

Flex System Storage Expansion Node



# Installation and Service Guide



Flex System Storage Expansion Node



# Installation and Service Guide

**Note**

Before using this information and the product it supports, read the general information in “Notices” on page 57, the *Warranty Information* document, and the *Safety Information* and the *Environmental Notices and User Guide* documents on the product *Documentation CD*.

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## Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་ཁུངས་འདི་བདེ་སྲོད་མ་བྱས་གོང་། རྒྱུ་ལྷན་ལྷན་གྱི་ཡིད་གཟབ་  
བྱ་འདུ་མིན་ཡོད་པའི་འོད་སྤེར་བཟང་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

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canjbinj soengq cungj vahgangj ancien siusik.

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## Safety statements

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

### Important:

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

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



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

## Statement 1



### DANGER

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

To avoid a shock hazard:

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

#### To Connect:

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

#### To Disconnect:

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

## Statement 3



**CAUTION:**

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

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



**DANGER**

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

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

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

**Statement 12**



**CAUTION:**

The following label indicates a hot surface nearby.



## Statement 21



### **CAUTION:**

**Hazardous energy is present when the blade is connected to the power source.  
Always replace the blade cover before installing the blade.**

This device is for use only with Listed Flex System Enterprise Chassis.

---

## Chapter 1. Introduction

The Flex System Storage<sup>®</sup> Expansion Node is a captive-mode storage enclosure that is dedicated to a single compute node in the Flex System Enterprise Chassis.

The storage expansion node is PCIe Generation 3 and SAS 2.1 compliant. It supports up to 12 SAS and SATA 2.5-inch hot-swap hard disk drives and solid-state drives, and it supports JBOD configurations and RAID 0, 1, 5, 6, 10, 50, and 60. Some RAID configurations require a Features on Demand key, an optional 512 MB or 1 GB flash/RAID adapter, or both.

The storage expansion node is supported in an Flex System Enterprise Chassis only, and it must be attached to a 1-bay X-Architecture<sup>®</sup> compute node. For information about supported compute nodes and support requirements, see “Supported compute nodes” on page 2.

**Attention:** *Before you connect a compute node to the storage expansion node, you must make sure that the integrated management module II (IMM2) primary and backup firmware in the compute node is at level `ibm_fw_imm2_1a0034x-1.xx_anyos_noarch` or later. If the IMM2 firmware in the compute node is at an earlier level when you connect the compute node to the storage expansion node, the firmware in the storage expansion node will become corrupted and unrecoverable, and you will have to replace the storage expansion node. For information about updating the firmware in the compute node, see the compute node *Installation and Service Guide*.*

This documentation provides the following information about setting up and troubleshooting the storage expansion node:

- Installing the storage expansion node in the Flex System Enterprise Chassis
- Installing an optional flash/RAID adapter and drives in the storage expansion node
- Diagnosing problems
- Installing, removing, and replacing components

The storage expansion node comes with a limited warranty. For information about the terms of the warranty, see the *Warranty Information* document for your storage expansion node. This document is available on the product *Documentation CD*.

You can obtain up-to-date information about the storage expansion node at <http://www.ibm.com/systems>.

The storage expansion node might have features that are not described in the documentation that comes with the product. The documentation might be updated occasionally to include information about those features. Technical updates might also be available to provide additional information that is not included in the storage expansion node documentation. To obtain the latest and most up-to-date documentation for this product, go to the Lenovo product website.

You can subscribe to information updates that are specific to your compute node at <http://www.ibm.com/support/mynotifications>.

---

## Features and specifications

Use this table to view specific information about the Flex System Storage Expansion Node, such as hardware features and the dimensions of the storage expansion node.

The following table is a summary of the features and specifications of the Flex System Storage Expansion Node.

<b>Integrated functions:</b> <ul style="list-style-type: none"><li>• Captive-mode connectivity by an interposer cable to an Flex System 1-bay X-Architecture compute node. For support requirements, see “Supported compute nodes.”</li><li>• PCIe 3.0 RAID controller, based on LSI SAS 2208 PCIe SAS/SATA processor chip</li><li>• Light path diagnostics</li></ul>	<b>Supported configurations:</b> <ul style="list-style-type: none"><li>• JBOD</li><li>• RAID 0, 1, 5, 6, 10, 50, and 60</li></ul> Some RAID configurations require a Features on Demand key, an optional 512 MB or 1 GB flash/RAID adapter, or both. <b>Optional devices:</b> <ul style="list-style-type: none"><li>• Supports up to 12 SAS and SATA 2.5-inch hot-swap hard disk drive and solid-state drives</li><li>• Supports a 512 MB or 1 GB flash/RAID adapter and flash power module</li></ul>	<b>Size:</b> <ul style="list-style-type: none"><li>• Height: 55.5 mm (2.19 in.)</li><li>• Depth: 503.9 mm (19.84 in.)</li><li>• Width: 229.1 mm (9.02 in.)</li></ul> <b>Weight*:</b> <ul style="list-style-type: none"><li>• Storage expansion node without drives: 6.12 kg (13.5 lb)</li><li>• Storage expansion node without drives, attached to expansion shelf: 9.53 kg (21.0 lb)</li><li>• Storage expansion node assembly without drives, including compute node: 17.46 kg (38.5 lb)</li><li>• Storage expansion node assembly with 12 drives, including compute node: 21.09 kg (46.5 lb)</li></ul>
<p>* Weights are approximate and depend on the types of installed drives and the hardware configuration of the compute node.</p>		

---

## Supported compute nodes

The storage expansion node must be attached to a 1-bay X-Architecture compute node.

**Attention:** *Before you connect a compute node to the storage expansion node, you must make sure that the integrated management module II (IMM2) primary and backup firmware in the compute node is at level `ibm_fw_imm2_1a0034x-1.xx_anyos_noarch` or later. If the IMM2 firmware in the compute node is at an earlier level when you connect the compute node to the storage expansion node, the firmware in the storage expansion node will become corrupted and unrecoverable, and you will have to replace the storage expansion node. For information about updating the firmware in the compute node, see the compute node *Installation and Service Guide*.*

Some compute nodes require two installed microprocessors to support connection to the storage expansion node.

As of the date of this publication, the storage expansion node supports the following Flex System compute nodes:

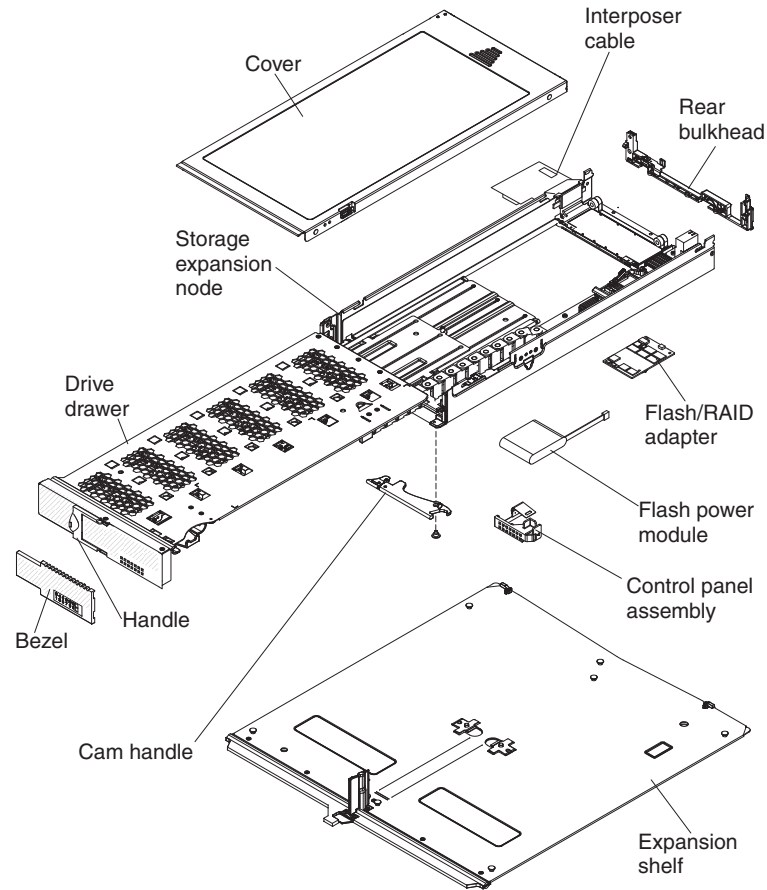
- x220 (requires two installed microprocessors)
- x240 (requires two installed microprocessors)

---

## Major components of the storage expansion node

Use this information to identify the major components of the storage expansion node.

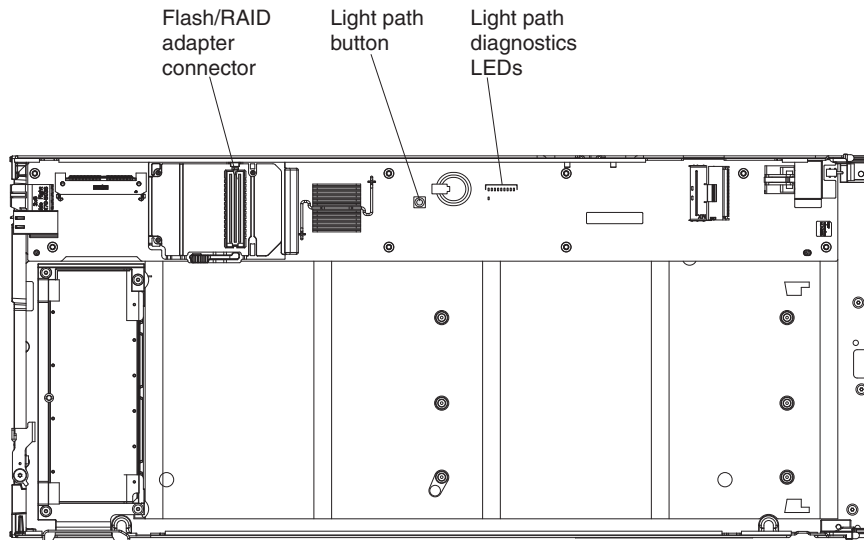
The following illustration shows the major components of the storage expansion node.



## System board

The system board executes all the major logic functions of the storage expansion node.

The following illustration shows the locations of the components on the system board.



### **Flash/RAID adapter connector**

The storage expansion node supports an optional 512 MB or 1 GB flash/RAID adapter.

### **Light path diagnostics LEDs and light path button**

Light path diagnostics is a system of LEDs in the storage expansion node and the attached compute node that you can use to diagnose problems. For more information, see “Light path diagnostics” on page 24.

