2.5-inch drive bays (bays 12-15)**

You can install up to four 2.5-inch hot-swap SATA solid-state drives into the drive bays.

**5 6 Rear I/O module**

The rear I/O module is used to connect the storage array to a server, or to another storage array. For information about the LEDs and connectors on the rear I/O module, see "LEDs and connectors on the rear I/O module" on page 16. For information about connecting your storage arrays, see "Connecting the storage arrays" on page 19.

## Storage array components

This topic provides information to help you locate the components of your storage array. For more information about the major components, see the related topics in "Locations" on page 9.

**Notes:**

- Depending on the model, your storage array might look slightly different from the following illustration.
- The EMI integrity and cooling of the storage array are protected by having all drive bays covered or occupied. The number of the installed drives in your storage array varies by model. The vacant drive bays are occupied by dummy drive trays.

The following illustration shows the components of your storage array.
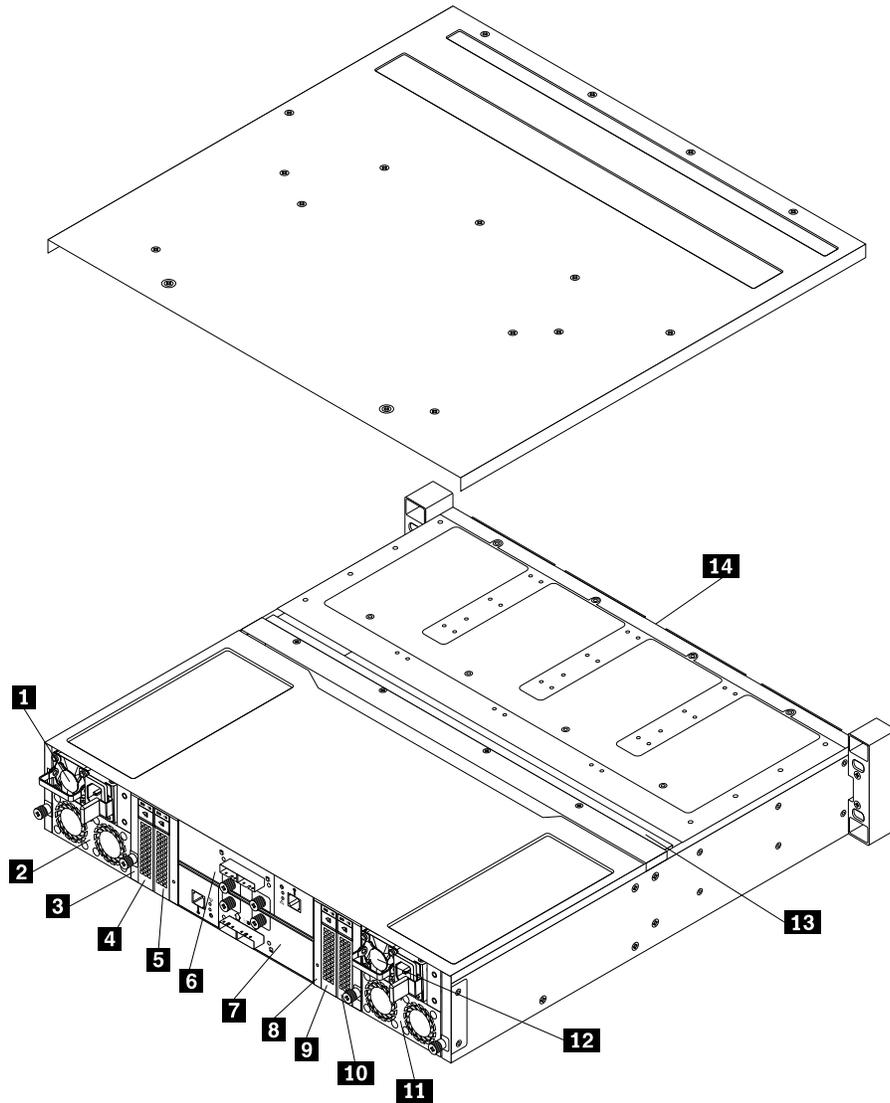


*Figure 7. Components of your storage array*

| | |
|---|---|
| **1** Power supply 1 | **2** Fan assembly 1 |
| **3** 2.5-inch drive cage (SATA-to-SAS) (in some models) | **4** 2.5-inch drive (in some models) |
| **5** 2.5-inch drive (in some models) | **6** Rear I/O module 2 (in some models) |
| **7** Rear I/O module 1 | **8** 2.5-inch drive cage (SATA-to-SAS) (in some models) |
| **9** 2.5-inch drive (in some models) | **10** 2.5-inch drive (in some models) |
| **11** Fan assembly 2 | **12** Power supply 2 (in some models) |
| **13** Backplane | **14** 3.5-inch drives (in some models) |

## CRU identification

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

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

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

**Notes:**

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

| Description | Self-service CRU | Optional-service CRU |
| --- | --- | --- |
| Dummy drive tray (in some models) | Yes | No |
| Power supply shield (in some models) | Yes | No |
| Fan assembly | Yes | No |
| Hard disk drive or solid-state drive (in some models) | Yes | No |
| Drive tray | Yes | No |
| Backplane | No | No |
| Power supply | Yes | No |
| Rear I/O module | Yes | No |
| 2.5-inch drive cage (SATA-to-SAS) (available as an option) | Yes | No |
| Mini SAS cables | Yes | No |

# LEDs on the front panel

The following illustration shows the LEDs on the front panel of the storage array.

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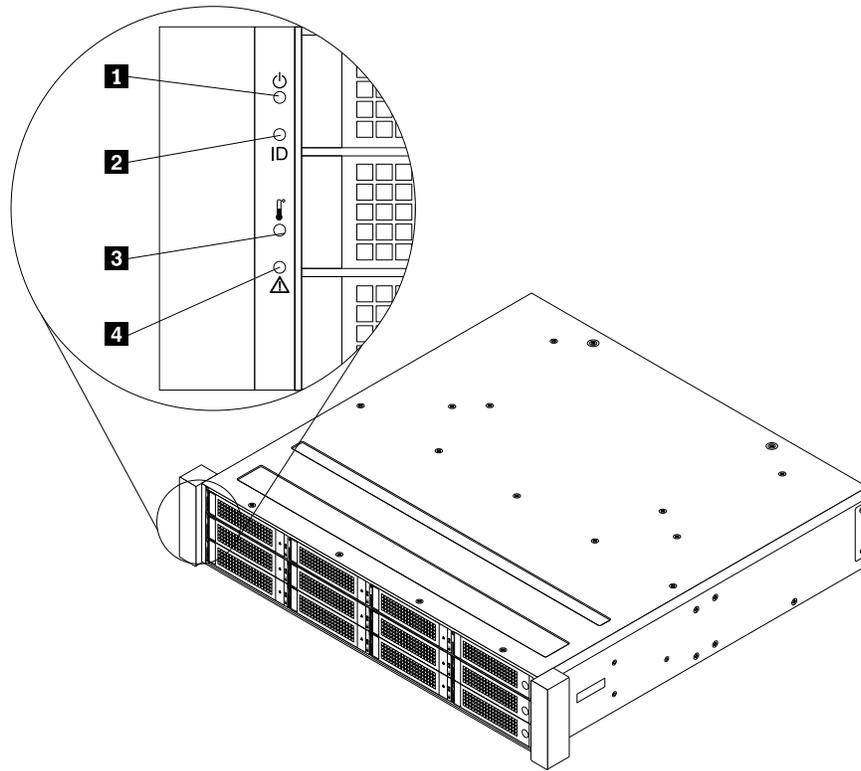


*Figure 8.  LEDs on the front panel*

| **1** Power-status LED | **2** System identification (ID) LED |
|---|---|
| **3** Temperature-status LED | **4** System error LED |

**1 Power-status LED**

The power-status LED helps you determine the current power status.

| Status | Color | Description |
|---|---|---|
| On | Green | The storage array is on and the power supplies are working normally. |
| Off | None | The storage array is off. |

**❷ System ID LED**

The system ID LED is lit to help you locate the storage array among other storage arrays.

| Status | Color | Description |
|--------|-------|-------------|
| Blinking | Green | The storage array is identified. |
| Off | None | The system ID LED is not in use or the storage array is not identified. |

**❸ Temperature-status LED**

The temperature-status LED helps you determine the current temperature status.

| Status | Color | Description |
|--------|-------|-------------|
| On | Amber | The storage array is overheated. |
| Off | None | The storage array is working normally. |

**❹ System error LED**

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

| Status | Color | Description |
|--------|-------|-------------|
| On | Amber | • The storage array is overheated.<br>• A fan is running at low speed or has been removed.<br>• There is a critical power-supply error.<br>• The rear I/O modules are not working correctly. |
| Off | None | The storage array is working normally. |

# LEDs and connectors on the rear I/O module

The following illustration shows the LEDs and connectors on the rear I/O module.
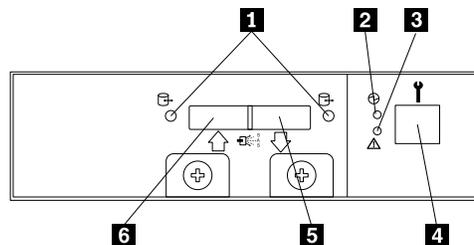


*Figure 9.  LEDs and connectors on the rear I/O module*

| | |
|---|---|
| ❶ SAS-connector-status LEDs | ❷ Rear I/O module power-status LED |
| ❸ Rear I/O module status LED | ❹ Debug connector |
| ❺ SAS-out connector | ❻ SAS-in connector |

**1 SAS-connector-status LEDs**

| Status | Color | Description |
|---|---|---|
| On | Green | The SAS connector is in use, but no data is being transferred. |
| Blinking | Green | The SAS connector is active and data is being transferred. |
| On | Amber | The SAS connector has potential errors. |
| Off | None | The SAS connector is not in use or is working normally. |

**Note:** When a SAS-connector-status LED indicates potential errors, check the system-status LEDs on the server that the storage array is connected to for confirmation.

**2 Rear I/O module power-status LED**

| Status | Description |
|---|---|
| On | The rear I/O module is turned on. |
| Off | The rear I/O module is turned off. |

**3 Rear I/O module status LED**

| Status | Description |
|---|---|
| On | The rear I/O module has potential errors. |
| Off | The rear I/O module is working normally. |

**4 Debug connector**

Use the debug connector to update the firmware of the storage array and diagnose problems. See Chapter 5 "Updating the firmware" on page 29 and "Using the command line interface" on page 59.

**5 SAS-out connector**

Use the SAS-out connector to connect your storage array to another storage array in cascading mode. See "Connecting the storage arrays" on page 19.

**6 SAS-in connector**

Use the SAS-in connector to connect your storage array to a server or another storage array. See "Connecting the storage arrays" on page 19.

## Drive-status LEDs

Each drive has two status LEDs on the front.
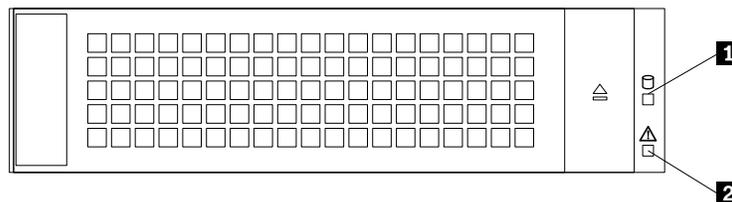


*Figure 10. Status LEDs on 3.5-inch drives*
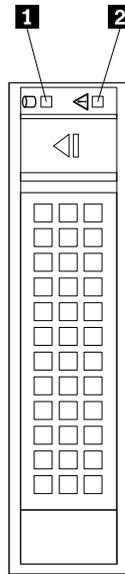
Figure 11. Status LEDs on 2.5-inch drives

| Drive-status LED **1** | Color | Description |
| --- | --- | --- |
| On | Green | The drive is present but not in use. |
| Blinking | Green | The drive is active and data is being transferred. |
| Off | None | No drive is installed or present. |

| Drive-status LED **2** | Color | Description |
| --- | --- | --- |
| On | Amber | The drive has failed. |
| Blinking | Amber | The drive is identified. |
| Off | None | The drive is working normally. |

## Backplane

The following illustration shows the slots on the front of the backplane.
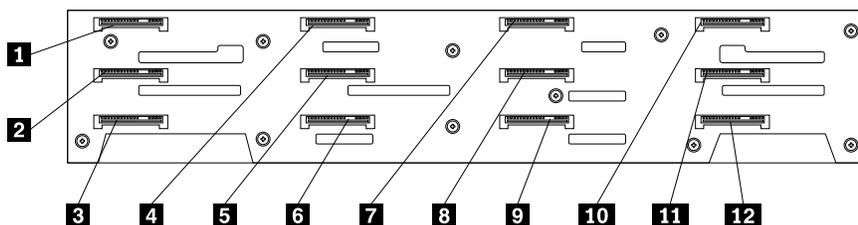


Figure 12. Slots on the front of the backplane

| | |
| --- | --- |
| **1** Slot 0 for a 3.5-inch drive | **2** Slot 1 for a 3.5-inch drive |
| **3** Slot 2 for a 3.5-inch drive | **4** Slot 3 for a 3.5-inch drive |

| **5** Slot 4 for a 3.5-inch drive | **6** Slot 5 for a 3.5-inch drive |
|---|---|
| **7** Slot 6 for a 3.5-inch drive | **8** Slot 7 for a 3.5-inch drive |
| **9** Slot 8 for a 3.5-inch drive | **10** Slot 9 for a 3.5-inch drive |
| **11** Slot 10 for a 3.5-inch drive | **12** Slot 11 for a 3.5-inch drive |

The following illustration shows the slots and connectors on the rear of the backplane.
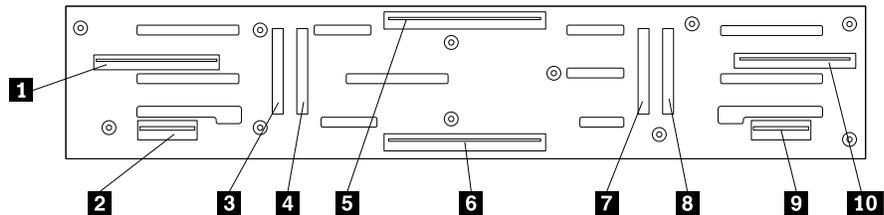


*Figure 13. Slots and connectors on the rear of the backplane*

| **1** Power supply 1 connector | **2** Fan assembly 1 connector |
|---|---|
| **3** Slot 12 for a 2.5-inch drive | **4** Slot 13 for a 2.5-inch drive |
| **5** Rear I/O module 2 connector | **6** Rear I/O module 1 connector |
| **7** Slot 14 for a 2.5-inch drive | **8** Slot 15 for a 2.5-inch drive |
| **9** Fan assembly 2 connector | **10** Power supply 2 connector |

# Connecting the storage arrays

You can connect up to eight storage arrays to a server. When you connect only one storage array to a server, the connection is referred to as basic mode. When you connect two to eight storage arrays to a server, the connection is referred to as cascading mode.

**Notes:**

- To connect the storage arrays, the target server must have a RAID card or a Host Bus Adapter (HBA) installed.
- Depending on the model, your storage arrays might look slightly different from the illustrations in this topic.

## Connecting a storage array to a server

To connect a storage array to a server, do the following:

1. Connect one end of a mini-SAS signal cable to the SAS-in connector on a rear I/O module of the storage array.
2. Connect the other end of the mini-SAS signal cable to an available mini-SAS connector on the RAID card or the Host Bus Adapter in the server. For more information about the RAID card or the Host Bus Adapter, refer to the user guide of your server.
3. For a storage array with two rear I/O modules, you can repeat step 1 and step 2 to connect another mini-SAS signal cable to the server and the secondary rear I/O module.

   **Note:** Connecting a storage array to a server through two rear I/O modules provides redundancy. The redundancy helps avoid significant interruption to the connection of the storage array when a rear I/O module fails.
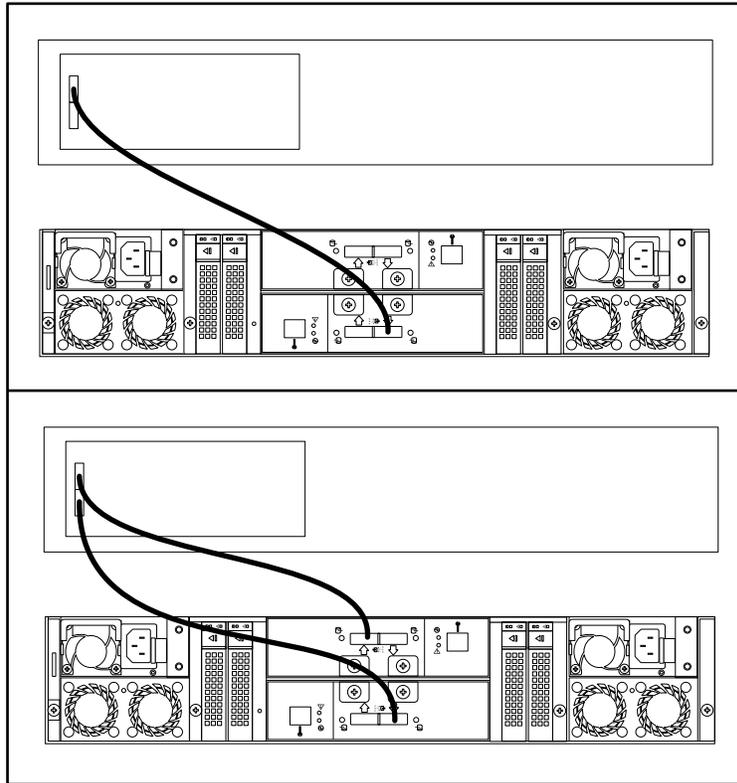
*Figure 14. Connecting a storage array to a server*

## Connecting two to eight storage arrays to a server

You can connect two to eight storage arrays to a server through cascading mode. The procedure for connecting more than one storage arrays to a server can be divided into two parts:

1. Connect a storage array to a server.
2. Connect the storage arrays to each other.

**Note:** Each mini-SAS connector on the RAID card or on the Host Bus Adapter installed in the target server can support up to four storage arrays.

To connect two to eight storage arrays to a server, do the following:

1. Connect a storage array to a server. See "Connecting a storage array to a server" on page 19.
2. Do the following to connect one storage array to another:

   a. Connect one end of a mini-SAS signal cable to the SAS-out connector on a rear I/O module (for example, rear I/O module 1) of a storage array.

   b. Connect the other end of the mini-SAS signal cable to the SAS-in connector on the corresponding rear I/O module (for example, rear I/O module 1) of another storage array.

   c. For storage arrays with two rear I/O modules, you can repeat step a and step b to connect a mini-SAS signal cable to the secondary rear I/O modules (for example, rear I/O module 2).

   **Note:** Connecting the storage arrays to each other through two rear I/O modules provides redundancy, which helps avoid significant interruption to the connection of the storage arrays when a rear I/O module fails.
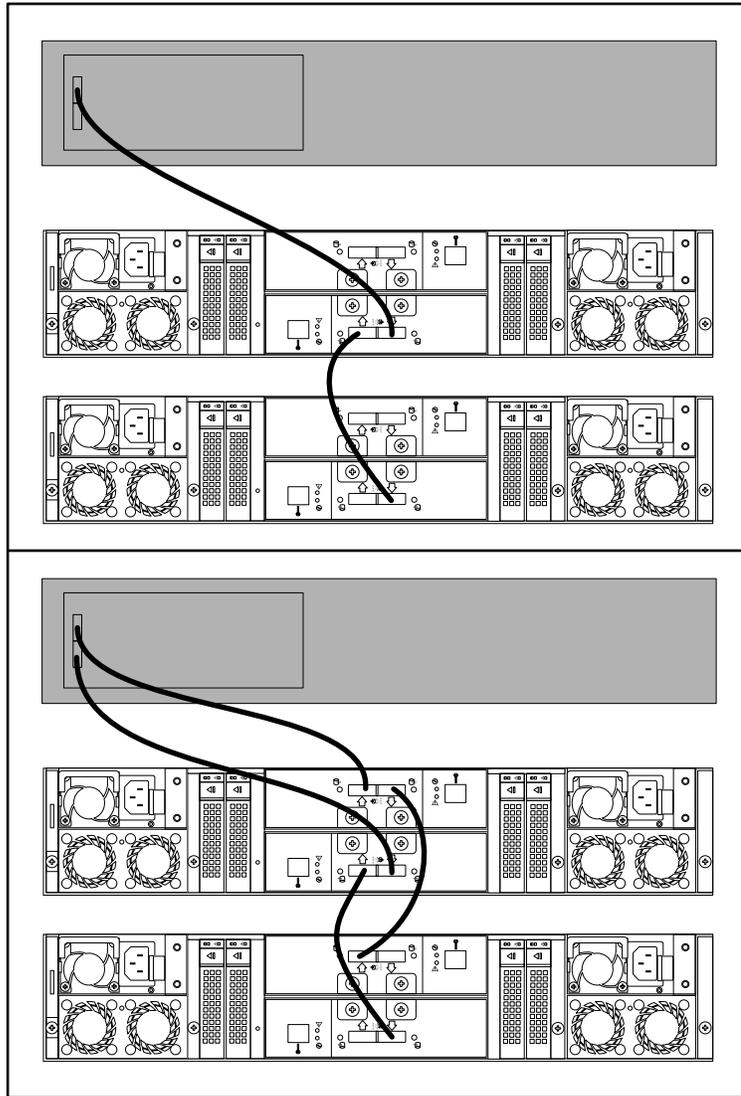
*Figure 15. Connecting one storage array to another*

3. Repeat step 2 to connect more storage arrays as you need. Each mini-SAS connector on the RAID card or on the Host Bus Adapter installed in the target server can support up to four storage arrays.
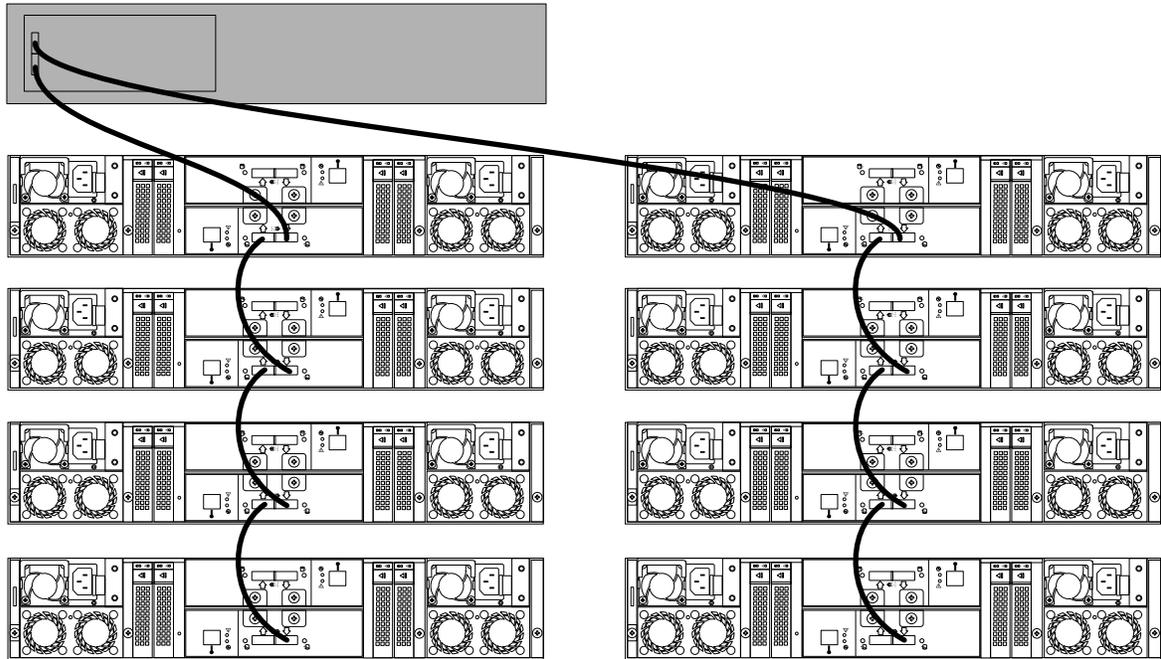
*Figure 16. Connecting two to eight storage arrays to a server (one rear I/O module)*
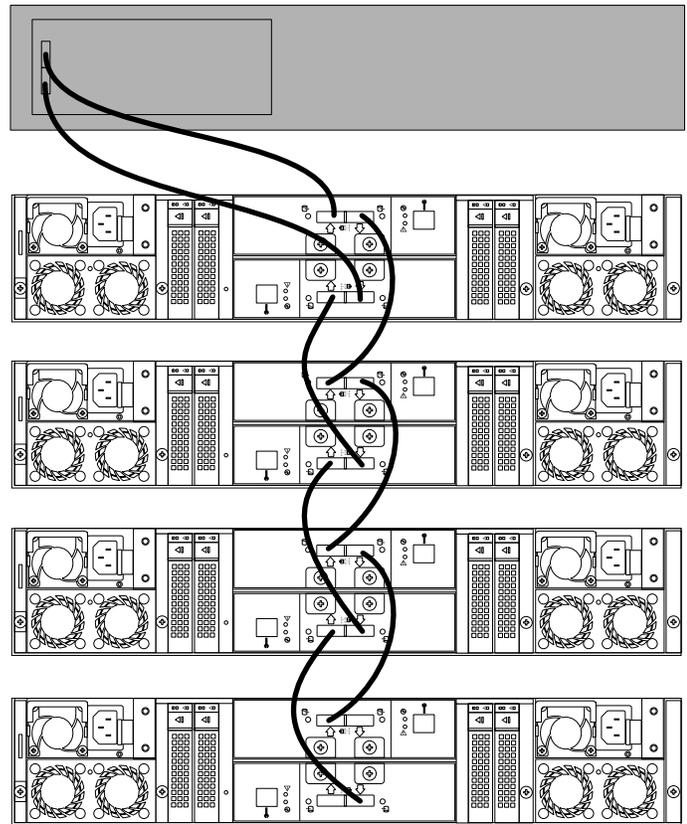
Figure 17. Connecting two to four storage arrays to a server (two rear I/O modules)

# Chapter 3. Turning on and turning off the storage array

This chapter provides information about turning on and turning off the storage array.

## Turning on the storage array

**Notes:**

- To use a storage array, ensure that you always turn on the storage array first, and then the server.
- There is no power switch on the storage array. The storage array turns on when you connect it to ac power.

To turn on the storage array, do the following:

1. Complete the hardware installation or replacement, and then connect the storage array to a server. See Chapter 6 "Installing, removing, or replacing hardware" on page 31 and "Connecting the storage arrays" on page 19.

   **Note:** Ensure that the SAS signal cables between the storage array and server are connected securely.

2. Connect the storage array to an ac power source. The power-status LED on the front panel is lit in green.

## Turning off the storage array
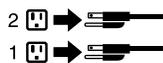


**Note:** There is no power switch on the storage array. The storage array turns off when you disconnect it from ac power.

To turn off the storage array, do the following:

1. Turn off the server that the storage array is connected to.
2. Disconnect the storage array from the ac power source.

**Note:** You do not have to turn off the storage array when restarting the server that the storage array is connected to.

# Chapter 4. Configuring RAID

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

**Note:** After the storage array is identified by the server that it is connected to, refer to the documentation that comes with the RAID card or HBA installed in the server to configure the storage array.

This topic contains the following items:

- "About RAID" on page 27
- "Configuring the advanced SATA/SAS hardware RAID" on page 28

## About RAID

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## Configuring the advanced SATA/SAS hardware RAID

The MegaRAID Storage Manager program helps you manage the RAID array and RAID controller in an operating system environment. For instructions on how to configure and manage the advanced SATA/SAS hardware RAID, refer to the *MegaRAID SAS Software User Guide* on the documentation DVD that comes with your storage array. This document also is available on the Lenovo Web site at: http://www.lenovo.com/UserManuals

# Chapter 5. Updating the firmware

This chapter provides instructions on how to update the firmware of the storage array.

You can update the firmware through one of the following methods:

- Using the out-of-band RS232 console
- Using the ThinkServer Storage Array Utility program

**Note:** It is recommended that you use the out-of-band RS232 console to update the firmware.

## Using the RS-232 console

The RS-232 console uses the Xmodem protocol to update the firmware of your storage array. Before you start, prepare a computer that meets the following requirements:

- Has an available DB9 serial connector.
- Has a serial-connector configuration program installed, such as the SecureCRT program.

To update the firmware of your storage array, do the following:

1. Connect one end of the DB9-to-RJ11 debug cable (provided in your storage array package) to the debug connector on the rear I/O module of the storage array. Then, connect the other end of the debug cable to the DB9 serial connector on the computer.

2. Start the serial-connector configuration program.

    **Note:** The following steps are based on the scenario that SecureCRT is started. If you are using a different serial-connector configuration program, the procedure is similar.

3. On the menu bar, click **File ➙ Quick Connect**. The Quick Connect window is displayed.

4. Configure the DB9 serial connector as the following:

    **Protocol**: **Serial**

    **Port**: **COMx** (x refers to the serial number of the DB9 serial connector)

    **Baud rate**: **115 200**

    **Data bits**: **8**

    **Parity**: **none**

    **Stop bits**: **1**

5. Clear the **RTS/CTS** check box, and then click **Connect**. The storage array is connected to the computer.

6. Enter lenovo in the main window. The Serial Debug Menu is displayed.

7. Enter 2. The Flash Menu is displayed.

8. Enter 1. The message "Waiting For X-modem Transfer" is displayed.

9. On the menu bar, click **Transfer ➙ Send Xmodem**, the "Select File to Send using Xmodem" window is displayed.

10. Browse to the *_sxp_*.bin file, and then click **Send**. The file transfer starts.

11. When the transfer progress is completed, enter 2. The message "Waiting For X-modem Transfer" is displayed.

12. On the menu bar, click **Transfer ➙ Send Xmodem**, the "Select File to Send using Xmodem" window is displayed.

13. Browse to the \*_istr_\*.bin file, and then click **Send**. The file transfer starts.

14. When the transfer progress is completed, enter 5. The firmware update operation is completed.

**Note:** If your storage array has two rear I/O modules installed, the two modules must have the same firmware version. Repeat the previous procedure to update the firmware of the secondary rear I/O module.