## **Interposer cable**

The interposer cable connects the storage expansion node to the compute node.

The storage expansion node comes with an interposer cable that is connected to the system board. The free end of the cable exits the storage expansion node near the left-rear corner. After you attach a compute node to the expansion shelf, you connect the free end of the interposer cable to the interposer connector on the compute node system board to establish the connection between the storage expansion node and the compute node.

## **Drive drawer**

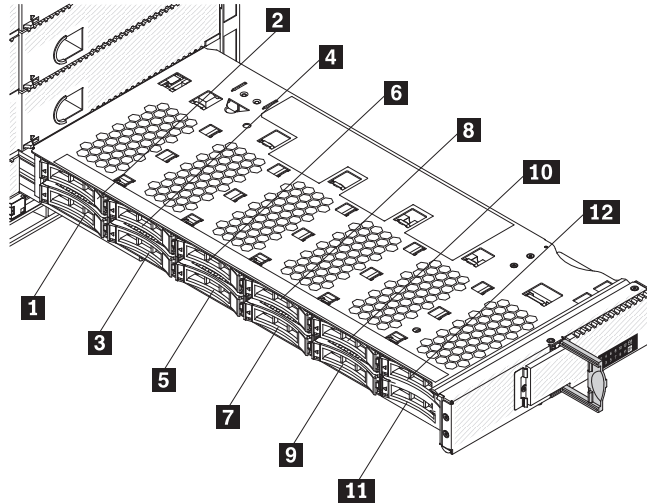
The drive drawer in the storage expansion node contains 12 hot-swap drive bays.

The drawer accommodates up to 12 hot-swap SAS or SATA 2.5-inch hard disk drives or solid-state drives.

The drive drawer also has a bracket for the flash power module that is used with an optional flash/RAID adapter.

The following illustration shows the layout of the drive bays in the drawer.

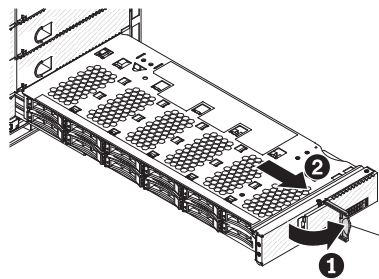




**Attention:**

- To ensure proper cooling and protect system data integrity, do not operate the storage expansion node for an extended period of time with the drawer open. Keep the drive drawer closed when you are not installing or removing drives.
- Make sure that the drive drawer is supported when it is open. The weight of installed drives can cause the storage expansion node assembly to be unstable when the drive drawer is open.

To open the drawer, pull out on the handle and pull the drawer out, as shown in the following illustration.

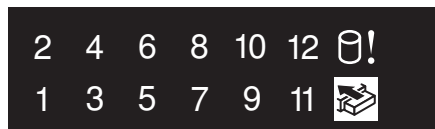


To close the drawer, push the drawer in until it stops, and return the handle to the closed position.

**Control panel**

The control panel on the storage expansion node has a green activity LED for each drive bay, one yellow status LED for all the drive bays, and a drawer-open LED.

The following illustration shows the LEDs on the control panel.



### Activity LEDs (green)

When one of these LEDs is lit, it indicates activity on the drive in the associated drive bay.

### Status LED (yellow)

The status LED gives the following indications:

- **Lit:** One or more drives are in a fault state.
- **Flashing:** One or more drives are being identified.
- **Flashing and then lit:** One or more drives are in a fault state and are being identified. The LED flashes until identification is complete, and then the LED remains lit until all fault states have been resolved.

### Drawer-open LED

If the storage expansion node is operated for too long with the drawer open, the chassis cooling fans might increase in speed, and the storage expansion node might power off. If the drawer is open, the drawer-open LED flashes and an audible beep sounds to give the following indications:

- **Every 15 seconds:** The drawer is not fully closed. Close the drawer when you have finished installing or removing drives.
- **Every 5 seconds:** The drawer has been open too long. Close the drawer immediately.
- **Every 0.25 second:** The storage expansion node has reached its thermal threshold. Close the drawer immediately to avoid damage to the drives.

---

## Notices and statements in this document

Use this information to understand the most common documentation notices and statements and how they are used.

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

The following notices and statements are used in this document:

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

---

## Chapter 2. Installing the storage expansion node

The storage expansion node comes attached to the expansion shelf. Use these instructions to install a compute node on the shelf, install an optional flash/RAID adapter and flash power module, and install the storage expansion node assembly in an Flex System Enterprise Chassis.

**Attention:** *Before you connect a compute node to the storage expansion node, you must make sure that the integrated management module II (IMM2) primary and backup firmware in the compute node is at level `ibm_fw_imm2_1a0034x-1.xx_anyos_noarch` or later. If the IMM2 firmware in the compute node is at an earlier level when you connect the compute node to the storage expansion node, the firmware in the storage expansion node will become corrupted and unrecoverable, and you will have to replace the storage expansion node. For information about updating the firmware in the compute node, see the compute node *Installation and Service Guide*.*

---

### Installation guidelines

Use these guidelines before you install the storage expansion node or optional devices.

- Before you begin, read “Safety” on page v and “Handling static-sensitive devices” on page 8. This information will help you work safely.
- Before you install your new storage expansion node, take the opportunity to download and apply the most recent firmware updates to the associated compute node. This step will help to ensure that any known issues are addressed and that your system is ready to function at maximum levels of performance.

**Attention:** *Before you connect a compute node to the storage expansion node, you must make sure that the integrated management module II (IMM2) primary and backup firmware in the compute node is at level `ibm_fw_imm2_1a0034x-1.xx_anyos_noarch` or later. If the IMM2 firmware in the compute node is at an earlier level when you connect the compute node to the storage expansion node, the firmware in the storage expansion node will become corrupted and unrecoverable, and you will have to replace the storage expansion node. For information about updating the firmware in the compute node, see the compute node *Installation and Service Guide*.*

- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- Back up all important data before you make changes to disk drives.
- Before you remove a compute node from the Flex System Enterprise Chassis, you must shut down the operating system and turn off the compute node. You do not have to shut down the chassis itself.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the compute node, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the compute node and operating system support hot-swap capability, you can remove or install the component while the compute node is running. (Orange can also indicate touchpoints on hot-swap components.) See the instructions for removing or

installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.

- For a list of supported optional devices for the compute node, see <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us>.

## System reliability guidelines

Use these guidelines to ensure that the storage expansion node meets the cooling and system reliability requirements.

- To ensure proper cooling, do not operate the Flex System Enterprise Chassis without a device or filler installed in each bay. See the documentation for your Flex System Enterprise Chassis for additional information.
- Make sure that the ventilation holes on the storage expansion node are not blocked.
- The compute node battery must be operational. If the battery becomes defective, replace it immediately. For instructions, see the compute node *Installation and Service Guide*.

## Handling static-sensitive devices

To reduce the possibility of damage from electrostatic discharge, observe these precautions.

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

- When you work on a rack that has an electrostatic discharge (ESD) connector, use a wrist strap, especially when you handle modules, optional devices, or compute nodes. To work correctly, the wrist strap must have a good contact at both ends (touching your skin at one end and firmly connected to the ESD connector on the front or back of the rack).
- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an *unpainted* metal part of the Flex System Enterprise Chassis or any *unpainted* metal surface on any other grounded rack component in the rack in which you are installing the device for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the compute node without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the compute node cover or on a metal surface.
- Take additional care when you handle devices during cold weather. Heating reduces indoor humidity and increases static electricity.

---

## Removing the cover from the storage expansion node

Use these instructions to remove the cover from the storage expansion node.

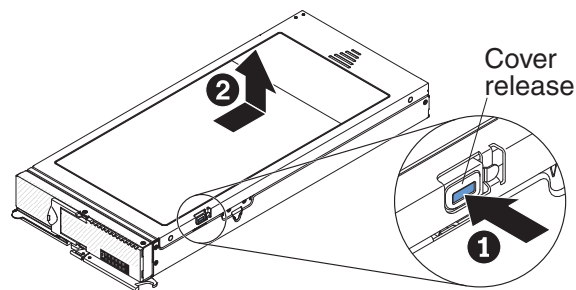
## Before you begin

Before you remove the cover from the storage expansion node, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. If the storage expansion node assembly is installed in an Flex System Enterprise Chassis, remove it (see “Removing the storage expansion node assembly from the Flex System Enterprise Chassis” on page 18 for instructions).
3. Carefully lay the storage expansion node assembly on a flat, static-protective surface.

## Procedure

Press on the cover release and slide the cover toward the rear of the storage expansion node; then, lift the cover away from the storage expansion node, as shown in the following illustration.



---

## Installing the compute node

The storage expansion node comes attached to the expansion shelf. You must attach a compute node to the expansion shelf and connect the interposer cable to the compute node.

### Before you begin

**Attention:** Before you connect a compute node to the storage expansion node, you must make sure that the integrated management module II (IMM2) primary and backup firmware in the compute node is at level `ibm_fw_imm2_1a0034x-1.xx_anyos_noarch` or later. If the IMM2 firmware in the compute node is at an earlier level when you connect the compute node to the storage expansion node, the firmware in the storage expansion node will become corrupted and unrecoverable, and you will have to replace the storage expansion node. For information about updating the firmware in the compute node, see the compute node *Installation and Service Guide*.

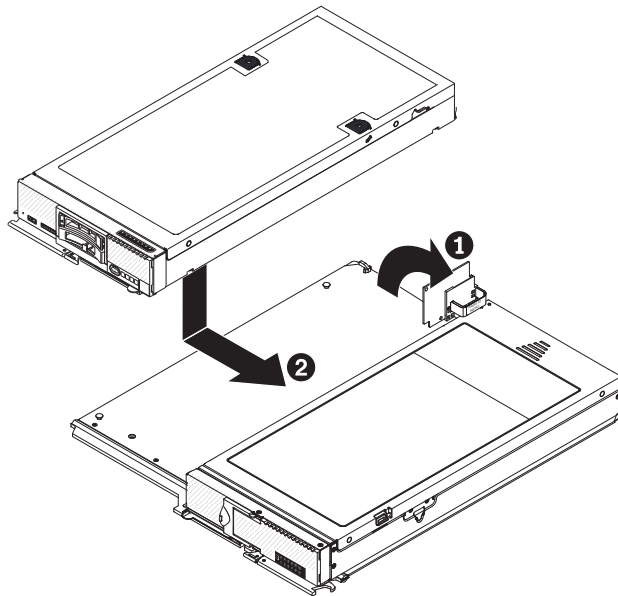
Before you attach a compute node to the expansion shelf, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. If the compute node is installed and operating, complete the following steps:
  - a. Shut down the operating system, and press the power button to turn off the compute node (see the compute node *Installation and Service Guide* for instructions).