## Using the ThinkServer Storage Array Utility program

The ThinkServer Storage Array Utility program enables you to maintain your storage array firmware up-to-date and helps you avoid unnecessary outages.

To update your storage array firmware using ThinkServer Storage Array Utility, do the following:

1. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to locate ThinkServer Storage Array Utility.

2. Download the EXE file for ThinkServer Storage Array Utility and the TXT file that contains the installation instructions.

3. Follow the instructions on the TXT file to install ThinkServer Storage Array Utility on the server that your storage arrays are connected to. Then, use ThinkServer Storage Array Utility to update the firmware of your storage arrays. For detailed information about using the program, refer to the user guide of the program.

# Chapter 6. Installing, removing, or replacing hardware

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

For a list of ThinkServer options, go to:
http://www.lenovo.com/thinkserver

## Guidelines

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

## Precautions

Before you use the storage array, ensure that you read and understand the following precautions:

- Before using the product, ensure that you read and understand the multilingual safety instructions and the Lenovo Limited Warranty (LLW) on the documentation DVD that comes with the product. Reading and understanding the safety instructions reduces the risk of personal injury and damage to your product.

- Before you install optional hardware devices, ensure that the storage array is working correctly. If the storage array is not working correctly, see Chapter 7 "Troubleshooting and diagnostics" on page 59 to do basic troubleshooting. If the problem cannot be solved, see Chapter 8 "Getting information, help, and service" on page 63.

- Observe good housekeeping in the area where you are working. Put removed covers and other parts in a safe place.

- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:

  – Ensure that you can stand safely without slipping.

  – Distribute the weight of the object equally between your feet.

  – Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.

  – To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.

- Ensure that you have an adequate number of properly grounded electrical outlets for the storage array, monitor, and other devices.

- Back up all important data before you make changes to drives.

- You do not have to turn off the storage array to install or replace a hot-swap power supply or a hot-swap hard disk drive. However, you must turn off the storage array before performing any step that involves installing, removing, or replacing non-hot-swap devices or components.

- When you are finished working on the storage array, reinstall all safety shields, guards, labels, and ground wires.

## Handling static-sensitive devices

**Attention:** Do not open the static-protective package that contains the new part until the defective part has been removed from the storage array and you are ready to install the new part. Static electricity, although harmless to you, can seriously damage storage array components and parts.

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

**Notes:**

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- Always carefully handle the parts and other components by edges or frame. Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- Before you replace a new part, touch the static-protective package containing the new part to an unpainted metal part of the storage array for at least two seconds. This reduces static electricity from the package and your body.
- Remove the new part from the static-protective package and directly install it in the storage array without placing it on any other surface. If it is hard for you to do this in your specific situation, place the static-protective package of the new part on a smooth, level surface, and then place the new part on the static-protective package.
- Do not place the part on the storage array cover or other metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.
- Use a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
- Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
- The use of a grounding system is recommended. Ensure that you work in an ESD-safe area. Select a grounding system, such as those listed below, to provide protection that meets the specific service requirement.
  - Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
  - When working on a double-insulated or battery-operated system, use an ESD common ground or reference point. You can use coax or connector-outside shells on these systems.
  - Use the ground prong of the ac plug on ac-operated storage arrays.

## System reliability guidelines

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

- Each of the drive bays has a drive or a dummy drive tray installed; or there is an electromagnetic interface (EMI) protective panel or EMI shield installed to protect the drive cage.
- Each of the power supply bay has a power supply installed, or one bay has a power supply installed while the other bay is covered by a shield.
- Leave adequate space around the storage array to ensure that the storage array cooling system works well. Leave approximately 50 mm (2 inches) of open space around the front and rear of the storage array. Do not place objects in front of the fans. For proper cooling and airflow, install the storage array cover before you turn on the storage array. Operating the storage array for extended periods of time (more than 30 minutes) with the storage array cover removed might damage storage array components.
- Ensure that you replace a failing fan assembly to avoid overheating problems.
- When replacing a hot-swap drive, install the new hot-swap drive within two minutes of removal.

- If your storage array has air ducts or air baffles, do not remove them while the storage array is running. Operating the storage array without the air ducts or air baffles might cause overheating problems.

## Working with the storage array with the power on

> **Attention:** Static electricity that is released to internal storage array components when the storage array is turned on might cause the storage array to halt, which might result in the loss of data. To avoid this potential problem, always use an ESD wrist strap or other grounding system when you work inside the storage array with the power on.

Follow these guidelines when you work with the storage array with the power on:

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

## Installing, removing, or replacing hardware

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

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

**Notes:**
1. Use only parts provided by Lenovo.
2. Depending on the model, your storage array might look slightly different from the illustrations in this topic.

The EMI integrity and cooling of the storage array are protected by having all bays covered or occupied. When you install an internal drive or a power supply, save the EMI shield or dummy drive tray from the drive bay in the event that you later remove the device.

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

## Installing or replacing a hot-swap drive

> **Attention:** Do not open your storage array or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 31.

This topic provides instructions on how to install or replace a hot-swap drive.

This topic applies only to storage array models that have drives installed. See "Features" on page 6 for more information about the supported drives.

For a list of ThinkServer drive options, go to:
http://www.lenovo.com/thinkserver

You can install or replace a drive without turning off the storage array, which helps you avoid significant interruption to the operation of the system.

The EMI integrity and cooling of the storage array are protected by having all drive bays covered or occupied. The number of the installed drives in your storage array varies depending on the storage array model. The vacant bays are occupied by dummy drive trays. When you install a drive, save the removed dummy drive tray from the drive bay in the event that you later remove the drive and need the dummy drive tray to cover the place.

**Attention:** An unoccupied drive bay without any other protection might impact the EMI integrity and cooling of the storage array, which might result in overheating or component damage. To maintain the EMI integrity and cooling of the storage array, install a new drive as soon as you remove the failing one or the dummy drive tray.

Before you begin, review the following drive installation rules:

- Follow the order of the drive bays when installing a drive. See "Front view of the storage array" on page 10 to locate the drive bays in your storage array.
- For drives with different capacities, install the drive by following the order of the drive bays as well as the order from the lowest capacity to the highest capacity.

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

**Notes:**

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

To install or replace a drive, do the following:

1. Do one of the following:

   - If you are installing a new drive, refer to the drive installation rules in this topic and locate the appropriate drive bay. Then, press the circled area **2** to open the handle of the dummy drive tray.

   - If you are replacing a drive, locate the drive you want to replace and press the release button **1** to open the handle of the drive.
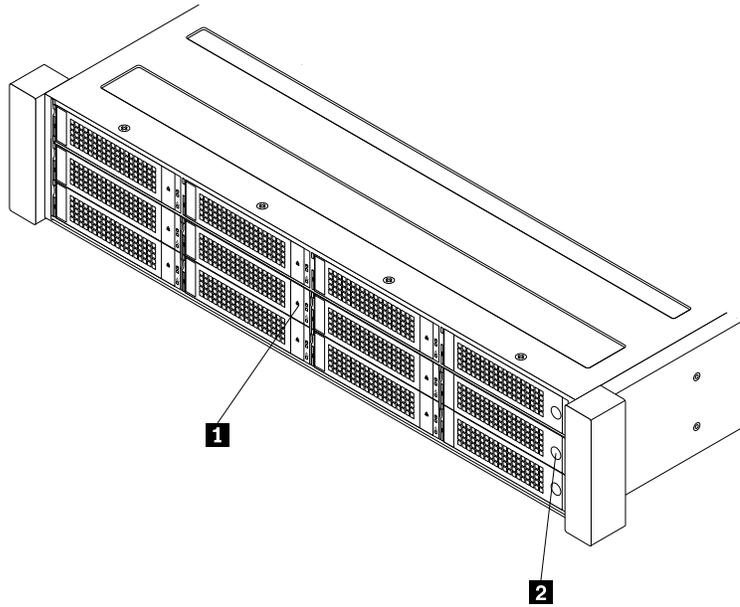
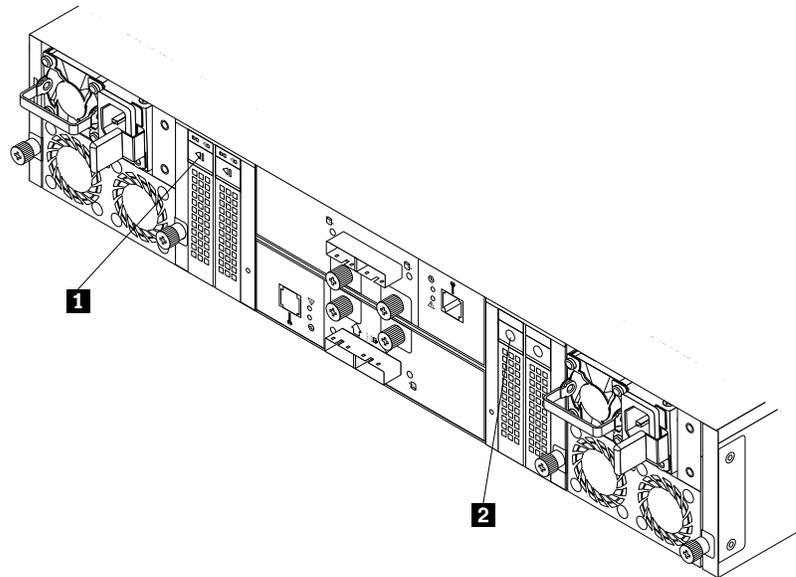*Figure 18. Opening the handle of a 3.5-inch drive or dummy drive tray*



*Figure 19. Opening the handle of a 2.5-inch drive or dummy drive tray*

2. Pull the handle and carefully slide the drive or the dummy drive tray out of the front of the chassis.
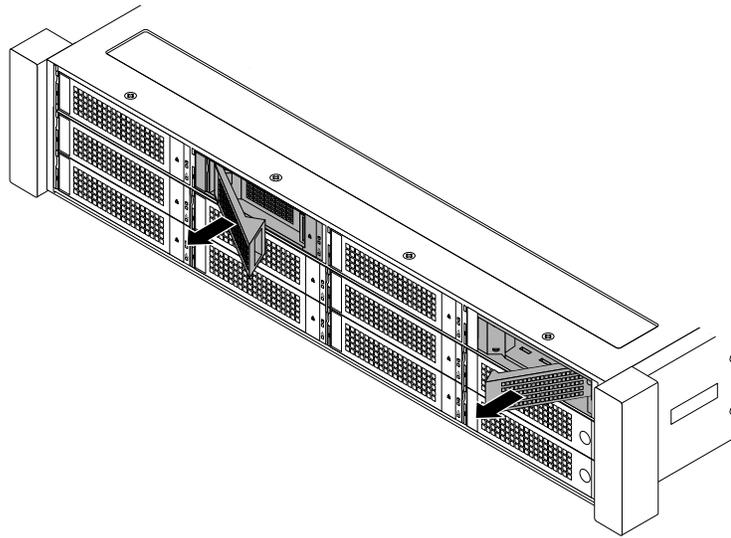
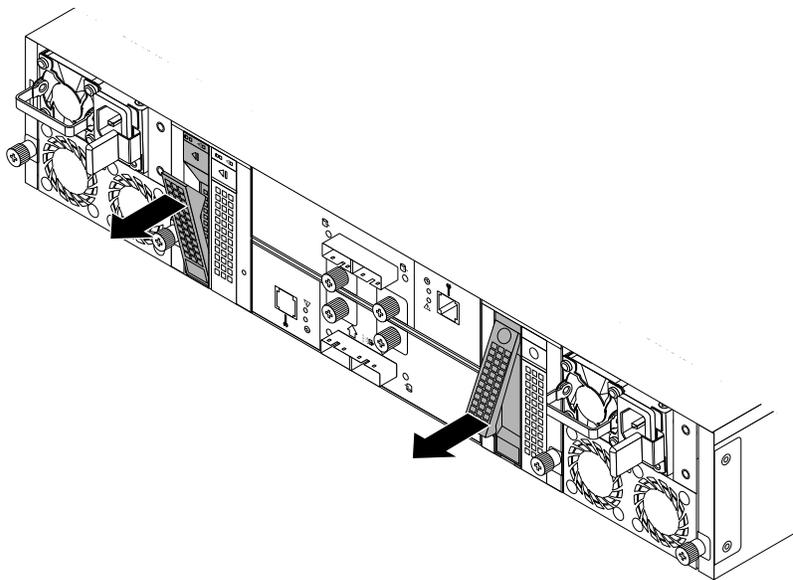*Figure 20. Removing the 3.5-inch drive or dummy drive tray*



*Figure 21. Removing the 2.5-inch drive or dummy drive tray*

3. Touch the static-protective package that contains the new drive to any unpainted surface on the outside of the storage array. Then, take the new drive out of the package.

**Note:** Do not touch the circuit board on the drive.
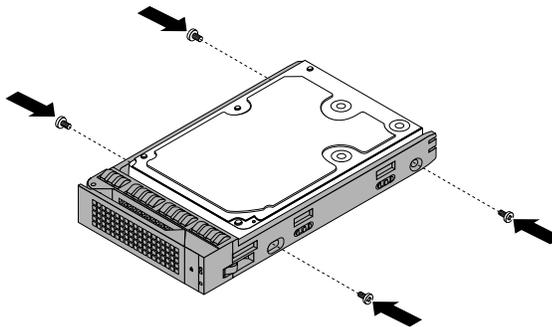
4. Do one of the following:

   - If you are replacing a drive, remove the four screws to remove the failing drive from the drive tray.
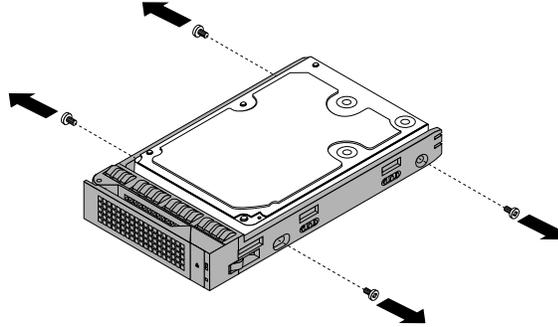
*Figure 22. Removing the drive from the drive tray*

   - If you are installing a drive, go to the next step.

5. Align the holes in the drive tray with the corresponding ones on the new drive. Then, install the four screws to secure the drive to the drive tray.

*Figure 23. Installing the drive to the drive tray*

6. Slide the assembled drive and tray into the drive bay from the front until the assembly snaps into position and then completely close the handle.

*Figure 24. Installing the 3.5-inch drive*
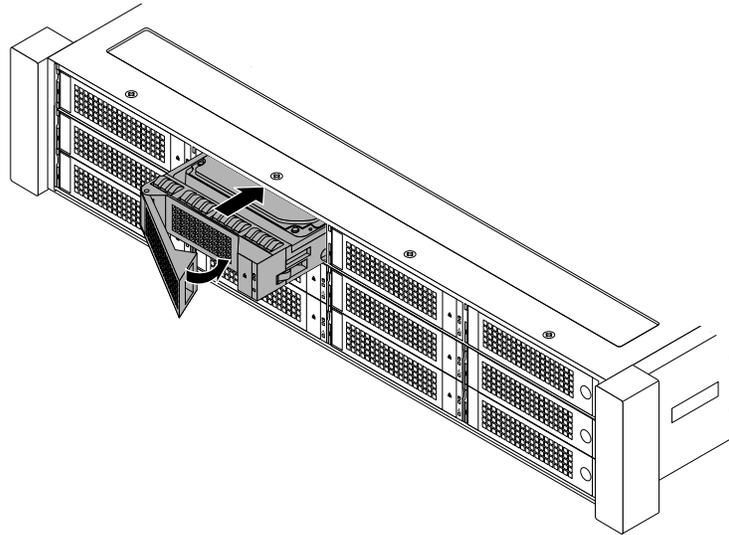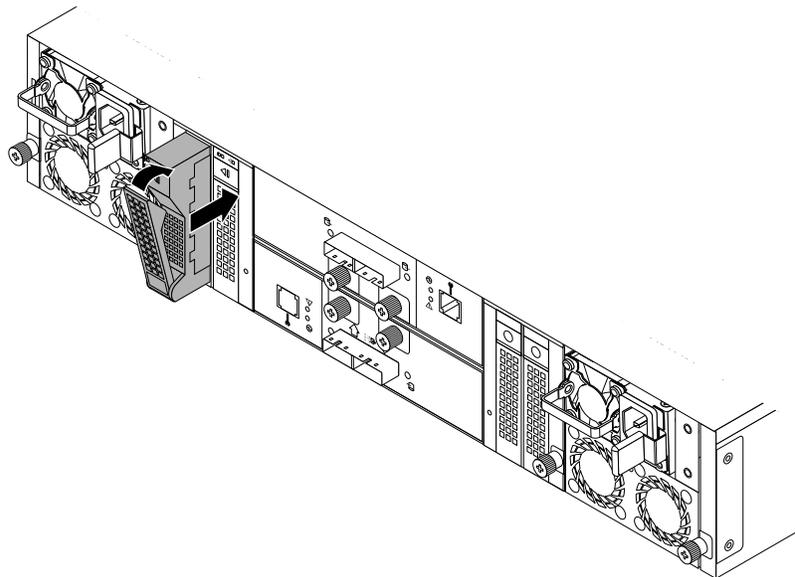


*Figure 25. Installing the 2.5-inch drive*

7. Check the drive-status LEDs to ensure that the drive is operating correctly. You might have to restart the storage array for the newly installed drive to be recognized. See "Drive-status LEDs" on page 17. If the drive is faulty, you need to reinstall or replace it until it is operating correctly.

8. Do one of the following:

- If you are installing a drive, save the removed dummy drive tray in the event that you later remove the drive and need a dummy drive tray to cover the drive bay.
- If you are replacing a drive and are instructed to return the old drive, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

9. Configure RAID after you replacing or installing a drive. See Chapter 4 "Configuring RAID" on page 27.

## Installing or replacing a power supply

**Attention:** Do not open your storage array or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 31.

This topic provides instructions on how to install or replace a power supply. This topic applies only to storage array models that come with one or two power supplies.

When the storage array is populated with two power supplies, it can withstand a power loss from either power supply. This helps you avoid significant interruption to the operation of the storage array when a power supply fails. You can replace the failing power supply without turning off the storage array.

Some storage array models come with only one power supply. You can purchase a power supply option from Lenovo.

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



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



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

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

**Notes:**

- To maintain the EMI integrity and cooling of the storage array, install a new power supply as soon as you remove the failing one or cover the other bay with a shield if you just use one power supply to provide power.
- Your power supply might look slightly different from the illustrations in this topic.
- Use any documentation that comes with the new power supply and follow those instructions in addition to the instructions in this topic.

To install or replace a power supply, do the following:

1. Do one of the following:

   - If you are installing a power supply, locate the bay for the power supply in the rear of your storage array. Insert a finger into the hole in the metal shield that protects the bay, press the tab **1** in the direction as shown, and then pull the shield out of the chassis. Store the shield in the event that you later remove the power supply and need the shield to cover the bay.
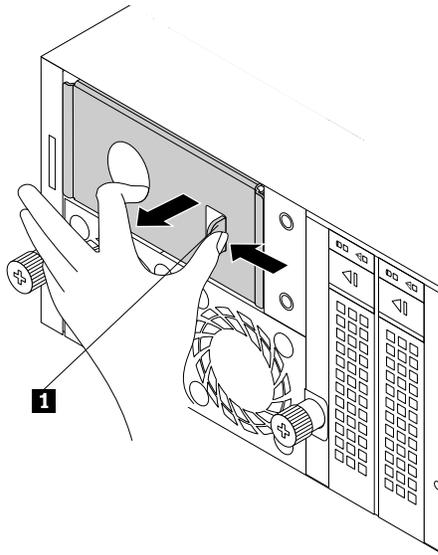


*Figure 26. Removing the protective shield for the power supply bay*

   - If you are replacing a power supply, do the following:

     a. Locate the failing power supply in the rear of your storage array and then disconnect the power cord from the failing power supply. For detailed information, see "LEDs on the front panel" on page 15 and "Rear view of the storage array" on page 10.

     b. Press the release tab **1** in the direction as shown and carefully pull the handle **2** at the same time to slide the failing power supply out of the chassis.

*Figure 27.  Removing a power supply*

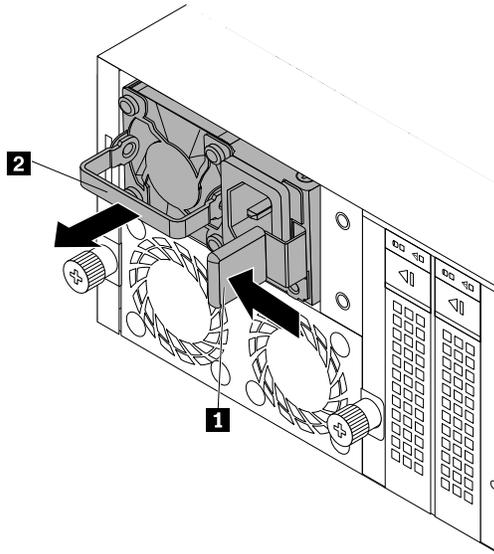2. Touch the static-protective package that contains the new power supply to any unpainted surface on the outside of the storage array.  Then, remove the new power supply from the package.

3. Note the orientation of the new power supply and then slide it into the chassis until it snaps into position.
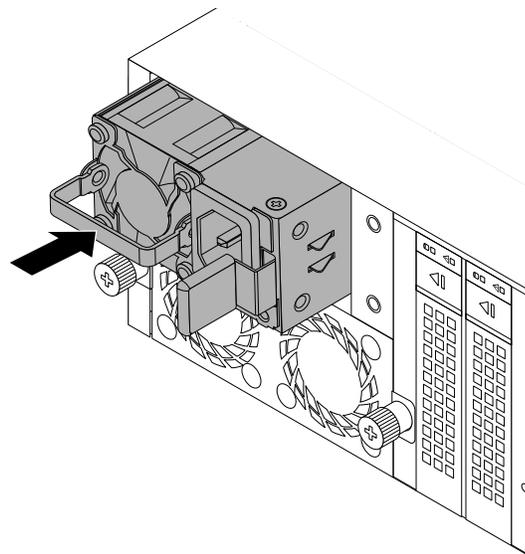


*Figure 28.  Installing a power supply*

4. Connect the power cord to the power cord connector on the new power supply. Then, check the status LED on the front panel. See "LEDs on the front panel" on page 15.

5. If you are instructed to return the failing power supply, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

# Replacing the fan assembly

**Attention:** Do not open your storage array or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 31.

This topic provides instructions on how to replace the fan assembly.

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

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

**Notes:**

• Depending on the model, your storage array might look slightly different from the illustrations in this topic.

• Use any documentation that comes with the new fan assembly and follow those instructions in addition to the instructions in this topic.

• Ensure that both fan assemblies are working correctly. Replace the failing fan assembly to avoid overheating problems.

To replace the fan assembly, do the following:

1. Disconnect all power cords from electrical outlets and disconnect all cables that are connected to the storage array.

2. Locate the failing fan assembly. See "Storage array components" on page 12.

3. Loosen the screws **1** and pull the two screws outward to remove the failing fan assembly out of the chassis.

*Figure 29. Removing a fan assembly*

4. Touch the static-protective package that contains the new fan assembly to any unpainted surface on the outside of the storage array. Then, remove the new fan assembly from the package.

5. Note the orientation of the new fan assembly and slide it into the chassis until it snaps into position. Then, tighten the screws **1** to secure the fan assembly to the chassis.
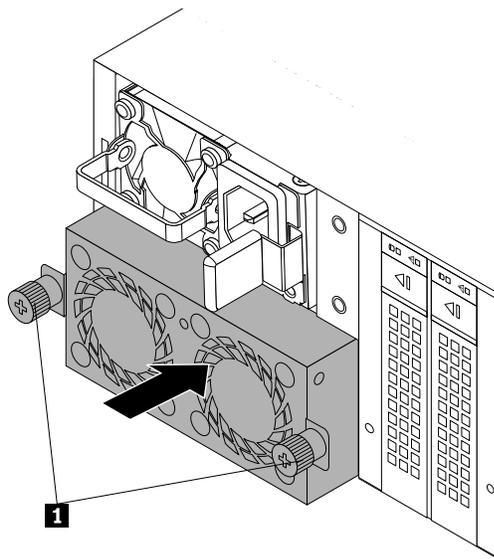


*Figure 30. Installing a fan assembly*

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

# Installing or replacing the rear I/O module

**Attention:** Do not open your storage array or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 31.

This topic provides instructions on how to install or replace an I/O module.

To install or replace an I/O module, do the following:

1. Disconnect all power cords from electrical outlets and disconnect all cables that are connected to the storage array.

   **Note:** If your storage array has two I/O modules installed, you can replace the failing I/O module with the power on.

2. Do one of the following:

   • If you are installing an I/O module, locate the bay for the I/O module in the rear of your storage array.

   • If you are replacing an I/O module, locate the failing I/O module in the rear of your storage array. Then, loosen the screws and pivot them as shown to pull the failing I/O module out of the chassis.
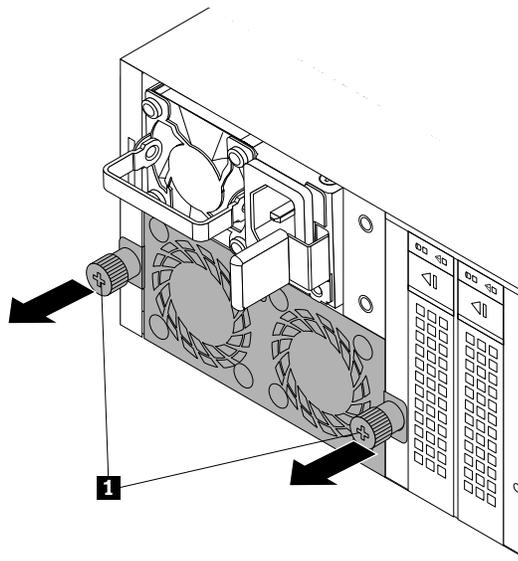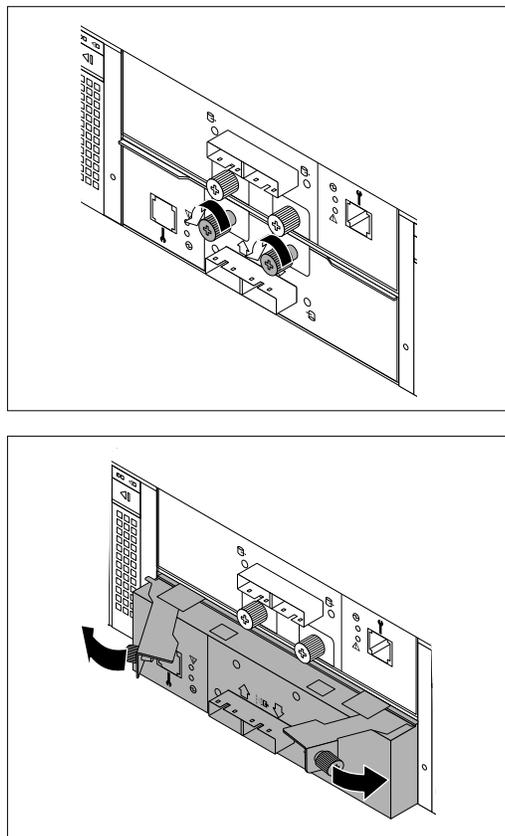


*Figure 31. Removing an I/O module*

3. Touch the static-protective package that contains the new I/O module to any unpainted surface on the outside of the storage array. Then, remove the new I/O module from the package.

4. Note the orientation of the new I/O module and slide it into the chassis until it snaps into position. Then, tighten the screws as shown to secure the I/O module to the chassis.
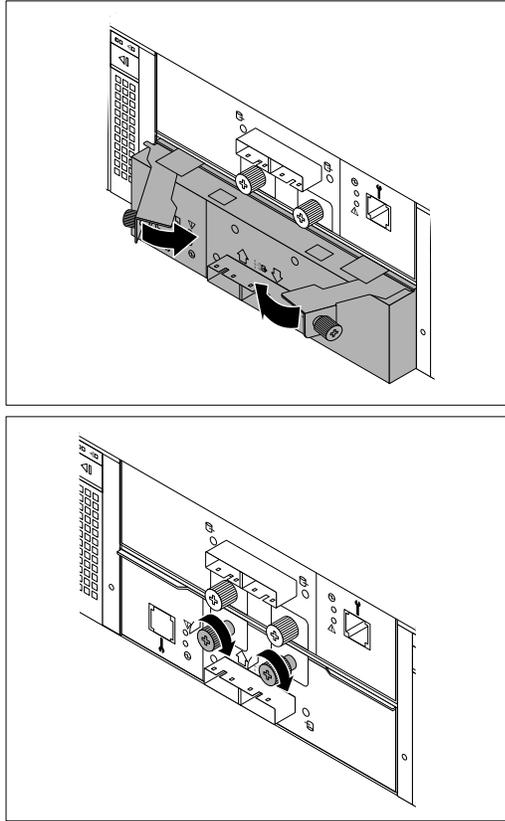


*Figure 32. Installing an I/O module*

5. Connect the cables to the new I/O module. Then, check the status LED on the I/O module. See "Rear view of the storage array" on page 10.

6. If you are instructed to return the failing I/O module, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

## Installing or replacing the 2.5-inch drive cage (SATA-to-SAS)

**Attention:** Do not open your storage array or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 31.

This topic provides instructions on how to install or replace a 2.5-inch drive cage (hereafter referred to as the drive cage). The drive cage enables 2.5-inch SATA drives to be connected to SAS connectors on the backplane.