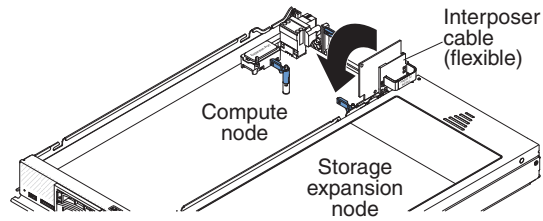
- b. Remove the compute node from the Flex System Enterprise Chassis (see the compute node *Installation and Service Guide* for instructions).
3. Make sure that the compute node has two microprocessors, if that configuration is required for the compute node to work with the storage expansion node. To determine whether a supported compute node requires two microprocessors, see “Supported compute nodes” on page 2.
4. Make sure that the integrated management module II (IMM2) primary and backup firmware is at level `ibm_fw_imm2_1a0034x-1.xx_anyos_noarch` or later.  
**Attention:** If the IMM2 firmware in the compute node is at an earlier level when you connect the compute node to the storage expansion node, *the firmware in the storage expansion node will become corrupted and unrecoverable, and you will have to replace the storage expansion node.*

## Procedure

To attach a compute node to the expansion shelf, complete the following steps.



1. Place the storage expansion node assembly on a flat, static-protective surface with the storage expansion node bezel facing you.
2. Remove the compute node cover (see the compute node *Installation and Service Guide* for instructions).  
**Attention:** Bend the interposer cable up and over the storage expansion node to ensure that the cable and connector are clear of the area where the compute node will be attached.
3. With the right edge of the compute node aligned with the compute node alignment mark on the expansion shelf, orient the slots on the bottom of the compute node with the posts on the left side of the expansion shelf. Then, slide the compute node toward the center of the shelf until the retention latch clicks into place.
4. If any I/O expansion adapters in the compute node are blocking access to the interposer connector, remove them (see the compute node *Installation and Service Guide* for instructions).
5. Connect the interposer cable to the interposer connector on the compute node system board, as shown in the following illustration.



6. If you removed any I/O expansion adapters from the compute node, install them (see the compute node *Installation and Service Guide* for instructions).
7. Install the compute node cover (see the compute node *Installation and Service Guide* for instructions).

---

## Removing the compute node from the storage expansion node assembly

Use these instructions to remove the compute node from the storage expansion node assembly.

### Before you begin

Before you remove the compute node from the storage expansion node assembly, complete the following steps:

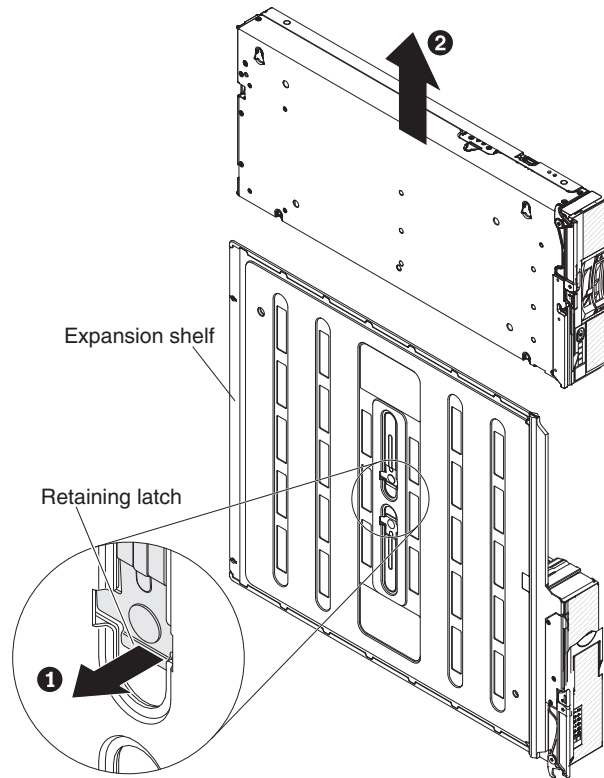
1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. If the storage expansion node assembly is installed in an Flex System Enterprise Chassis, remove it (see “Removing the storage expansion node assembly from the Flex System Enterprise Chassis” on page 18 for instructions).
3. Carefully lay the storage expansion node assembly on a flat, static-protective surface with the storage expansion node and compute node bezels facing you.

### Procedure

To remove the compute node, complete the following steps:

1. Remove the compute node cover (see the compute node *Installation and Service Guide* for instructions).
2. If any I/O expansion adapters in the compute node are blocking access to the interposer connector, remove them (see the compute node *Installation and Service Guide* for instructions).
3. Disconnect the interposer cable from the interposer connector on the compute node system board.
4. If you removed any I/O expansion adapters from the compute node, install them (see the compute node *Installation and Service Guide* for instructions).
5. On the underside of the expansion shelf, lift the raised edge of the retaining latch that secures the compute node to the shelf while you slide the compute node away from the center of the shelf, as shown in the following illustration.





6. Install the compute node cover (see the compute node *Installation and Service Guide* for instructions).

---

## Installing a flash/RAID adapter and flash power module

Some RAID configurations require an optional 512 MB or 1 GB flash/RAID adapter. The adapter comes with a flash power module, which you must install with the adapter.

### Before you begin

Before you install a flash/RAID adapter and flash power module in the storage expansion node, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. If the storage expansion node assembly is installed in an Flex System Enterprise Chassis, remove it (see “Removing the storage expansion node assembly from the Flex System Enterprise Chassis” on page 18 for instructions).
3. Carefully lay the storage expansion node assembly on a flat, static-protective surface.
4. Remove the storage expansion node cover (see “Removing the cover from the storage expansion node” on page 8 for instructions).

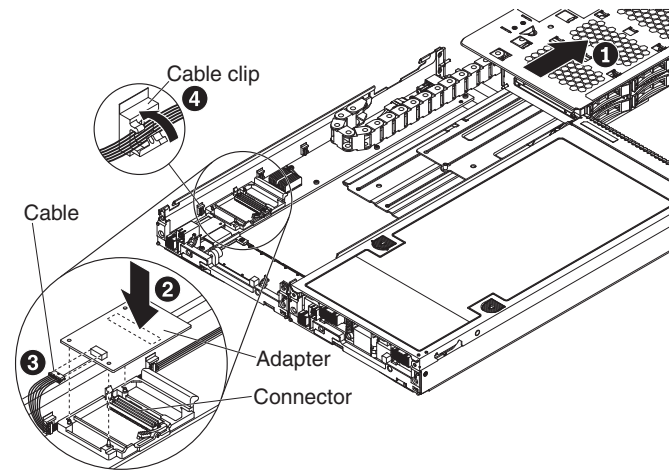
**Attention:** Make sure that the drive drawer is supported when it is open. The weight of installed drives can cause the storage expansion node assembly to be unstable when the drive drawer is open.

5. Open the drive drawer approximately 30 cm (12 in.).
6. See the illustration in “System board” on page 3 for the location of the flash/RAID adapter connector.

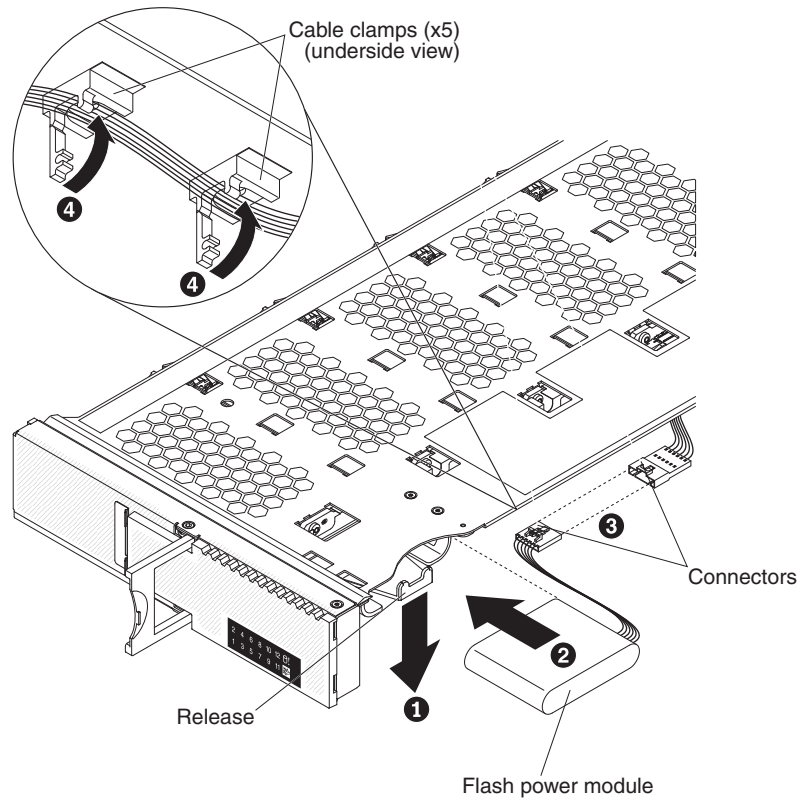


## Procedure

To install a flash/RAID adapter and flash power module, complete the following steps.



1. Touch the static-protective package that contains the adapter to any *unpainted* metal surface on the Flex System Enterprise Chassis or any *unpainted* metal surface on any other grounded rack component; then, remove the adapter from the package.
2. Orient the adapter with the connector on the system board; then, firmly press on the indicated location on the adapter until the blue latch snaps up and over the edge of the adapter.
3. Connect the cable to the adapter. The connectors are keyed to prevent incorrect insertion.
4. Make sure that the cable is secured in the cable clip on the inside wall of the storage expansion node.
5. Press down slightly on the release on the outer edge of the blue flash power module bracket and insert the flash power module into the bracket, with the cable oriented toward the outside of the drive drawer, as shown in the following illustration.



6. Connect the flash power module to the connector on the underside of the drawer. The connectors are keyed to prevent incorrect insertion.
7. Route the cable through the cable clamps on the underside of the drawer and close the cable clamps.

### What to do next

After you install the flash/RAID adapter and flash power module, close the drive drawer and go to “Completing the installation.”

---

## Completing the installation

Use this information to install the cover on the storage expansion node and install the storage expansion node assembly in an Flex System Enterprise Chassis.

### About this task

To complete the installation, complete the following tasks.

## Installing the cover on the storage expansion node

Use these instructions to install the cover on the storage expansion node.