To install or replace a drive cage, do the following:

1. Disconnect all power cords from electrical outlets and disconnect all cables that are connected to the storage array.

2. Do one of the following:

   • If you are installing a drive cage, do the following:

a. Locate the bay for the drive cage in the rear of your storage array. Then, remove the fan assembly that is installed near the bay. See "Replacing the fan assembly" on page 42.

b. Remove the screw that secures the metal shield to the chassis.
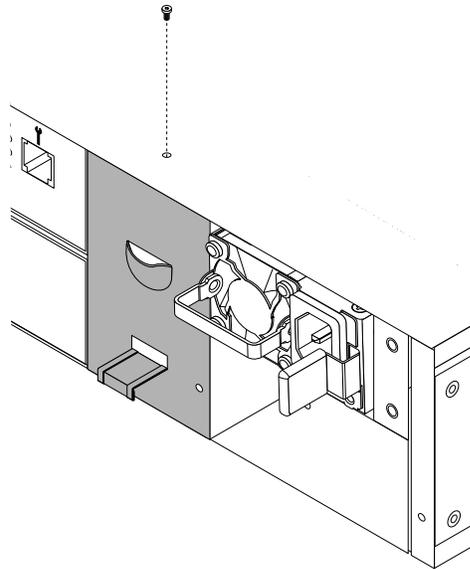


*Figure 33. Removing the screw*

c. Pull the tab upward, and then pull the shield out of the chassis.
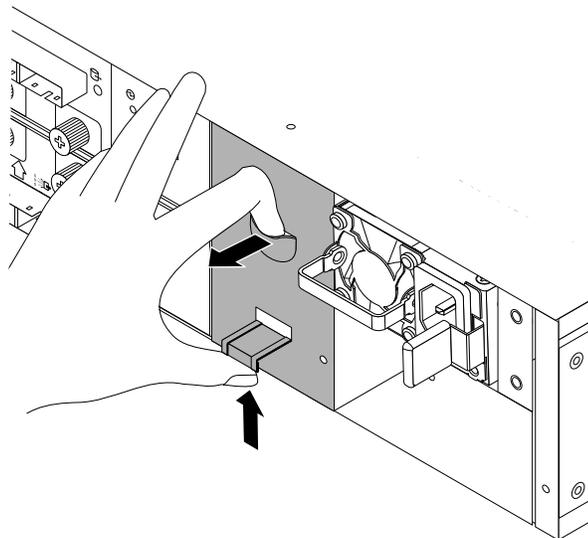


*Figure 34. Removing the protective shield*

- If you are replacing a drive cage, do the following:
  a. Remove the 2.5-inch drives from the failing drive cage. Then, remove the fan assembly that is installed near the drive cage. See "Installing or replacing a hot-swap drive" on page 33 and "Replacing the fan assembly" on page 42.
  b. Remove the screws **1**. Then, pull the failing drive cage out of the chassis.
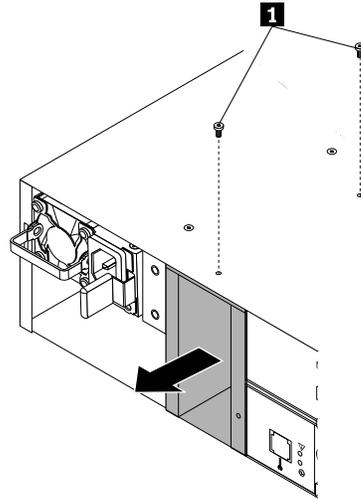
*Figure 35. Removing the drive cage*

3. Touch the static-protective package that contains the new drive cage to any unpainted surface on the outside of the storage array. Then, remove the new drive cage from the package.

4. Note the orientation of the new drive cage and slide it into the chassis until it snaps into position. Then, install the screws **1** to secure the drive cage to the chassis.

*Figure 36. Installing a drive cage*

5. Install the 2.5-inch drives and the fan assembly. See "Installing or replacing a hot-swap drive" on page 33 and "Replacing the fan assembly" on page 42.

6. If you are instructed to return the old drive cage, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.
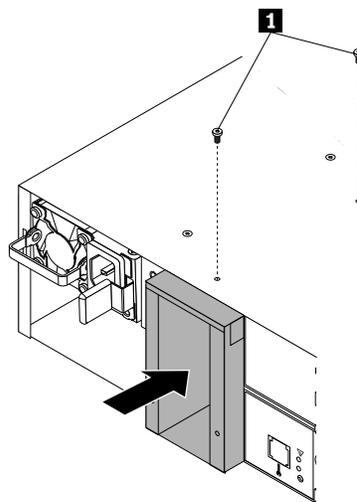
# Replacing the backplane

**Attention:** Do not open your storage array or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 31.

This topic provides instructions on how to replace the backplane.

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

**Notes:**

- This action must be performed only by Lenovo service personnel. See Chapter 8 "Getting information, help, and service" on page 63.
- The backplane is sensitive to ESD. Ensure that you read and understand "Handling static-sensitive devices" on page 31 first and carefully perform the operation.
- Use any documentation that comes with the new backplane and follow those instructions in addition to the instructions in this topic.
- Depending on the model, your storage array might look slightly different from the illustrations in this topic.
- It is recommended that you wait three to five minutes to let the storage array cool before replacing the backplane.

To replace the backplane, do the following:

1. Disconnect all power cords from electrical outlets and disconnect all cables that are connected to the storage array.

2. If the storage array is installed in a rack cabinet, remove the storage array from the rack cabinet and place it on a flat, clean, and static-protective surface. See "Removing the storage array from the rack cabinet" on page 55.

3. Remove the screws that secure the cover one by one and record the location of each specific screw after you remove it. Then, slide the cover to the rear of the storage array to remove the cover.

   **Note:** The screws that secure the cover differ in length. Ensure that you record the location of each screw so that you can easily locate the corresponding hole for each screw when you install the screws back.
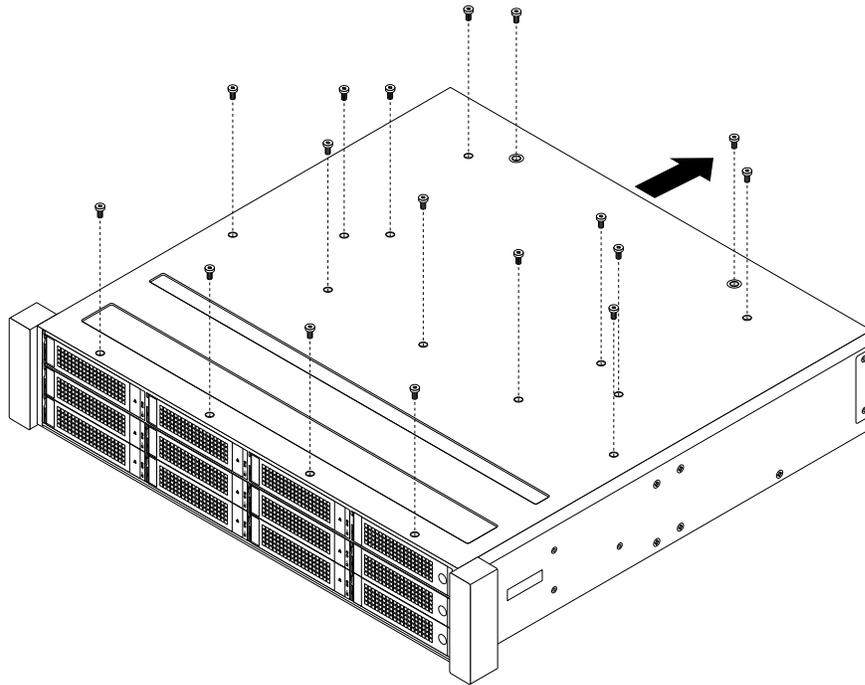


*Figure 37. Removing the cover*

4. Remove the components that are connected to the backplane. See the related topics in Chapter 6 "Installing, removing, or replacing hardware" on page 31.

5. Remove the screws that secure the backplane to the chassis. Then, lift the failing backplane off the chassis.

   **Note:** Use a screw driver with a long handle to remove the screws **1** from the bottom of the chassis.



*Figure 38. Removing the backplane*

6. Touch the static-protective package that contains the new backplane to any unpainted surface on the outside of the storage array. Then, take the new backplane out of the package.

   **Note:** Carefully handle the backplane by its edges.

7. Position the new backplane so that the screw holes in the new backplane are aligned with the corresponding holes in the chassis. Then, install the screws to secure the new backplane to the chassis.

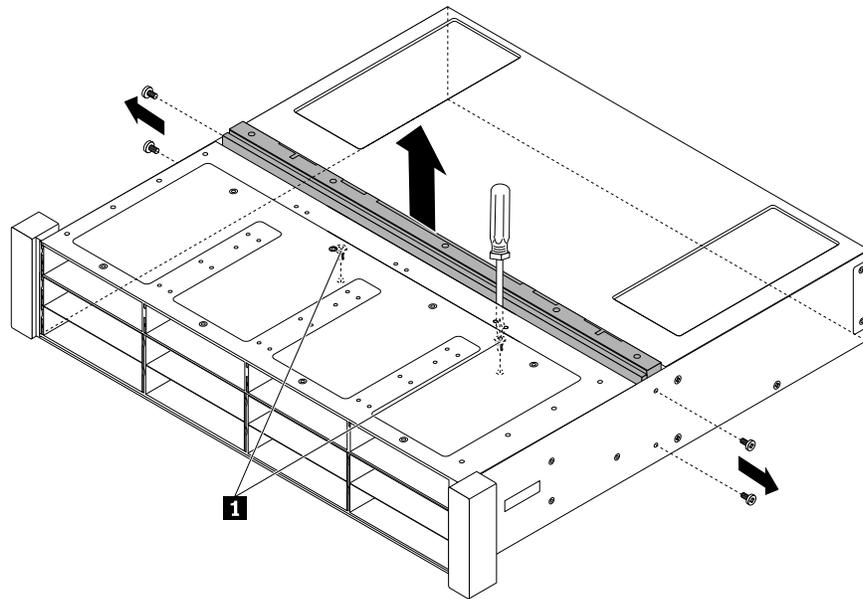   **Note:** Use a screw driver with a long handle to install the screws **1** to the bottom of the chassis.
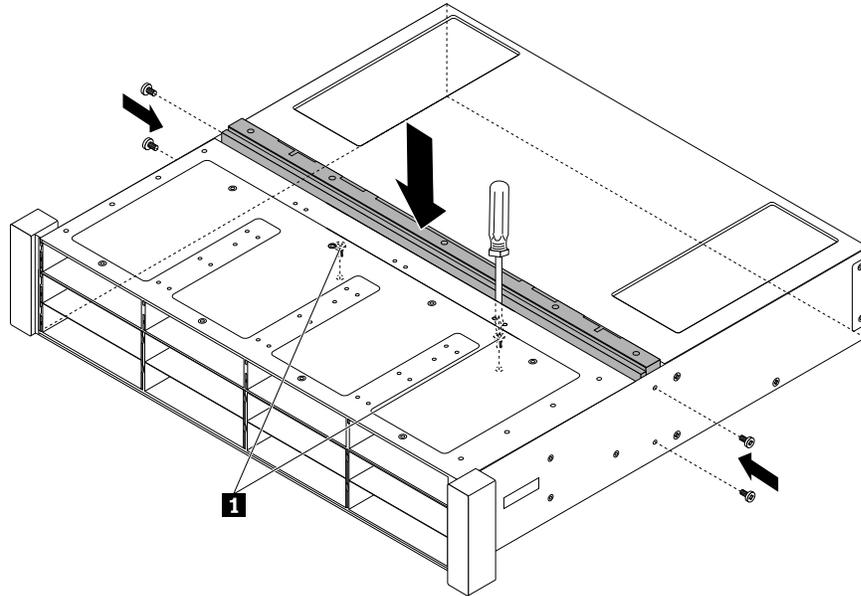


*Figure 39.  Installing the backplane*

8. Reinstall the components that were removed. See the related topics in Chapter 6 "Installing, removing, or replacing hardware" on page 31.

9. Slide the cover to the front of the chassis so that the holes in the cover align with the corresponding ones on the chassis. Then, install the screws to secure the cover.
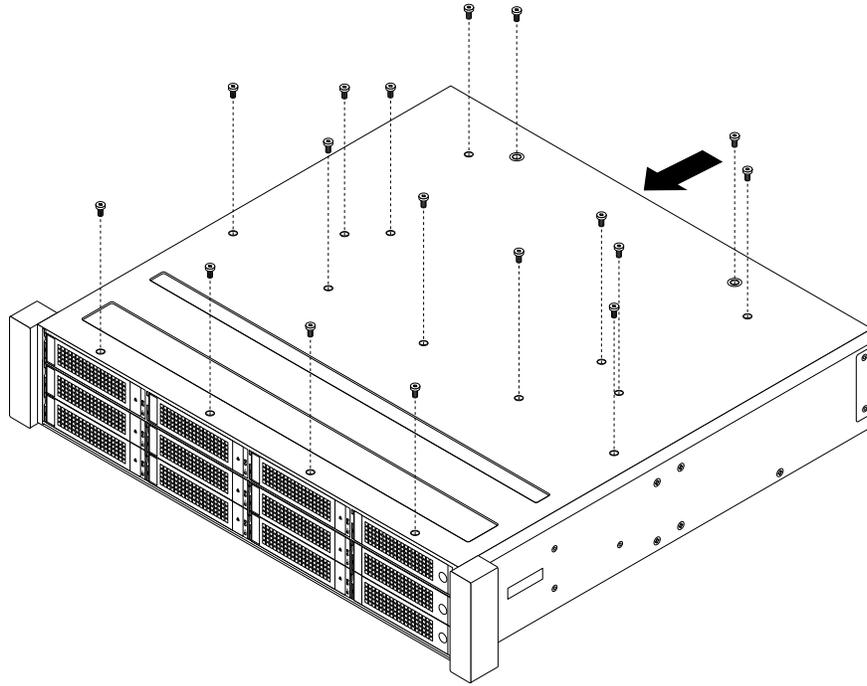


*Figure 40. Reinstalling the cover*

## Installing the storage array into the rack cabinet

**Notes:**

- The depth of the rack cabinet must be within the range from 600 mm (23.62 inches) to 850 mm (33.46 inches).
- Use the correct type of screws in your rail kit to install the side rails to the rack cabinet and secure the storage array to the side rails. The screws in your rail kit might look slightly different from the illustrations.
- The weight of the storage array is rated above 16 kg (35.27 lb). Refer to the following statement for safe practices when lifting.
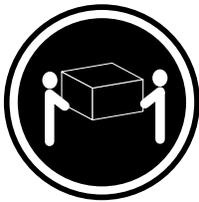


| ≥ 18 kg (39.7 lb) | ≥ 32 kg (70.5 lb) | ≥ 55 kg (121.2 lb) |
| < 32 kg (70.5 lb) | < 55 kg (121.2 lb) | < 100 kg (220.5 lb) |
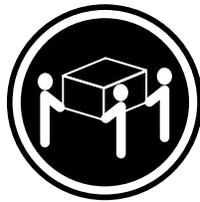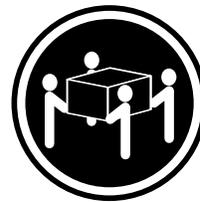
**CAUTION:**
**Use safe practices when lifting.**

To install the storage array into the rack cabinet, do the following:

1. Position the two side rails so that they are parallel with each other. Then, install the screws to secure the side rails to the mounting flanges of the rack cabinet.
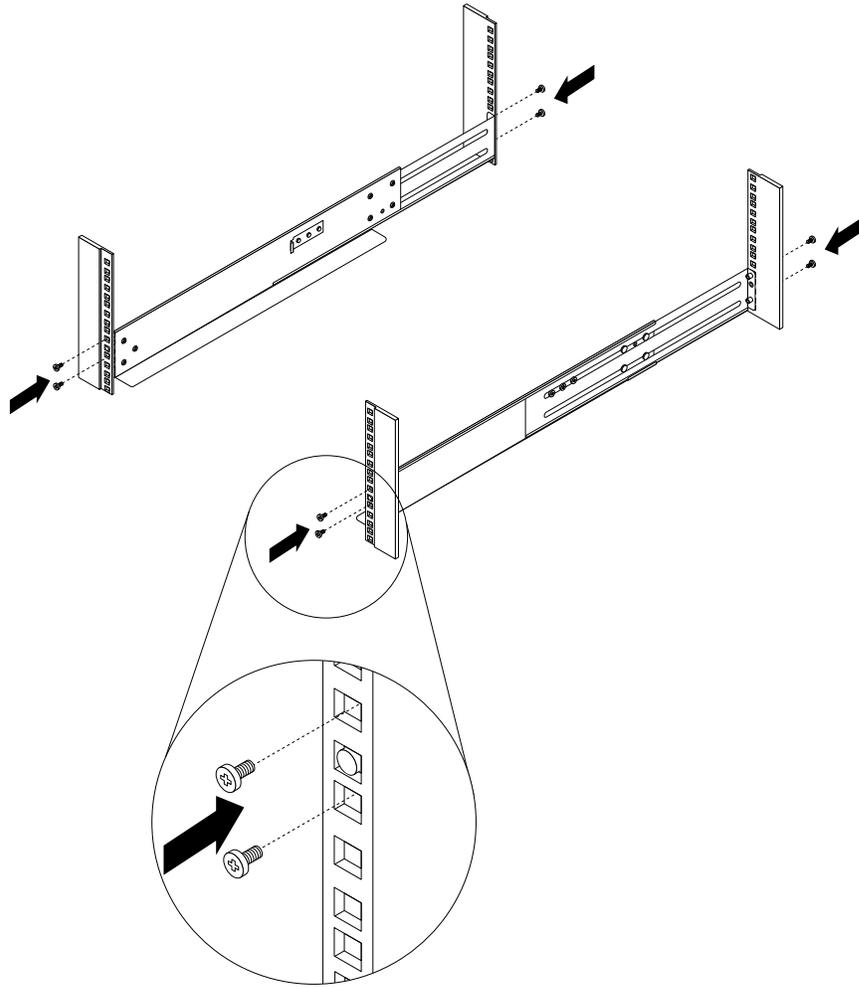
Figure 41. Installing the side rails to the mounting flanges

2. Position the storage array as shown and ensure that the rear side of the storage array is secured in position by the rear support brackets. Then, install the screws to secure the storage array to the side rails.
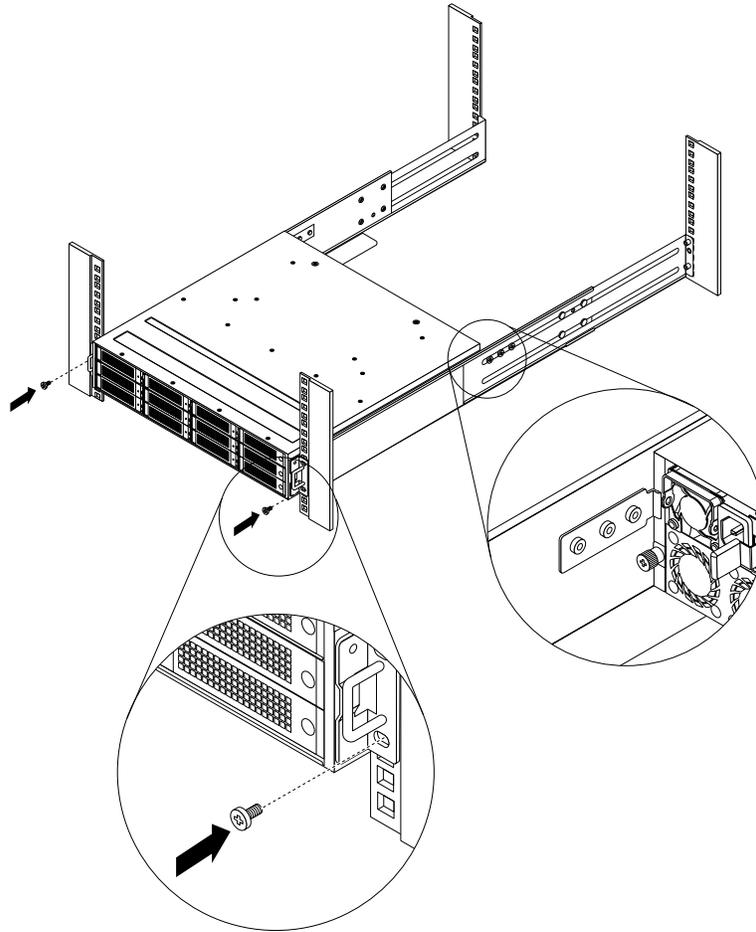


*Figure 42. Installing the storage array to the side rails*

3. Install the ear caps to the storage array.
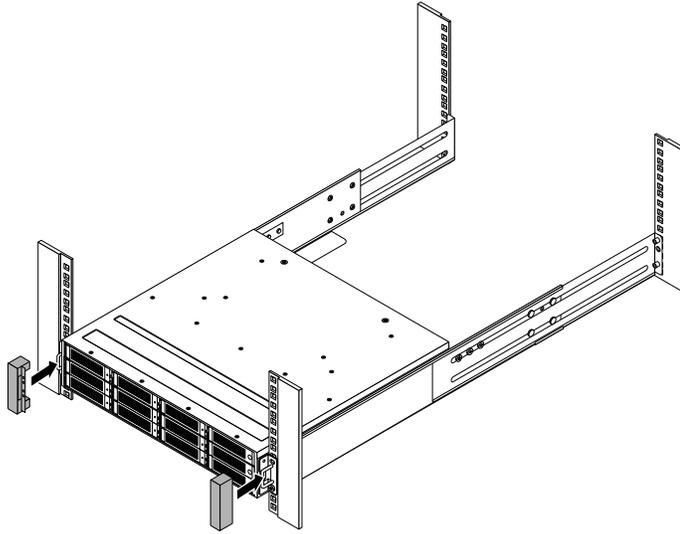


*Figure 43. Installing the two ear caps to the storage array*

# Removing the storage array from the rack cabinet

The weight of the storage array is rated above 16 kg (35.27 lb). Refer to the following statement for safe practices when lifting.
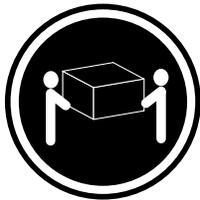


| ≥ 18 kg (39.7 lb) | ≥ 32 kg (70.5 lb) | ≥ 55 kg (121.2 lb) |
| < 32 kg (70.5 lb) | < 55 kg (121.2 lb) | < 100 kg (220.5 lb) |
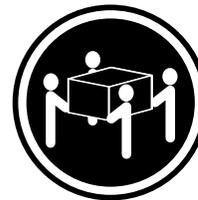
**CAUTION:**
**Use safe practices when lifting.**

To remove the storage array from the rack cabinet, do the following:

1. Remove the ear caps from the storage array.
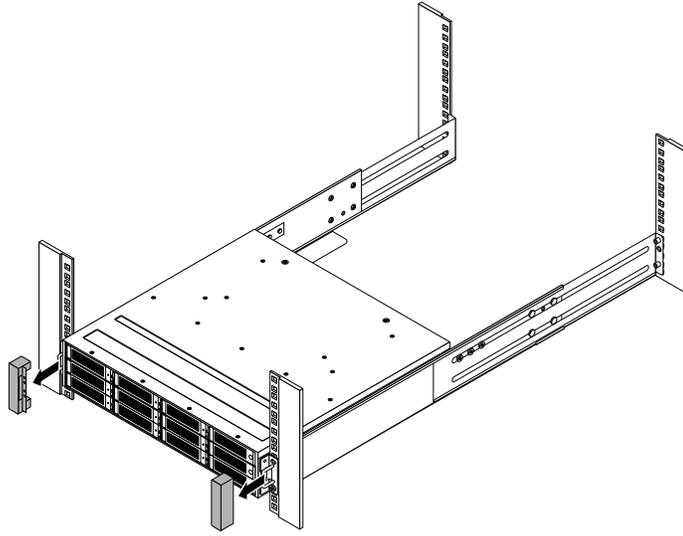


*Figure 44. Removing the ear caps from the storage array*

2. Remove the screws that secure the storage array to the side rails. Then, remove the storage array from the side rails.
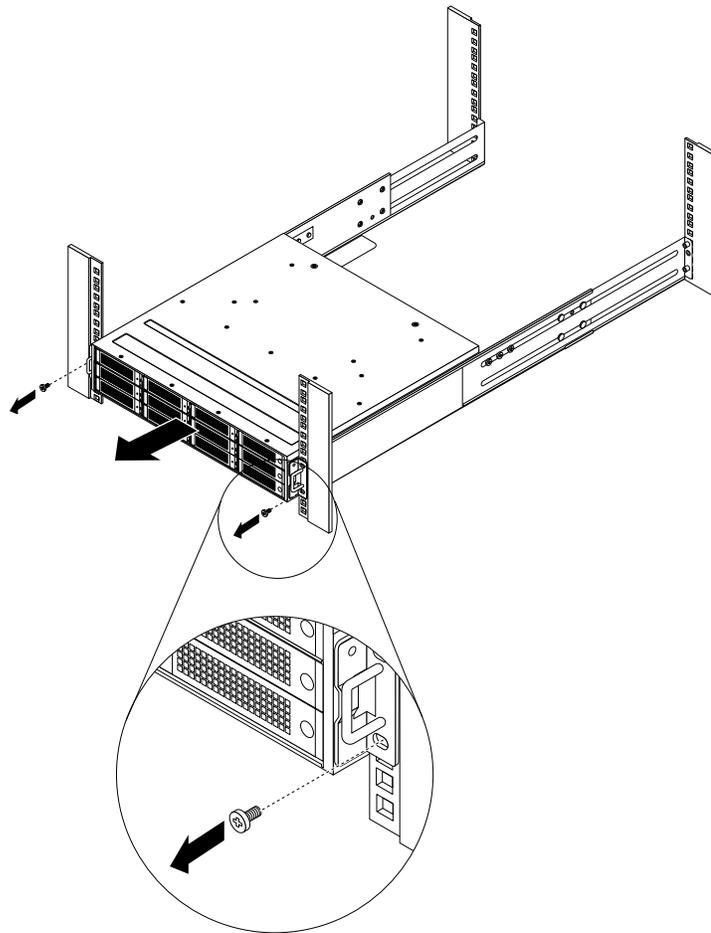


*Figure 45. Removing the storage array from the side rails*

# Chapter 7. Troubleshooting and diagnostics

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

If you cannot diagnose and correct a problem by using the information in this chapter, see Chapter 8 "Getting information, help, and service" on page 63 for additional troubleshooting resources.

## Troubleshooting procedure

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

1. Verify that the power cords and the cables for all attached devices are connected correctly and securely.
2. Verify that the storage array is connected to properly grounded, functioning electrical outlets.
3. View the status and diagnostic LEDs to identify the device status and diagnose problems.
4. Verify that both fan assemblies are working correctly. Replace the failing fan assembly to avoid overheating problems.
5. If the storage array is not working after you have installed a new optional device or replaced a piece of hardware, remove or reinstall the device to see if the problem could be solved.
6. If none of these actions solve the problem, seek technical assistance. See Chapter 8 "Getting information, help, and service" on page 63.

## Using a diagnostic program

The MegaRAID Storage Manager program is available for you to diagnose problems.

To use MegaRAID Storage Manager, do the following:

1. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to locate the program.
2. Download and run the EXE file.
3. Follow the instructions on the screen to use the program.

For detailed information about using the program, refer to the user guide of the program, which is available for download at:
http://www.lenovo.com/drivers

## Using the command line interface

The command line interface (CLI) enables you to diagnose problems for your storage array. Before you start, prepare a computer that meets the following requirements:

- Has an available DB9 serial connector.
- Has a serial-connector configuration program installed, such as the SecureCRT program.

To diagnose problems of your storage array using the CLI, do the following:

1. Connect one end of the DB9-to-RJ11 debug cable (provided in your storage array package) to the debug connector on the rear I/O module of the storage array. Then, connect the other end of the debug cable to the DB9 serial connector on the computer.
2. Start the serial-connector configuration program.

**Note:** The following steps are based on the scenario that SecureCRT is started. If you are using a different serial-connector configuration program, the procedure is similar.

3. On the menu bar, click **File ➜ Quick Connect**. The Quick Connect window is displayed.

4. Configure the DB9 serial connector as the following:

   **Protocol**: **Serial**

   **Port**: **COMx** (x refers to the serial number of the DB9 serial connector)

   **Baud rate**: **115 200**

   **Data bits**: **8**

   **Parity**: **none**

   **Stop bits**: **1**

5. Clear the **RTS/CTS** check box, and then click **Connect**. The storage array is connected to the computer.

6. Enter `lenovo` in the main window. The Serial Debug Menu is displayed.

7. Enter the number that represents the menu you want to open. Then, follow the instructions on the screen.

   **Note:** To open the help information system of the program, enter `h`.

# Basic troubleshooting

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

**Symptom:**

The server cannot detect the connected storage array.

**Actions:**

1. Ensure that the rear I/O modules are secured to the chassis and connected to the connectors on the rear of the backplane.

2. Ensure that the SAS signal cables are securely connected to the correct connectors on the rear I/O modules.

3. Ensure that the SAS signal cables are securely connected to the correct connectors on the RAID card or Host Bus Adapter installed in the server.

4. Check the power-status LED on the front panel. If the LED is not lit in green, do one or all of the following:

   • Disconnect and reconnect the power cords.

   • Remove and reinstall the power supplies.

5. Connect the storage array to the server again and check if the server can detect the storage array.

6. Check the status LEDs on the rear I/O modules to ensure that the rear I/O modules are working normally.

**Symptom:**

The color of some LEDs on the front panel indicates potential system errors.

**Actions:**

1. Ensure that the ambient temperature is within the required range of the storage array.

2. If the power-status LED is not lit in green, check that:

   • The power cord is working correctly.

   • The power supply is working normally. Replace the power supply if necessary.

- The ventilation at the rear of the storage array is not blocked by any object.
- All of the fans are working correctly.

3. Remove and reinstall the fan assembly. Replace the fan assembly if necessary.

4. If the system error LED is lit in amber, ensure that the rear I/O module is connected to the server correctly. Remove and reinstall the rear I/O module if necessary.

**Symptom:**

The management software on the server cannot detect the hard disk drives installed in the storage array after connecting the storage array to the server.