### Before you begin

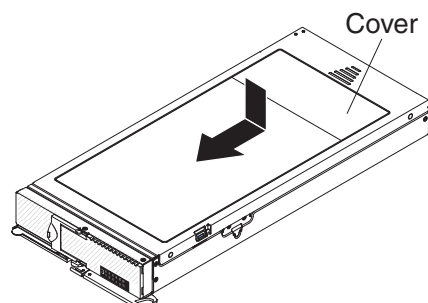
Before you install the cover on the storage expansion node, read “Safety” on page v and “Installation guidelines” on page 7.

**Attention:**

- You cannot insert the storage expansion node assembly into the Flex System Enterprise Chassis until the covers are installed on the storage expansion node and the compute node. Do not attempt to override this protection.
- Before you install the cover, make sure that the interposer cable is seated correctly and that you have not left loose tools or parts inside the storage expansion node or the compute node.

**Procedure**

To install the cover on the storage expansion node, complete the following steps.



1. Lower the cover so that the posts inside the cover fit into the slots in the storage expansion node.
2. Slide the cover toward the front of the storage expansion node, until it clicks into place.

## Installing the storage expansion node in an Flex System Enterprise Chassis

Use these instructions to install the storage expansion node assembly in an Flex System Enterprise Chassis.

**Before you begin**

Before you install the storage expansion node assembly in an Flex System Enterprise Chassis, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. Make sure that the integrated management module II (IMM2) primary and backup firmware in the compute node is at level `ibm_fw_imm2_1a0034x-1.xx_anyos_noarch` or later.

**Attention:** If you attempt to operate the storage expansion node with a compute node that has IMM2 firmware an earlier level, *the firmware in the storage expansion node will become corrupted and unrecoverable*, and you will have to replace the storage expansion node.

3. Remove the 1-bay shelf from the Flex System Enterprise Chassis bays where you will install the storage expansion node assembly.

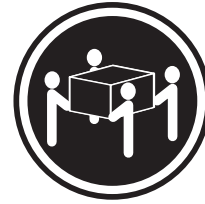
**Statement 4**



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)

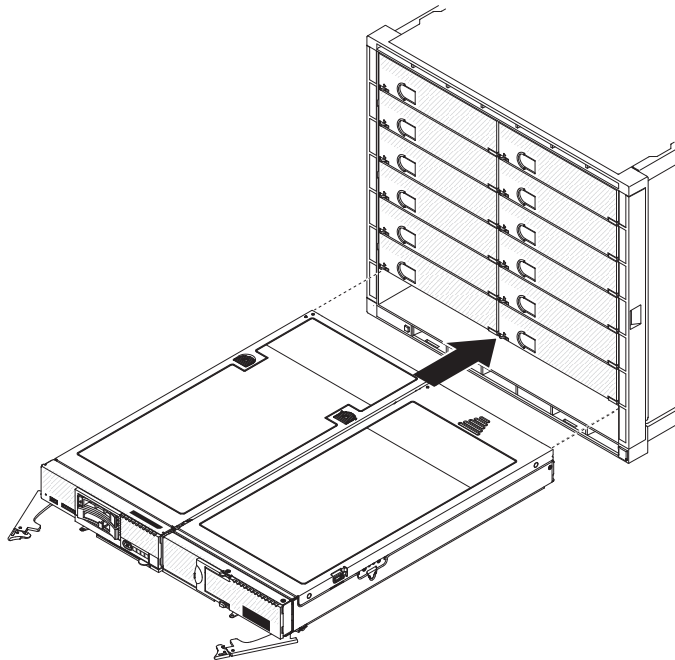


≥ 55 kg (121.2 lb)

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

## Procedure

To install the storage expansion node assembly, complete the following steps.



**Attention:** Make sure that the drive drawer is closed and latched. Do not attempt to install the storage expansion node assembly in the chassis while the drive drawer is open.

1. Open the cam handles on the compute node and the storage expansion node.
2. Orient the storage expansion node assembly with the storage expansion node and compute node bezels facing you.
3. Place the storage expansion node assembly onto the shelf supports in the chassis bays; then, slide the assembly all the way into the bays.
4. Close the cam handles on the compute node and the storage expansion node to latch the assembly in place.

## What to do next

If you have changed the configuration of the compute node or if you are installing a different compute node from the one that you removed, you must configure the compute node through the Setup utility, and you might have to install the compute

node operating system. See “Updating the compute node configuration” for more information.

## Updating the compute node configuration

When the compute node starts for the first time after you add or remove an optional device, you might receive a message that the configuration has changed.

The Setup utility automatically starts so that you can save the new configuration settings. See the *Installation and Service Guide* for the compute node for more information about the Setup utility.

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

## Configuring the RAID controller

This section provides information about configuring the RAID controller.

The storage expansion node has a PCIe 3.0 half-size, half-height RAID controller that is based on the LSI SAS 2208 PCIe SAS/SATA I/O processor chip. The controller controls eight internal 6 Gbps SAS/SATA ports through two SFF-8087 x4 internal mini-SAS connectors. It integrates eight high-performance SAS/SATA PHYs and a PCIe bus master DMA core. Each of the PHYs is capable of 6.0 Gbps SAS link rates and 6.0 Gbps SATA III link rates.

For instructions for configuring, monitoring, and maintaining the RAID controller and installing the device driver for the RAID controller, see <http://www.ibm.com/support/entry/portal/docdisplay?lnocid=MIGR-5086126>.

For information about using the MegaRAID Command Tool, see <http://www.ibm.com/support/entry/portal/docdisplay?lnocid=MIGR-5089103>.

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## Installing a hot-swap drive

The storage expansion node supports up to 12 hot-swap SAS or SATA 2.5-inch hard disk drives or solid-state drives.

### Before you begin

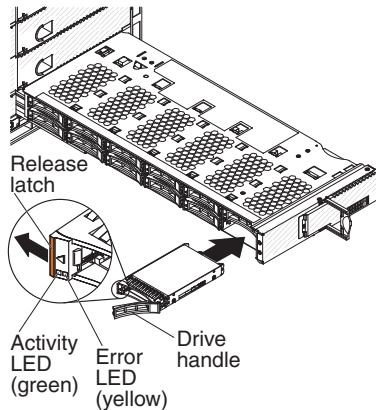
Before you install a hot-swap drive in the storage expansion node, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. See the illustration in “Drive drawer” on page 4 for the locations of the drive bays.

**Attention:** To ensure proper cooling and protect system data integrity, do not operate the storage expansion node for an extended period of time with the drawer open. Keep the drive drawer closed when you are not installing or removing drives.

## Procedure

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



1. Open the drive drawer as far as necessary to access the drive bay that you want to use.
2. Touch the static-protective package that contains the drive to any *unpainted* metal surface on the Flex System Enterprise Chassis or any *unpainted* metal surface on any other grounded rack component; then, remove the drive from the package.
3. Press the orange release latch on the drive to release the drive handle.
4. Slide the drive into the bay until it is firmly seated in the connector.
5. Lock the drive in place by closing the drive handle.
6. Close the drive drawer.
7. Check the drive status LED on the control panel on the front of the storage expansion node to make sure that the drive is operating correctly (see “Control panel” on page 5 for the location of the drive status LED).

---

## Removing the storage expansion node assembly from the Flex System Enterprise Chassis

Use these instructions to remove the storage expansion node assembly from the Flex System Enterprise Chassis.

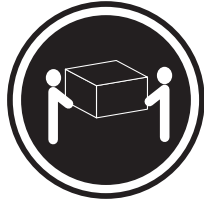
### Before you begin

Before you remove the storage expansion node assembly, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. If the compute node in the storage expansion node assembly is operating, shut down the operating system, and press the power button to turn off the compute node (see the compute node *Installation and Service Guide* for more information).

### Statement 4

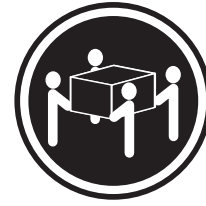




≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)

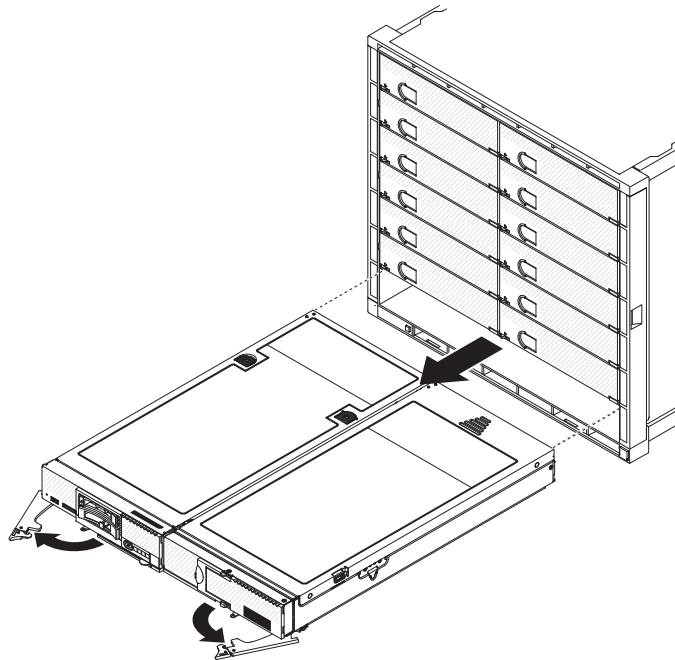


≥ 55 kg (121.2 lb)

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

## Procedure

To remove the storage expansion node assembly from the Flex System Enterprise Chassis, complete the following steps.



**Attention:** Make sure that the drive drawer is closed and latched. Do not attempt to remove the storage expansion node assembly from the chassis while the drive drawer is open.

1. Open the cam handles on the compute node and the storage expansion node.  
**Attention:** To maintain proper system cooling, do not operate the Flex System Enterprise Chassis without a node or filler in each bay.
2. Pull the storage expansion node assembly out of the bay and place the assembly on a flat, static-protective surface.
3. Install a 1-bay shelf with fillers or other nodes within 1 minute.