**Actions:**

1. Ensure that the rear I/O module and power supply work correctly.

2. Ensure that the drives installed in the storage array are the correct type. The drives installed in the front must be 3.5-inch hot-swap SAS hard disk drives. The drives installed in the rear must be 2.5-inch hot-swap SATA solid-state drives.

3. Check the drive-status LEDs. If the LED is lit in amber, remove and reinstall the drive or install the drive to another drive bay. Replace the faulty drive if necessary. See "Installing or replacing a hot-swap drive" on page 33.

4. Test the function of the slots on the backplane. If the slots are faulty, seek technical assistance. See Chapter 8 "Getting information, help, and service" on page 63.

**Symptom:**

When more than one storage array is connected to a server in cascading mode, the server only can detect the first-level storage array but cannot detect some of the other storage arrays.

**Actions:**

1. Check the status LEDs of the storage arrays for any potential system errors.

2. Ensure that the first-level storage array is connected to the server correctly.

3. Ensure that all of the storage arrays are connected to one another correctly.

4. Check the SAS-connector-status LEDs. Replace the SAS signal cables if necessary.

5. If none of these actions solve the problem, seek technical assistance. See Chapter 8 "Getting information, help, and service" on page 63.

# Chapter 8.  Getting information, help, and service

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

## Information resources

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

## Using the documentation

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

## ThinkServer Web site

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

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

## Lenovo Support Web site

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

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

- Drivers and software
- Diagnostic solutions
- Product and service warranty

- Product and parts details
- User guides and manuals
- Knowledge base and frequently asked questions

## Help and service

This topic contains information about obtaining help and service.

## Before you call

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

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

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

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

## Calling for service

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

The following services are available during the warranty period:

- **Problem determination** - Trained service personnel are available to assist you with determining a hardware problem and deciding what action is necessary to fix the problem.
- **Hardware repair** - If the problem is caused by hardware under warranty, trained service personnel are available to provide the applicable level of service.
- **Engineering Change management** - There might be changes that are required after a product has been sold. Lenovo or your reseller will make selected Engineering Changes (ECs) that apply to your hardware available.

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

For the warranty type and duration for your product, refer to Chapter 9 "Lenovo Limited Warranty" on page 67. You must retain your proof of purchase to obtain warranty service.

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

## Using other services

If you travel with a Lenovo notebook computer or relocate your computer to a country where your desktop, notebook, or storage array machine type is sold, your computer might be eligible for International Warranty Service, which automatically entitles you to obtain warranty service throughout the warranty period. Service will be performed by service providers authorized to perform warranty service.

Service methods and procedures vary by country, and some services might not be available in all countries. International Warranty Service is delivered through the method of service (such as depot, carry-in, or on-site service) that is provided in the servicing country. Service centers in certain countries might not be able to service all models of a particular machine type. In some countries, fees and restrictions might apply at the time of service.

To determine whether your computer is eligible for International Warranty Service and to view a list of countries where service is available, go to http://www.lenovo.com/support, click **Warranty**, and follow the instructions on the screen.

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

## Purchasing additional services

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

# Chapter 9. Lenovo Limited Warranty

**L505-0010-02 08/2011**

This Lenovo Limited Warranty consists of the following parts:

**Part 1 - General Terms**

**Part 2 - Country-specific Terms**

**Part 3 - Warranty Service Information**

The terms of **Part 2** replace or modify terms of **Part 1** as specified for a particular country.

## Part 1 - General Terms

This Lenovo Limited Warranty applies only to Lenovo hardware products you purchased for your own use and not for resale. This Lenovo Limited Warranty is available in other languages at www.lenovo.com/warranty.

### What this Warranty Covers

Lenovo warrants that each Lenovo hardware product that you purchase is free from defects in materials and workmanship under normal use during the warranty period. The warranty period for the product starts on the original date of purchase as shown on your sales receipt or invoice or as may be otherwise specified by Lenovo. The warranty period and type of warranty service that apply to your product are as specified in "**Part 3 - Warranty Service Information**" below. This warranty only applies to products in the country or region of purchase.

**THIS WARRANTY IS YOUR EXCLUSIVE WARRANTY AND REPLACES ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. AS SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF EXPRESS OR IMPLIED WARRANTIES, THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES APPLY ONLY TO THE EXTENT AND FOR SUCH DURATION AS REQUIRED BY LAW AND ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. AS SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON THE DURATION OF AN IMPLIED WARRANTY, THE ABOVE LIMITATION ON DURATION MAY NOT APPLY TO YOU.**

### How to Obtain Warranty Service

If the product does not function as warranted during the warranty period, you may obtain warranty service by contacting Lenovo or a Lenovo approved Service Provider. A list of approved Service Providers and their telephone numbers is available at: www.lenovo.com/support/phone.

Warranty service may not be available in all locations and may differ from location to location. Charges may apply outside a Service Provider's normal service area. Contact a local Service Provider for information specific to your location.

### Customer Responsibilities for Warranty Service

Before warranty service is provided, you must take the following steps:
• follow the service request procedures specified by the Service Provider;

- backup or secure all programs and data contained in the product;
- provide the Service Provider with all system keys or passwords;
- provide the Service Provider with sufficient, free, and safe access to your facilities to perform service;
- remove all data, including confidential information, proprietary information and personal information, from the product or, if you are unable to remove any such information, modify the information to prevent its access by another party or so that it is not personal data under applicable law. The Service Provider shall not be responsible for the loss or disclosure of any data, including confidential information, proprietary information, or personal information, on a product returned or accessed for warranty service;
- remove all features, parts, options, alterations, and attachments not covered by the warranty;
- ensure that the product or part is free of any legal restrictions that prevent its replacement;
- if you are not the owner of a product or part, obtain authorization from the owner for the Service Provider to provide warranty service.

### What Your Service Provider Will Do to Correct Problems

When you contact a Service Provider, you must follow the specified problem determination and resolution procedures.

The Service Provider will attempt to diagnose and resolve your problem by telephone, e-mail or remote assistance. The Service Provider may direct you to download and install designated software updates.

Some problems may be resolved with a replacement part that you install yourself called a "Customer Replaceable Unit" or "CRU." If so, the Service Provider will ship the CRU to you for you to install.

If your problem cannot be resolved over the telephone; through the application of software updates or the installation of a CRU, the Service Provider will arrange for service under the type of warranty service designated for the product under "**Part 3 - Warranty Service Information**" below.

If the Service Provider determines that it is unable to repair your product, the Service Provider will replace it with one that is at least functionally equivalent.

If the Service Provider determines that it is unable to either repair or replace your product, your sole remedy under this Limited Warranty is to return the product to your place of purchase or to Lenovo for a refund of your purchase price.

### Replacement Products and Parts

When warranty service involves the replacement of a product or part, the replaced product or part becomes Lenovo's property and the replacement product or part becomes your property. Only unaltered Lenovo products and parts are eligible for replacement. The replacement product or part provided by Lenovo may not be new, but it will be in good working order and at least functionally equivalent to the original product or part. The replacement product or part shall be warranted for the balance of the period remaining on the original product.

### Use of Personal Contact Information

If you obtain service under this warranty, you authorize Lenovo to store, use and process information about your warranty service and your contact information, including name, phone numbers, address, and e-mail address. Lenovo may use this information to perform service under this warranty. We may contact you to inquire about your satisfaction with our warranty service or to notify you about any product recalls or safety issues. In accomplishing these purposes, you authorize Lenovo to transfer your information to any country where we do business and to provide it to entities acting on our behalf. We may also disclose it where required by law. Lenovo's privacy policy is available at www.lenovo.com/.

### What this Warranty Does not Cover

This warranty does not cover the following:
- uninterrupted or error-free operation of a product;
- loss of, or damage to, your data by a product;
- any software programs, whether provided with the product or installed subsequently;
- failure or damage resulting from misuse, abuse, accident, modification, unsuitable physical or operating environment, natural disasters, power surges, improper maintenance, or use not in accordance with product information materials;
- damage caused by a non-authorized service provider;
- failure of, or damage caused by, any third party products, including those that Lenovo may provide or integrate into the Lenovo product at your request;
- any technical or other support, such as assistance with "how-to" questions and those regarding product set-up and installation;
- products or parts with an altered identification label or from which the identification label has been removed.

## Limitation of Liability

Lenovo is responsible for loss or damage to your product only while it is in the Service Provider's possession or in transit, if the Service Provider is responsible for the transportation.

Neither Lenovo nor the Service Provider is responsible for loss or disclosure of any data, including confidential information, proprietary information, or personal information, contained in a product.

**UNDER NO CIRCUMSTANCES, AND NOTWITHSTANDING THE FAILURE OF ESSENTIAL PURPOSE OF ANY REMEDY SET FORTH HEREIN, SHALL LENOVO, ITS AFFILIATES, SUPPLIERS, RESELLERS, OR SERVICE PROVIDERS BE LIABLE FOR ANY OF THE FOLLOWING EVEN IF INFORMED OF THEIR POSSIBILITY AND REGARDLESS OF WHETHER THE CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE, STRICT LIABILITY OR OTHER THEORY OF LIABILITY: 1) THIRD PARTY CLAIMS AGAINST YOU FOR DAMAGES; 2) LOSS, DAMAGE OR DISCLOSURE OF YOUR DATA; 3) SPECIAL, INCIDENTAL, PUNITIVE, INDIRECT OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, BUSINESS REVENUE, GOODWILL OR ANTICIPATED SAVINGS. IN NO CASE SHALL THE TOTAL LIABILITY OF LENOVO, ITS AFFILIATESS, SUPPLIERS, RESELLERS OR SERVICE PROVIDERS FOR DAMAGES FROM ANY CAUSE EXCEED THE AMOUNT OF ACTUAL DIRECT DAMAGES, NOT TO EXCEED THE AMOUNT PAID FOR THE PRODUCT.**

**THE FOREGOING LIMITATIONS DO NOT APPLY TO DAMAGES FOR BODILY INJURY (INCLUDING DEATH), DAMAGE TO REAL PROPERTY OR DAMAGE TO TANGIBLE PERSONAL PROPERTY FOR WHICH LENOVO IS LIABLE UNDER LAW. AS SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.**

## Your Other Rights

**THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY HAVE OTHER RIGHTS ACCORDING TO THE APPLICABLE LAWS OF YOUR STATE OR JURISDICTION. YOU MAY ALSO HAVE OTHER RIGHTS UNDER A WRITTEN AGREEMENT WITH LENOVO. NOTHING IN THIS WARRANTY AFFECTS STATUTORY RIGHTS, INCLUDING RIGHTS OF CONSUMERS UNDER LAWS OR REGULATIONS GOVERNING THE SALE OF CONSUMER GOODS THAT CANNOT BE WAIVED OR LIMITED BY CONTRACT.**

# Part 2 - Country-specific Terms

**Australia**

"Lenovo" means Lenovo (Australia & New Zealand) Pty Limited ABN 70 112 394 411. Address: Level 10, North Tower, 1-5 Railway Street, Chatswood, NSW, 2067. Telephone: +61 2 8003 8200. Email: lensyd_au@lenovo.com

*The following replaces the same section in Part 1:*

## What this Warranty Covers:

Lenovo warrants that each hardware product that you purchase is free from defects in materials and workmanship under normal use and conditions during the warranty period. If the product fails due to a covered defect during the warranty period, Lenovo will provide you a remedy under this Limited Warranty. The warranty period for the product starts on the original date of purchase specified on your sales receipt or invoice unless Lenovo informs you otherwise in writing. The warranty period and type of warranty service that apply to your product are set forth below in **Part 3 - Warranty Service Information**.

**THE BENEFITS GIVEN BY THIS WARRANTY ARE IN ADDITION TO YOUR RIGHTS AND REMEDIES AT LAW, INCLUDING THOSE UNDER THE AUSTRALIAN CONSUMER LAW.**

*The following replaces the same section in Part 1:*

## Replacement Products and Parts:

When warranty service involves the replacement of a product or part, the replaced product or part becomes Lenovo's property and the replacement product or part becomes your property. Only unaltered Lenovo products and parts are eligible for replacement. The replacement product or part provided by Lenovo may not be new, but it will be in good working order and at least functionally equivalent to the original product or part. The replacement product or part shall be warranted for the balance of the period remaining on the original product. Products and parts presented for repair may be replaced by refurbished products or parts of the same type rather than being repaired. Refurbished parts may be used to repair the product; and repair of the product may result in loss of data, if the product is capable of retaining user-generated data.

*The following is added to the same section in Part 1:*

## Use of Personal Contact Information:

Lenovo will not be able to perform our service under this warranty if you refuse to provide your information or do not wish us to transfer your information to our agent or contractor. You have the right to access your personal contact information and request correction of any errors in it pursuant to the Privacy Act 1988 by contacting Lenovo.

*The following replaces the same section in Part 1:*

## Limitation of Liability:

Lenovo is responsible for loss or damage to your product only while it is in the Service Provider's possession or in transit, if the Service Provider is responsible for the transportation.

Neither Lenovo nor the Service Provider is responsible for loss or disclosure of any data, including confidential information, proprietary information, or personal information, contained in a product.

**TO THE EXTENT PERMITTED BY LAW, UNDER NO CIRCUMSTANCES AND NOTWITHSTANDING THE FAILURE OF ESSENTIAL PURPOSE OF ANY REMEDY SET FORTH HEREIN, SHALL LENOVO, ITS AFFILIATES, SUPPLIERS, RESELLERS, OR SERVICE PROVIDERS BE LIABLE FOR ANY OF THE FOLLOWING EVEN IF INFORMED OF THEIR POSSIBILITY AND REGARDLESS OF WHETHER THE CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE, STRICT LIABILITY OR OTHER THEORY**

**OF LIABILITY: 1) THIRD PARTY CLAIMS AGAINST YOU FOR DAMAGES; 2) LOSS, DAMAGE OR DISCLOSURE OF YOUR DATA; 3) SPECIAL, INCIDENTAL, PUNITIVE, INDIRECT OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOST PROFITS, BUSINESS REVENUE, GOODWILL OR ANTICIPATED SAVINGS. IN NO CASE SHALL THE TOTAL LIABILITY OF LENOVO, ITS AFFILIATESS, SUPPLIERS, RESELLERS OR SERVICE PROVIDERS FOR DAMAGES FROM ANY CAUSE EXCEED THE AMOUNT OF ACTUAL DIRECT DAMAGES, NOT TO EXCEED THE AMOUNT PAID FOR THE PRODUCT.**

**THE FOREGOING LIMITATIONS DO NOT APPLY TO DAMAGES FOR BODILY INJURY (INCLUDING DEATH), DAMAGE TO REAL PROPERTY OR DAMAGE TO TANGIBLE PERSONAL PROPERTY FOR WHICH LENOVO IS LIABLE UNDER LAW.**

*The following replaces the same section in Part 1:*

**Your Other Rights:**

**THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU ALSO HAVE OTHER RIGHTS AT LAW, INCLUDING UNDER THE AUSTRALIAN CONSUMER LAW. NOTHING IN THIS WARRANTY AFFECTS STATUTORY RIGHTS OR RIGHTS AT LAW, INCLUDING RIGHTS THAT CANNOT BE WAIVED OR LIMITED BY CONTRACT.**

For example, our products come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the products repaired or replaced if the products fail to be of acceptable quality and the failure does not amount to a major failure.