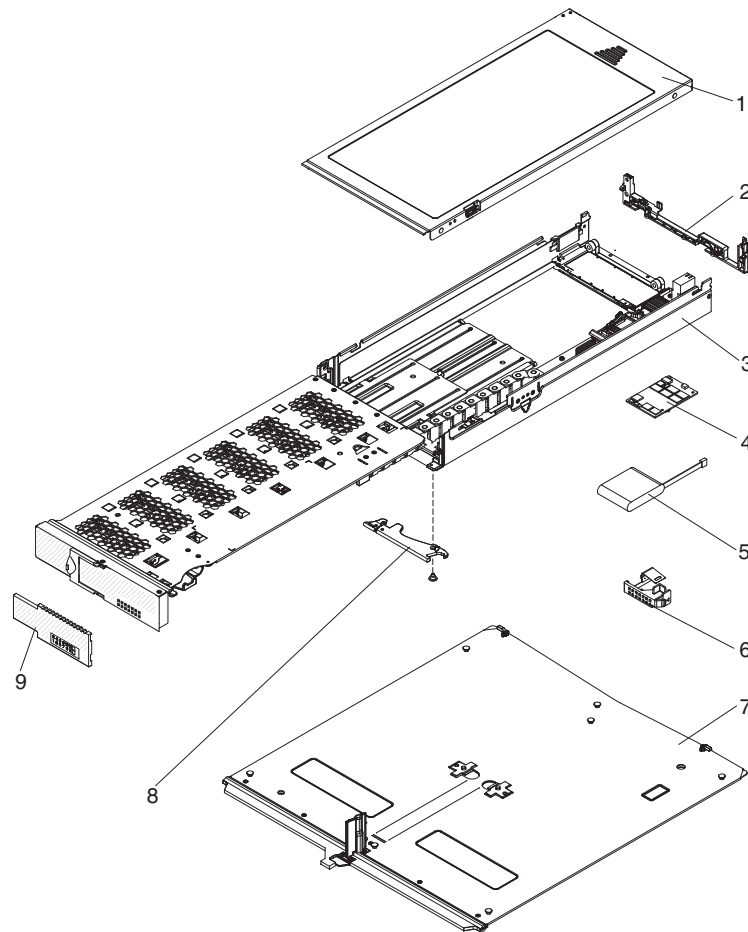
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## Chapter 3. Parts listing - storage expansion node

Use this information to locate and identify replaceable components for the storage expansion node.

For an updated parts listing go to <http://www.ibm.com/supportportal> and search for system service parts.

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



Replaceable components consist of consumable parts, structural parts, field replaceable units (FRUs), and customer replaceable units (CRUs):

- **Consumable parts:** Purchase and replacement of consumable parts (components, such as batteries and printer cartridges, that have depletable life) is your responsibility. If IBM® acquires or installs a consumable component at your request, you will be charged for the service.
- **Structural parts:** Purchase and replacement of structural parts is your responsibility. If IBM acquires or installs a structural component at your request, you will be charged for the service.
- **Field replaceable unit (FRU):** FRUs must be replaced only by a trained service technician, unless they are classified as customer replaceable units (CRUs).

- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request without a service contract, you will be charged for the installation.
- **Tier 2 customer replaceable unit:** You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service that is designated for your storage expansion node.

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

Index	Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number (trained service technician only)
3	Storage expansion node	90Y9277		
4	Flash/RAID adapter, 512 MB	81Y4488		
4	Flash/RAID adapter, 1 GB	81Y4580		
5	Flash power module	81Y4579		

## Consumable and structural parts

Consumable and structural parts are not covered by the product Statement of Limited Warranty.

Index	Description	Part number
1	Node cover	44E4786
2	Rear bulkhead kit	44E4788
6	Control panel assembly	44E4784
7	Expansion shelf	44E4783
8	Expansion node cam handle kit	00Y2939
9	Bezel	44E4785
	Miscellaneous parts kit	44E4787
	Miscellaneous labels kit	44E4789

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## Chapter 4. Troubleshooting

Use this information to diagnose and fix any problems that might occur in the storage expansion node.

If the check log LED on the compute node is lit, check the integrated management module II (IMM2) and Chassis Management Module (CMM) event logs. For instructions, see the troubleshooting information in the compute node *Installation and Service Guide*.

If the compute node fails to recognize or connect to the storage expansion node, follow the procedures in “Connection failure.”

---

### Event messages

Hardware events in the storage expansion node are detected by the integrated management module II (IMM2) in the compute node that is connected to the storage expansion node assembly.

The IMM2 logs storage expansion node events in the system-event log in the compute node. In addition, the IMM2 sends that event to the Chassis Management Module (CMM) and to the Flex System Manager management node, if one is installed.

For instructions, see the troubleshooting information in the compute node *Installation and Service Guide*.

---

### Connection failure

Use this procedure if the compute node fails to recognize or connect to the storage expansion node.

Check for the following general requirements:

- Make sure that the compute node has two installed microprocessors, if that configuration is required for the compute node to work with the storage expansion node. To determine whether a supported compute node requires two microprocessors, see “Supported compute nodes” on page 2.
- Make sure that the integrated management module II (IMM2) primary and backup firmware is at level `ibm_fw_imm2_1a0034x-1.xx_anyos_noarch` or later.  
**Attention:** If the IMM2 firmware in the compute node is at an earlier level when you connect the compute node to the storage expansion node, *the firmware in the storage expansion node will become corrupted and unrecoverable*, and you will have to replace the storage expansion node.
- If an optional flash/RAID adapter has been installed and operating in the storage expansion node, make sure that the adapter is currently installed. If a previously installed flash/RAID adapter has been removed, reinstall or replace the adapter. If you choose to operate the storage expansion node without a flash/RAID adapter, contact IBM Hardware Support to reset the LSI SAS MegaRAID firmware to its defaults, or replace the storage expansion node.

If those requirements are met and the compute node still fails to recognize or connect to the storage expansion node, complete the following steps:

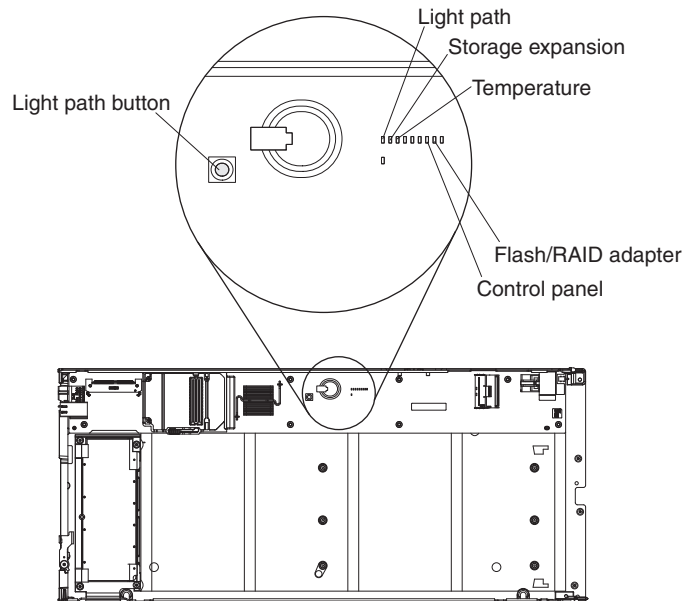
1. On the compute node, start the Setup utility (see the compute node *Installation and Service Guide* for instructions).
2. Select **System Settings > Storage**.
  - If **LSI MegaRAID <ServeRAID M5110e> Configuration Utility - xx.xx.xx** is displayed, the compute node detects the presence of the storage expansion node. Continue to step 3.
  - If **LSI MegaRAID <ServeRAID M5110e> Configuration Utility - xx.xx.xx** is not displayed, check the connection of the interposer cable to the connector on the compute node system board. Then, check the Setup utility again to determine whether the compute node now detects the presence of the storage expansion node.
3. If you are using a Windows operating system, open Device Manager.
4. Make sure that ... **Flex System Storage Expansion Node** is displayed under **Storage controllers**. If it is not, install the RAID controller device driver. For instructions, see “Configuring the RAID controller” on page 17.
5. If the problem remains, contact Product Support.

---

## Light path diagnostics

Light path diagnostics is a system of LEDs on the system board of the storage expansion node and on various internal components of the compute node. When an error occurs, LEDs can be lit in the storage expansion node and throughout the compute node to help identify the source of the error.

The following illustration shows the light path diagnostics LEDs and the light path button on the system board.



To view the light path diagnostics LEDs on the storage expansion node system board, complete the following steps:

1. Remove the storage expansion node assembly from the chassis (see “Removing the storage expansion node assembly from the Flex System Enterprise Chassis” on page 18 for instructions).

2. Remove the cover from the storage expansion node (see “Removing the cover from the storage expansion node” on page 8 for instructions).

**Attention:** Make sure that the drive drawer is supported when it is open. The weight of installed drives can cause the storage expansion node assembly to be unstable when the drive drawer is open.

3. Open the drive drawer approximately 35 cm (14 in.). The LEDs are visible below the segmented cable track.
4. Press the light path button to illuminate any LEDs that are activated.

When the storage expansion node assembly is not installed in the chassis, a capacitor on the storage expansion node system board provides power for the light path diagnostics LEDs. The capacitor circuit can keep all internal light path diagnostics LEDs illuminated for a minimum of 20 seconds of continuous operation.

The following light path diagnostics LEDs are on the storage expansion node system board:

#### **Light path**

If this LED is lit when you press the light path button, it indicates that power is available to light any light path diagnostics LEDs that are activated.

#### **Storage expansion**

If this LED is lit, it indicates a fault in the storage expansion node. Check the event logs for specific information about the event. For instructions, see the troubleshooting information in the compute node *Installation and Service Guide*.

#### **Temperature**

If this LED is lit, it indicates that a temperature event has occurred. Check the event logs for specific information about the event. For instructions, see the troubleshooting information in the compute node *Installation and Service Guide*.

#### **Flash/RAID adapter**

If this LED is lit, it indicates a fault in the flash/RAID adapter. Replace the flash/RAID adapter. See “Removing the flash/RAID adapter” on page 43 and “Replacing the flash/RAID adapter” on page 44 for instructions.

#### **Control panel**

If this LED is lit, it indicates that the control panel assembly is not detected. If the control panel assembly is present, reseal the connector. If the problem remains, replace the control panel assembly. See “Removing the control panel assembly” on page 36 and “Replacing the control panel assembly” on page 37 for instructions.



---

## Chapter 5. Removing and replacing components

Use this information to install, remove, and replace components in the storage expansion node.

See Chapter 3, “Parts listing - storage expansion node,” on page 21 to determine whether a component is a Tier 1 CRU, Tier 2 CRU, or FRU that must be replaced only by a trained service technician.

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

---

### Installation guidelines

Use these guidelines before you install the storage expansion node or optional devices.

- Before you begin, read “Safety” on page v and “Handling static-sensitive devices” on page 8. This information will help you work safely.
- Before you install your new storage expansion node, take the opportunity to download and apply the most recent firmware updates to the associated compute node. This step will help to ensure that any known issues are addressed and that your system is ready to function at maximum levels of performance.