**New Zealand**

*The following is added to the same section in Part 1:*

**Use of Personal Information:**

Lenovo will not be able to perform our service under this warranty if you refuse to provide your information or do not wish us to transfer your information to our agent or contractor. You have the right to access your personal information and request correction of any errors in it pursuant to the Privacy Act 1993 by contacting Lenovo (Australia & New Zealand) Pty Limited ABN 70 112 394 411. Address: Level 10, North Tower, 1-5 Railway Street, Chatswood, NSW, 2067. Telephone: 61 2 8003 8200. Email: lensyd_au@lenovo.com

**Bangladesh, Cambodia, India, Indonesia, Nepal, Philippines, Vietnam and Sri Lanka**

*The following is added to Part 1:*

**Dispute Resolution**

Disputes arising out of or in connection with this warranty shall be finally settled by arbitration held in Singapore. This warranty shall be governed, construed and enforced in accordance with the laws of Singapore, without regard to conflict of laws. If you acquired the product in **India**, disputes arising out of or in connection with this warranty shall be finally settled by arbitration held in Bangalore, India. Arbitration in Singapore shall be held in accordance with the Arbitration Rules of Singapore International Arbitration Center ("SIAC Rules") then in effect. Arbitration in India shall be held in accordance with the laws of India then in effect. The arbitration award shall be final and binding on the parties without appeal. Any award shall be in writing and set forth the findings of fact and the conclusions of law. All arbitration proceedings, including all documents presented in such proceedings shall be conducted in the English language. The English language version of this warranty prevails over any other language version in such proceedings.

**European Economic Area (EEA)**

*The following is added to Part 1:*

Customers in the EEA may contact Lenovo at the following address: EMEA Service Organisation, Lenovo (International) B.V., Floor 2, Einsteinova 21, 851 01, Bratislava, Slovakia. Service under this warranty for Lenovo hardware products purchased in EEA countries may be obtained in any EEA country in which the product has been announced and made available by Lenovo.

**Russia**

*The following is added to Part 1:*

**Product Service Life**

The product service life is four (4) years from the original date of purchase.

# Part 3 - Warranty Service Information

To check the warranty status of your computer, go to http://www.lenovo.com/support, click **Warranty & Services**, click **Check Warranty Status**, and then follow the instructions on the screen.

If required, your Service Provider will provide repair or exchange service depending on the type of warranty service specified for your product and the available service. Scheduling of service will depend upon the time of your call, parts availability, and other factors.

**Types of Warranty Service**

**1. Customer Replaceable Unit ("CRU") Service**

Under CRU Service, the Service Provider will ship CRUs to you at its cost for installation by you. CRU information and replacement instructions are shipped with your product and are available from Lenovo at any time upon request. CRUs that are easily installed by you are called "Self-service CRUs". "Optional-service CRUs" are CRUs that may require some technical skill and tools. Installation of Self-service CRUs is your responsibility. You may request that a Service Provider install Optional-service CRUs under one of the other types of warranty service designated for your product. An optional service offering may be available for purchase from a Service Provider or Lenovo under which Self-service CRUs would be installed for you. You may find a list of CRUs and their designation in the publication that was shipped with your product or at www.lenovo.com/CRUs. The requirement to return a defective CRU, if any, will be specified in the instructions shipped with a replacement CRU. When return is required: 1) return instructions, a prepaid return shipping label, and a container will be included with the replacement CRU; and 2) you may be charged for the replacement CRU if the Service Provider does not receive the defective CRU from you within thirty (30) days of your receipt of the replacement CRU.

**2. On-site Service**

Under On-Site Service, a Service Provider will either repair or exchange the product at your location. You must provide a suitable working area to allow disassembly and reassembly of the product. Some repairs may need to be completed at a service center. If so, the Service Provider will send the product to the service center at its expense.

### 3. Courier or Depot Service

Under Courier or Depot Service, your product will be repaired or exchanged at a designated service center, with shipping at the expense of the Service Provider. You are responsible for disconnecting the product and packing it in a shipping container provided to you to return your product to a designated service center. A courier will pick up your product and deliver it to the designated service center. The service center will return the product to you at its expense.

### 4. Customer Carry-In Service

Under Customer Carry-In Service, your product will be repaired or exchanged after you deliver it to a designated service center at your risk and expense. After the product has been repaired or exchanged, it will be made available to you for collection. If you fail to collect the product, the Service Provider may dispose of the product as it sees fit, with no liability to you.

### 5. Mail-In Service

Under Mail-In Service, your product will be repaired or exchanged at a designated service center after you deliver it at your risk and expense. After the product has been repaired or exchanged, it will be returned to you at Lenovo's risk and expense, unless the Service Provider specifies otherwise.

### 6. Customer Two-Way Mail-In Service

Under Customer Two-Way Mail-In Service, your product will be repaired or exchanged after you deliver it to a designated service center at your risk and expense. After the product has been repaired or exchanged, it will be made available to you for return shipping at your risk and expense. If you fail to arrange return shipment, the Service Provider may dispose of the product as it sees fit, with no liability to you.

### 7. Product Exchange Service

Under Product Exchange Service, Lenovo will ship a replacement product to your location. You are responsible for its installation and verification of its operation. The replacement product becomes your property in exchange for the failed product, which becomes the property of Lenovo. You must pack the failed product in the shipping carton in which you received the replacement product and return it to Lenovo. Transportation charges, both ways, shall be at Lenovo's expense. If you fail to use the carton in which the replacement product was received, you may be responsible for any damage to the failed product occurring during shipment. You may be charged for the replacement product if Lenovo does not receive the failed product within thirty (30) days of your receipt of the replacement product.

## Suplemento de Garantía para México

Este Suplemento se considera parte integrante de la Garantía Limitada de Lenovo y será efectivo única y exclusivamente para los productos distribuidos y comercializados dentro del Territorio de los Estados Unidos Mexicanos. En caso de conflicto, se aplicarán los términos de este Suplemento.

El comercializador responsable del producto es Lenovo México S de R L de CV y para efectos de esta garantía su domicilio es Paseo de Tamarindos No.400-A Piso 27 Arcos Torre Poniente Bosques de Las Lomas C.P. 05120 México, D.F. En el caso de que se precise una reparación cubierta por la garantía o precise de partes, componentes, consumibles o accesorios diríjase a este domicilio.

Otra opción es llamar al Centro de soporte al cliente al 01-800-9253-6686, donde le dirigirán al Centro de servicio autorizado más cercano. Si no existiese ningún Centro de servicio autorizado en su ciudad, población o en un radio de 70 kilómetros de su ciudad o población, la garantía incluirá cualquier gasto de entrega razonable relacionado con el transporte del producto a su Centro de servicio autorizado más

cercano. Por favor, llame al Centro de servicio autorizado más cercano para obtener las aprobaciones necesarias o la información relacionada con el envío del producto y la dirección de envío.

Esta garantía ampara todas las piezas de hardware del producto e incluye mano de obra.

El procedimiento para hacer efectiva la garantía consiste en la presentación del producto, acompañado de la póliza correspondiente, debidamente sellada por el establecimiento que lo vendió, o la factura, o recibo o comprobante, en el que consten los datos específicos del producto objeto de la compraventa.

Lenovo sólo pueden eximirse de hacer efectiva la garantía en los siguientes casos: a) Cuando el producto se hubiese utilizado en condiciones distintas a las normales. b) Cuando el producto no hubiese sido operado de acuerdo con el instructivo de uso que se le acompaña. c) Cuando el producto hubiese sido alterado o reparado por personas no autorizadas por el fabricante nacional, importador o comercializador responsable respectivo.

Todos los programas de software precargados en el equipo sólo tendrán una garantía de treinta (30) días por defectos de instalación desde la fecha de compra. Lenovo no es responsable de la información incluida en dichos programas de software y /o cualquier programa de software adicional instalado por Usted o instalado después de la compra del producto.

Los servicios no cubiertos por la garantía se cargarán al usuario final, previa obtención de una autorización.

Esta garantía tiene una duración de un año a partir del momento de la compra.

Para obtener una lista de los Centros de servicio autorizados, por favor, visite:
http://www.lenovo.com/mx/es/servicios

> **Importado por:**
> **Lenovo México S. de R.L. de C.V.**
> **Paseo de Tamarindos No.400-A**
> **Piso 27 Arcos Torre Poniente**
> **Bosques de Las Lomas C.P.**
> **05120 Mexico, D.F.**

**Modelo del producto:** _____

**Fecha en que el consumidor recibió el producto:** _____

**Marca Lenovo**

# Appendix A. Notices

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

Lenovo may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

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

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This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. Lenovo may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

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

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

# Trademarks

Lenovo, the Lenovo logo, and ThinkServer are trademarks of Lenovo in the United States, other countries, or both.

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

# Important notes

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

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

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

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

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

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

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

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

# Particulate contamination

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

*Table 1. 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].<br>• 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.<br>• The deliquescent relative humidity of the particulate contamination must be more than 60%[2].<br>• The room must be free of conductive contamination such as zinc whiskers. |
| Gaseous | • Copper: Class G1 as per ANSI/ISA 71.04-1985[3]<br>• 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.<br><br>[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.<br><br>[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. ||

## Polyvinyl Chloride (PVC) cable and cord notice

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

## Important WEEE information



The WEEE marking on Lenovo products applies to countries with WEEE and e-waste regulations (for example, European Directive 2002/96/EC, India E-Waste Management & Handling Rules, 2011). Appliances are labeled in accordance with local regulations concerning waste electrical and electronic equipment (WEEE). These regulations determine the framework for the return and recycling of used appliances as applicable within each geography. This label is applied to various products to indicate that the product is not to be thrown away, but rather put in the established collection systems for reclaiming these end of life products.

Users of electrical and electronic equipment (EEE) with the WEEE marking must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, and recovery of WEEE and to minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. For additional WEEE information go to: http://www.lenovo.com/recycling

# 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

# Recycling information for Brazil

**Declarações de Reciclagem no Brasil**

**Descarte de um Produto Lenovo Fora de Uso**

Equipamentos elétricos e eletrônicos não devem ser descartados em lixo comum, mas enviados à pontos de coleta, autorizados pelo fabricante do produto para que sejam encaminhados e processados por empresas especializadas no manuseio de resíduos industriais, devidamente certificadas pelos orgãos ambientais, de acordo com a legislação local.

A Lenovo possui um canal específico para auxiliá-lo no descarte desses produtos. Caso você possua um produto Lenovo em situação de descarte, ligue para o nosso SAC ou encaminhe um e-mail para: reciclar@lenovo.com, informando o modelo, número de série e cidade, a fim de enviarmos as instruções para o correto descarte do seu produto Lenovo.

# Restriction of Hazardous Substances Directive (RoHS)

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

# China RoHS

| 部件名称 | 有害物质 | | | | | |
|---|---|---|---|---|---|---|
| | 铅<br>(Pb) | 汞<br>(Hg) | 镉<br>(Cd) | 六价铬<br>(Cr(VI)) | 多溴联苯<br>(PBB) | 多溴二苯醚<br>(PBDE) |
| 机架 | O | O | O | O | O | O |
| 外部盖板 | O | O | O | O | O | O |
| 机械<br>组合件 | O | O | O | O | O | O |
| 空气传动<br>设备 | X | O | O | O | O | O |
| 冷却<br>组合件 | X | O | O | O | O | O |
| 内存模块 | X | O | O | O | O | O |
| 处理器<br>模块 | X | O | O | O | O | O |
| 键盘 | X | O | O | O | O | O |
| 调制<br>解调器 | X | O | O | O | O | O |
| 监视器 | X | X | O | O | O | O |
| 鼠标 | X | O | O | O | O | O |
| 电缆<br>组合件 | X | O | O | O | O | O |
| 电源 | X | O | O | O | O | O |
| 存储设备 | X | O | O | O | O | O |
| 电池匣<br>组合件 | X | O | O | O | O | O |
| 电池 | X | O | O | O | O | O |
| 有mech的<br>电路卡 | X | O | O | O | O | O |
| 无mech的<br>电路卡 | X | O | O | O | O | O |
| 激光器 | X | O | O | O | O | O |

本表格依据 SJ/T 11364 的规定编制。
○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。
注：表中标记"×"的部件，皆因全球技术发展水平限制而无法实现有害物质的替代。

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

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

# European Union RoHS

Lenovo products sold in the European Union, on or after 3 January 2013 meet the requirements of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment ("RoHS recast" or "RoHS 2").

For more information about Lenovo progress on RoHS, go to:
http://www.lenovo.com/social_responsibility/us/en/RoHS_Communication.pdf

## India RoHS

RoHS compliant as per E-Waste (Management & Handling) Rules, 2011.

## Turkish RoHS

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

**Türkiye AEEE Yönetmeliğine Uygunluk Beyanı**

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

AEEE Yönetmeliğine Uygundur.

## Ukraine RoHS

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

## German Ordinance for Work gloss statement

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

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

## Export classification notice

This product is subject to the United States Export Administration Regulations (EAR) and has an Export Classification Control Number (ECCN) of 4A994.b. It can be re-exported except to any of the embargoed countries in the EAR E1 country list.

## Electronic emission notices

The following information refers to the Lenovo ThinkServer machine types 70F0 and 70F1.

## Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Lenovo is not responsible for any radio or television interference caused by using other than specified or recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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

**Industry Canada Class A emission compliance statement**

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

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

**United Kingdom telecommunications safety requirement**

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

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

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

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

Lenovo, Einsteinova 21, 851 01 Bratislava, Slovakia

$C\epsilon$

**Warning:** This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

**German Class A compliance statement**

**Deutschsprachiger EU Hinweis:**

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

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

**Deutschland:**

**Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmittein**

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

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

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

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:
**Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.**

Nach der EN 55022: „Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen."

Nach dem EMVG: „Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind." (Auszug aus dem EMVG, Paragraph 3, Abs. 4). Dieses Genehmigungsverfahren ist nach Paragraph 9 EMVG in Verbindung mit der entsprechenden Kostenverordnung (Amtsblatt 14/93) kostenpflichtig.

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den Handbüchern angegeben, zu installieren und zu betreiben.

**Korea Class A compliance statement**

| A급 기기 (업무용 방송통신기자재) |
| --- |
| 이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다 |

**Lenovo product service information for Taiwan**

台灣 Lenovo 產品服務資訊如下:
荷蘭商聯想股份有限公司台灣分公司
台北市內湖區堤頂大道二段89號5樓
服務電話: 0800-000-702

# Eurasian compliance mark

ЕАС

# Japan VCCI Class A compliance statement

　この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。　　　　　　ＶＣＣＩ－Ａ

# 通信規制の注記

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact a Lenovo representative or reseller for any questions.

本製品は、電気通信事業者の通信回線との責任分界点への、直接的な接続を想定した認定取得作業を行っていません。
そのような接続を行うには、電気通信事業者による事前検査等が必要となる場合があります。
ご不明な点については、Lenovo担当員または販売代理店にお問い合わせください。

# Index