**Attention:** Before you connect a compute node to the storage expansion node, you must make sure that the integrated management module II (IMM2) primary and backup firmware in the compute node is at level `ibm_fw_imm2_1aoo34x-1.xx_anyos_noarch` or later. If the IMM2 firmware in the compute node is at an earlier level when you connect the compute node to the storage expansion node, the firmware in the storage expansion node will become corrupted and unrecoverable, and you will have to replace the storage expansion node. For information about updating the firmware in the compute node, see the compute node *Installation and Service Guide*.

- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- Back up all important data before you make changes to disk drives.
- Before you remove a compute node from the Flex System Enterprise Chassis, you must shut down the operating system and turn off the compute node. You do not have to shut down the chassis itself.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the compute node, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the compute node and operating system support hot-swap capability, you can remove or install the component while the compute node is running. (Orange can also indicate touchpoints on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- For a list of supported optional devices for the compute node, see <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us>.

## System reliability guidelines

Use these guidelines to ensure that the storage expansion node meets the cooling and system reliability requirements.

- To ensure proper cooling, do not operate the Flex System Enterprise Chassis without a device or filler installed in each bay. See the documentation for your Flex System Enterprise Chassis for additional information.
- Make sure that the ventilation holes on the storage expansion node are not blocked.
- The compute node battery must be operational. If the battery becomes defective, replace it immediately. For instructions, see the compute node *Installation and Service Guide*.

## Handling static-sensitive devices

To reduce the possibility of damage from electrostatic discharge, observe these precautions.

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

- When you work on a rack that has an electrostatic discharge (ESD) connector, use a wrist strap, especially when you handle modules, optional devices, or compute nodes. To work correctly, the wrist strap must have a good contact at both ends (touching your skin at one end and firmly connected to the ESD connector on the front or back of the rack).
- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an *unpainted* metal part of the Flex System Enterprise Chassis or any *unpainted* metal surface on any other grounded rack component in the rack in which you are installing the device for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the compute node without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the compute node cover or on a metal surface.
- Take additional care when you handle devices during cold weather. Heating reduces indoor humidity and increases static electricity.

## Returning a device or component

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

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## Removing and replacing structural parts

Purchase and replacement of structural parts is your responsibility. If IBM installs a structural component at your request, you will be charged for the service.



## Removing the cover from the storage expansion node

Use these instructions to remove the cover from the storage expansion node.

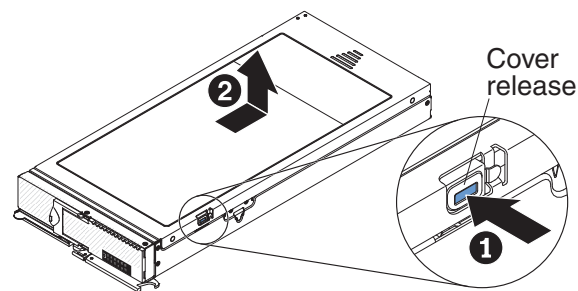
### Before you begin

Before you remove the cover from the storage expansion node, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. If the storage expansion node assembly is installed in an Flex System Enterprise Chassis, remove it (see “Removing the storage expansion node assembly from the Flex System Enterprise Chassis” on page 18 for instructions).
3. Carefully lay the storage expansion node assembly on a flat, static-protective surface.

### Procedure

Press on the cover release and slide the cover toward the rear of the storage expansion node; then, lift the cover away from the storage expansion node, as shown in the following illustration.



## Installing the cover on the storage expansion node

Use these instructions to install the cover on the storage expansion node.

### Before you begin

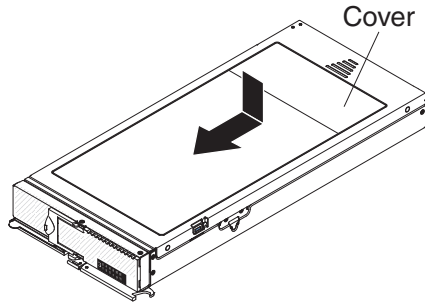
Before you install the cover on the storage expansion node, read “Safety” on page v and “Installation guidelines” on page 7.

**Attention:**

- You cannot insert the storage expansion node assembly into the Flex System Enterprise Chassis until the covers are installed on the storage expansion node and the compute node. Do not attempt to override this protection.
- Before you install the cover, make sure that the interposer cable is seated correctly and that you have not left loose tools or parts inside the storage expansion node or the compute node.

**Procedure**

To install the cover on the storage expansion node, complete the following steps.



1. Lower the cover so that the posts inside the cover fit into the slots in the storage expansion node.
2. Slide the cover toward the front of the storage expansion node, until it clicks into place.

**Removing the cam handle**

Use these instructions to remove the cam handle from the storage expansion node.

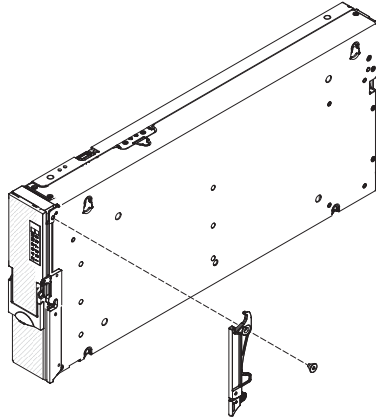
**Before you begin**

Before you remove the cam handle, complete the following steps:

1. Read "Safety" on page v and "Installation guidelines" on page 7.
2. If the storage expansion node assembly is installed in an Flex System Enterprise Chassis, remove it (see "Removing the storage expansion node from the expansion shelf" on page 48 for instructions).
3. Carefully lay the storage expansion node assembly on a flat, static-protective surface with the cover side down and the storage expansion node bezel facing you.

## Procedure

To remove the cam handle, complete the following steps.



1. Locate the screw that attaches the handle to the storage expansion node.
2. Using a T15 Torx screwdriver, remove the screw from the handle.

## What to do next

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

Continue to “Replacing the cam handle.”

## Replacing the cam handle

Use these instructions to install a replacement cam handle on the storage expansion node.

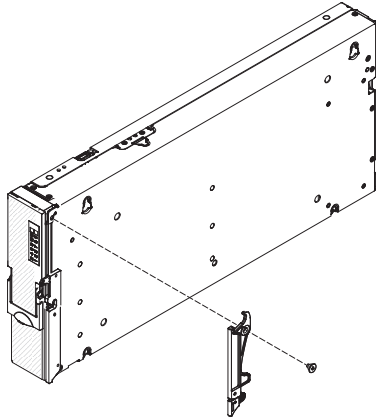
### Before you begin

Before you install the cam handle, read “Safety” on page v and “Installation guidelines” on page 7.

## Procedure

This procedure requires only the cam handle and the larger of the two screws that are provided in the expansion node cam handle kit.

To install the cam handle, complete the following steps.



1. Orient the handle so that the blue release latch is toward the middle of the storage expansion node.
2. Align the hole in the handle with the hole on the storage expansion node where the handle is to be installed.
3. Using a T15 Torx screwdriver, install the screw that is provided in the expansion node cam handle kit.

### What to do next

After you install the cam handle, install the storage expansion node assembly into the chassis. See “Installing the storage expansion node in an Flex System Enterprise Chassis” on page 15 for instructions.

## Removing the expansion shelf

Use these instructions to remove the expansion shelf from the storage expansion node assembly.

### Before you begin

Before you remove the expansion shelf, complete the following steps:

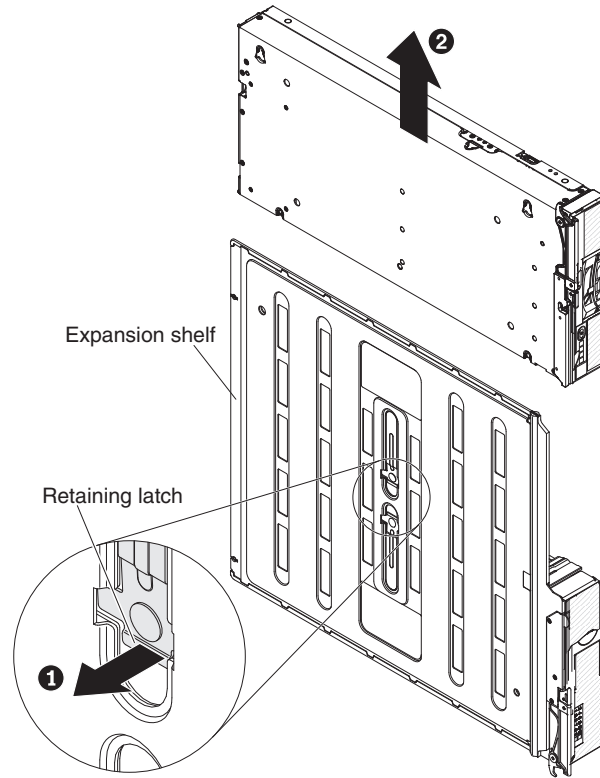
1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. If the storage expansion node assembly is installed in an Flex System Enterprise Chassis, remove it (see “Removing the storage expansion node from the expansion shelf” on page 48 for instructions).
3. Carefully lay the storage expansion node assembly on a flat, static-protective surface with the storage expansion node bezel facing you.

### Procedure

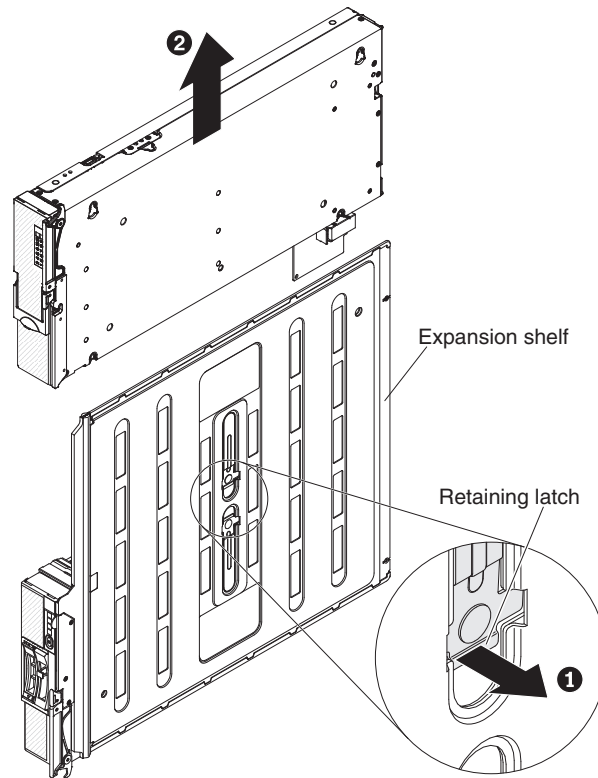
To remove the expansion shelf, complete the following steps:

1. If a compute node is attached to the expansion shelf, complete the following steps to remove it from the shelf:
  - a. Remove the compute node cover (see the compute node *Installation and Service Guide* for instructions).
  - b. If any I/O expansion adapters in the compute node are blocking access to the interposer connector, remove them (see the compute node *Installation and Service Guide* for instructions).
  - c. Disconnect the interposer cable from the interposer connector on the compute node system board.

- d. If you removed any I/O expansion adapters from the compute node, install them (see the compute node *Installation and Service Guide* for instructions).
- e. On the underside of the expansion shelf, lift up on the raised edge of the retaining latch that secures the compute node to the shelf while you slide the compute node away from the center of the shelf, as shown in the following illustration.



- f. Install the compute node cover (see the compute node *Installation and Service Guide* for instructions).
2. On the underside of the expansion shelf, lift up on the raised edge of the retaining latch that secures the storage expansion node to the shelf while you slide the storage expansion node away from the center of the shelf, as shown in the following illustration.



### What to do next

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

## Replacing the expansion shelf

Use these instructions to install a replacement expansion shelf on the storage expansion node assembly.

### Before you begin

Before you install the expansion shelf, read “Safety” on page v and “Installation guidelines” on page 7.

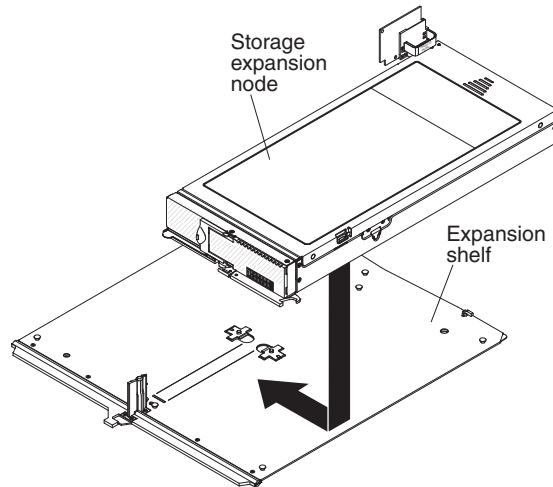
### Procedure

**Attention:** *Before you connect a compute node to the storage expansion node, you must make sure that the integrated management module II (IMM2) primary and backup firmware in the compute node is at level `ibm_fw_imm2_1a0034x-1.xx_anyos_noarch` or later. If the IMM2 firmware in the compute node is at an earlier level when you connect the compute node to the storage expansion node, the firmware in the storage expansion node will become corrupted and unrecoverable, and you will have to replace the storage expansion node. For information about updating the firmware in the compute node, see the compute node *Installation and Service Guide*.*

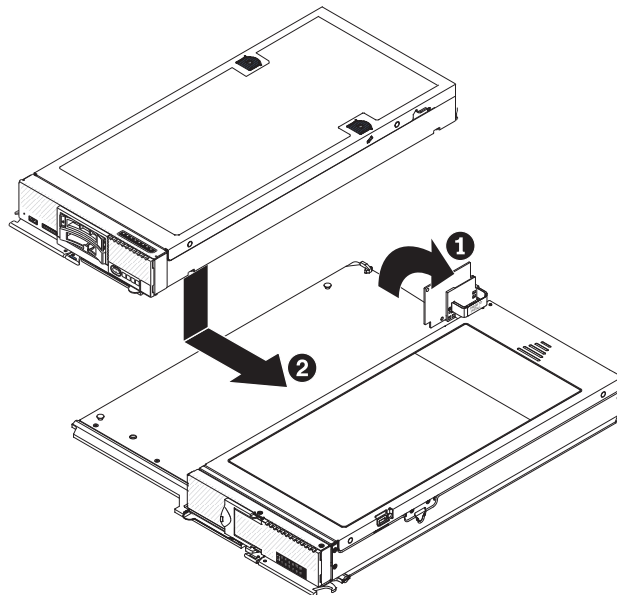
To install the expansion shelf, complete the following steps:

1. Place the expansion shelf on a flat, static-protective surface with the black edge facing you.

2. With the left edge of the storage expansion node aligned with the expansion node alignment mark on the expansion shelf, orient the slots on the bottom of the storage expansion node with the posts on the right side of the expansion shelf. Then, slide the storage expansion node toward the center of the shelf until the retention latch clicks into place, as shown in the following illustration.

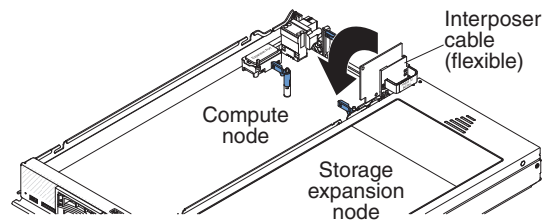


3. Remove the compute node cover (see the compute node *Installation and Service Guide* for instructions).  
**Attention:** Bend the interposer cable up and over the storage expansion node to ensure that the cable and connector are clear of the area where the compute node will be attached.
4. With the right edge of the compute node aligned with the compute node alignment mark on the expansion shelf, orient the slots on the bottom of the compute node with the posts on the left side of the expansion shelf. Then, slide the compute node toward the center of the shelf until the retention latch clicks into place, as shown in the following illustration.



5. If any I/O expansion adapters in the compute node are blocking access to the interposer connector, remove them (see the compute node *Installation and Service Guide* for instructions).

6. Connect the interposer cable to the interposer connector on the compute node system board, as shown in the following illustration.



7. If you removed any I/O expansion adapters from the compute node, install them (see the compute node *Installation and Service Guide* for instructions).
8. Install the compute node cover (see the compute node *Installation and Service Guide* for instructions).

### What to do next

After you install the expansion shelf, install the storage expansion node assembly into the chassis. See “Installing the storage expansion node in an Flex System Enterprise Chassis” on page 15 for instructions.

## Removing the control panel assembly

Use these instructions to remove the control panel assembly from the storage expansion node.

### Before you begin

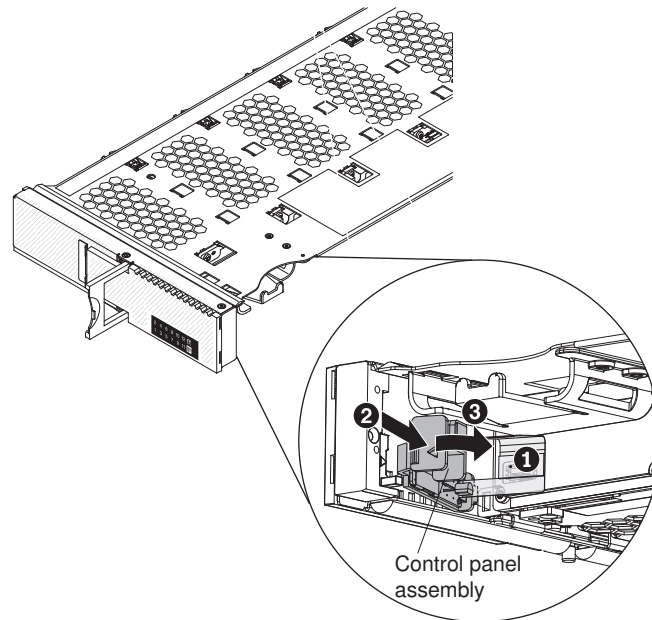
Before you remove the control panel assembly, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. If the storage expansion node assembly is installed in an Flex System Enterprise Chassis, remove it (see “Removing the storage expansion node assembly from the Flex System Enterprise Chassis” on page 18 for instructions).
3. Carefully lay the storage expansion node assembly on a flat, static-protective surface.  
**Attention:** Make sure that the drive drawer is supported when it is open. The weight of installed drives can cause the storage expansion node assembly to be unstable when the drive drawer is open.
4. Open the drive drawer approximately 20 cm (8 in.).



## Procedure

To remove the control panel assembly, complete the following steps.



1. Disconnect the control panel assembly cable from the connector on the drive drawer.
2. Press the tab on the outer edge of the control panel assembly to release the assembly from the inside of the bezel.

## What to do next

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

Continue to “Replacing the control panel assembly.”

## Replacing the control panel assembly

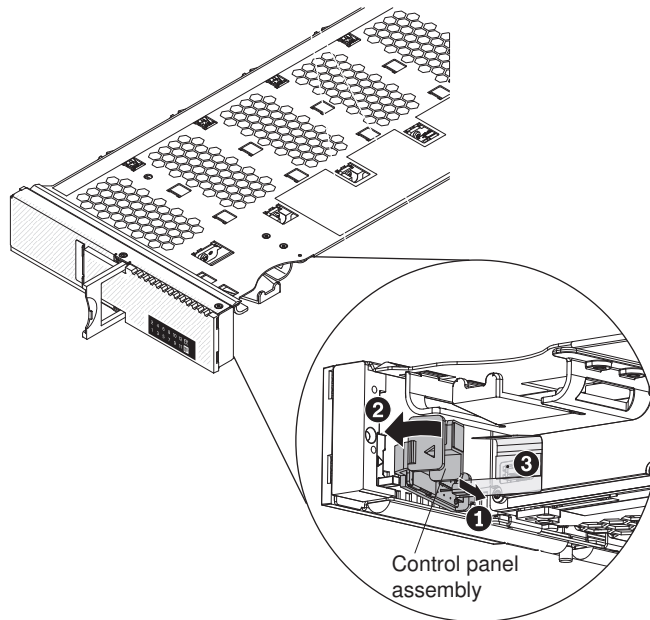
Use these instructions to install a replacement control panel assembly in the storage expansion node.

### Before you begin

Before you install the control panel assembly, read “Safety” on page v and “Installation guidelines” on page 7.

## Procedure

To install the control panel assembly, complete the following steps.



**Attention:** Make sure that the drive drawer is supported when it is open. The weight of installed drives can cause the storage expansion node assembly to be unstable when the drive drawer is open.

1. With the drive drawer open approximately 20 cm (8 in.), insert the tab on the end of the control panel assembly into the slot on the inside of the bezel; then, press the other end of the assembly until it snaps into place. You might have to use a flashlight to see the slot on the inside of the bezel.
2. Connect the control panel assembly cable to the connector on the drawer. The connector is keyed to prevent incorrect connection.

## What to do next

After you install the control panel assembly, complete the following steps:

1. Close the drive drawer.
2. Install the cover on the storage expansion node.
3. Install the storage expansion node assembly into the chassis. See “Installing the storage expansion node in an Flex System Enterprise Chassis” on page 15 for instructions.

## Removing the bezel

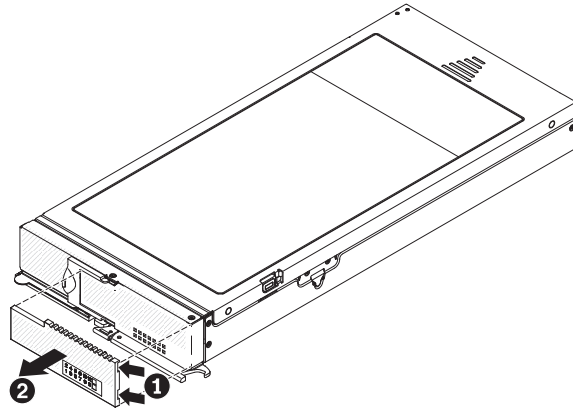
Use these instructions to remove the bezel from the storage expansion node.

### Before you begin

Before you remove the bezel, read “Safety” on page v and “Installation guidelines” on page 7.

## Procedure

To remove the bezel, complete the following steps.



1. Insert a flat-blade screwdriver into one of the grooves along the right edge of the bezel.
2. Carefully pry the bezel away from the storage expansion node.

## What to do next

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

Continue to “Replacing the bezel.”

## Replacing the bezel

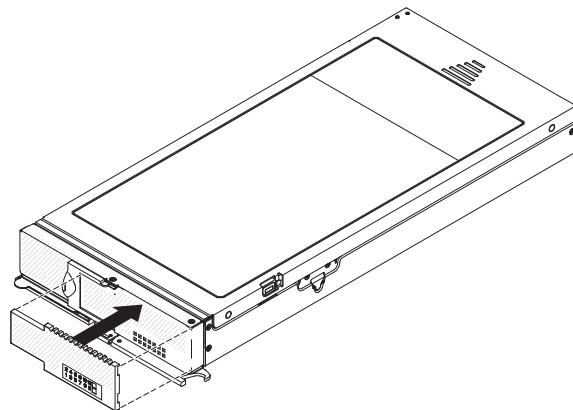
Use these instructions to install a replacement bezel on the storage expansion node.

### Before you begin

Before you install the bezel, read “Safety” on page v and “Installation guidelines” on page 7.

## Procedure

To install the bezel, complete the following steps.



1. Align the two posts on the front of the storage expansion node with the corresponding holes on the back of the bezel.

2. Press the bezel until it clicks into place over each of the posts.

## Removing the rear bulkhead

Use these instructions to remove the rear bulkhead from the storage expansion node.

### Before you begin

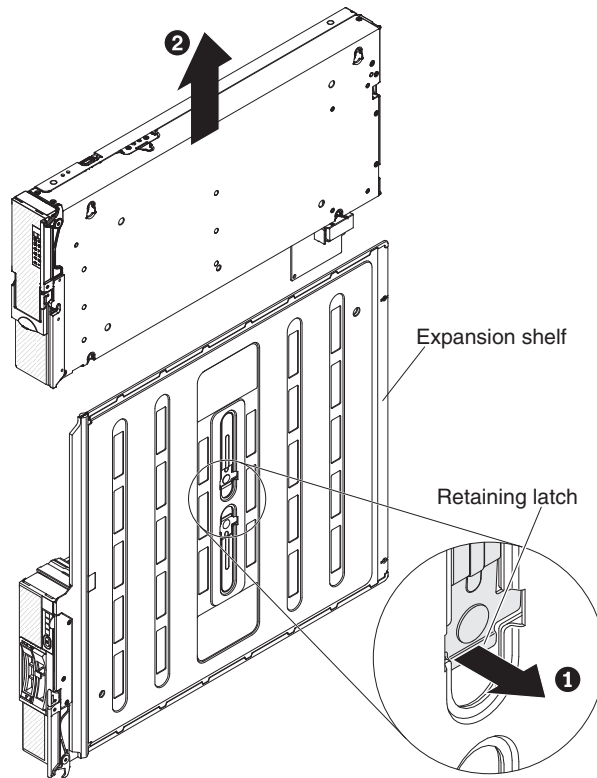
Before you remove the rear bulkhead, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. If the storage expansion node assembly is installed in an Flex System Enterprise Chassis, remove it (see “Removing the storage expansion node from the expansion shelf” on page 48 for instructions).
3. Carefully lay the storage expansion node assembly on a flat, static-protective surface.

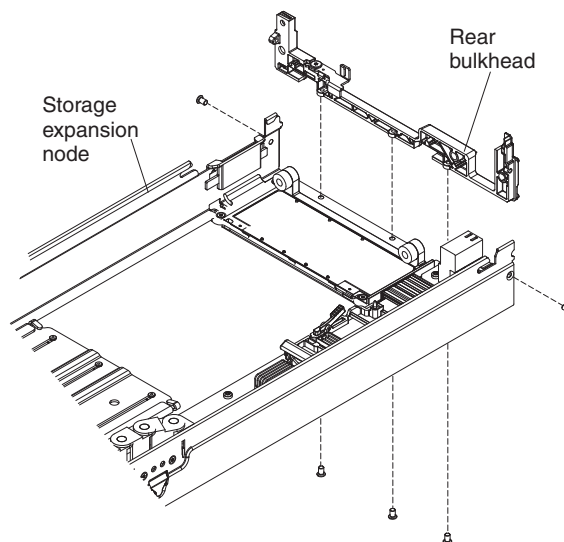
### Procedure

To remove the rear bulkhead, complete the following steps:

1. Remove the cover from the compute node in the storage expansion node assembly (see the compute node *Installation and Service Guide* for instructions).
2. If any I/O expansion adapters in the compute node are blocking access to the interposer connector, remove them (see the compute node *Installation and Service Guide* for instructions).
3. Disconnect the interposer cable from the interposer connector on the compute node system board.
4. On the underside of the expansion shelf, lift the raised edge of the retaining latch that secures the storage expansion node to the shelf while you slide the storage expansion node away from the center of the shelf, as shown in the following illustration.



5. Remove the cover from the storage expansion node (see “Installing the cover on the storage expansion node” on page 14 for instructions).
6. Using a T8 Torx screwdriver, remove the five screws (one on each side and three on the bottom) that secure the bulkhead to the storage expansion node, as shown in the following illustration. Save the screws in a safe place. Use the same screws when you install the replacement bulkhead.



### What to do next

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

Continue to “Replacing the rear bulkhead.”

## Replacing the rear bulkhead

Use these instructions to install a replacement rear bulkhead on the storage expansion node.

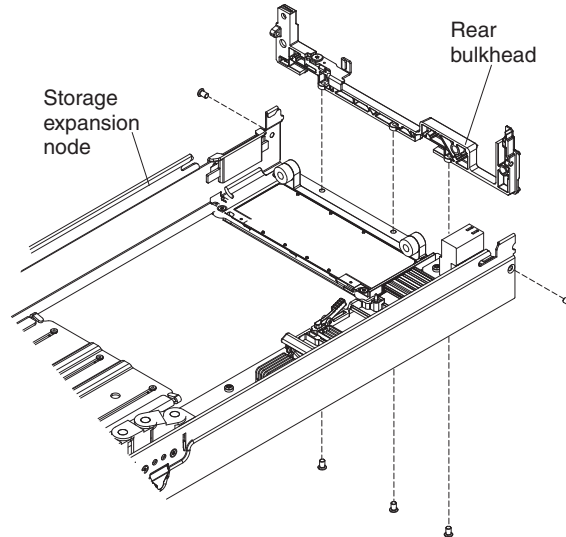
### Before you begin

Before you install the rear bulkhead, read “Safety” on page v and “Installation guidelines” on page 7.

### Procedure

To install the rear bulkhead, complete the following steps:

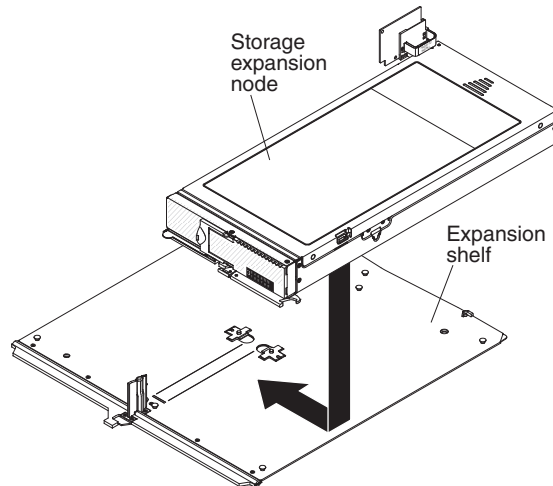
1. Place the bulkhead so that the screw holes on the bulkhead are aligned with the screw holes on the storage expansion node.
2. Using a T8 Torx screwdriver, install the five screws that secure the bulkhead, as shown in the following illustration. Use the screws that you removed when you removed the bulkhead.



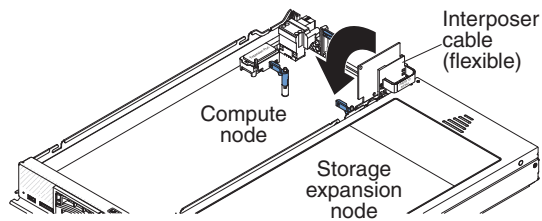
3. Install the cover on the storage expansion node (see “Installing the cover on the storage expansion node” on page 14 for instructions).

**Attention:** Bend the interposer cable up and over the storage expansion node to ensure that the cable and connector are clear of the compute node.

4. With the left edge of the storage expansion node aligned with the expansion node alignment mark on the expansion shelf, orient the slots on the bottom of the storage expansion node with the posts on the right side of the expansion shelf. Then, slide the storage expansion node toward the center of the shelf until the retention latch clicks into place, as shown in the following illustration.



5. Connect the interposer cable to the interposer connector on the compute node system board, as shown in the following illustration.



6. If you removed any I/O expansion adapters from the compute node, install them (see the compute node *Installation and Service Guide* for instructions).
7. Install the compute node cover (see the compute node *Installation and Service Guide* for instructions).

### What to do next

After you install the rear bulkhead, install the storage expansion node assembly into the chassis. See “Installing the storage expansion node in an Flex System Enterprise Chassis” on page 15 for instructions.

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## Removing and replacing Tier 1 customer replaceable units (CRUs)

Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request without a service contract, you will be charged for the installation.

### Removing the flash/RAID adapter

Use these instructions to remove the flash/RAID adapter from the storage expansion node.

#### Before you begin

Before you remove the flash/RAID adapter, complete the following steps:

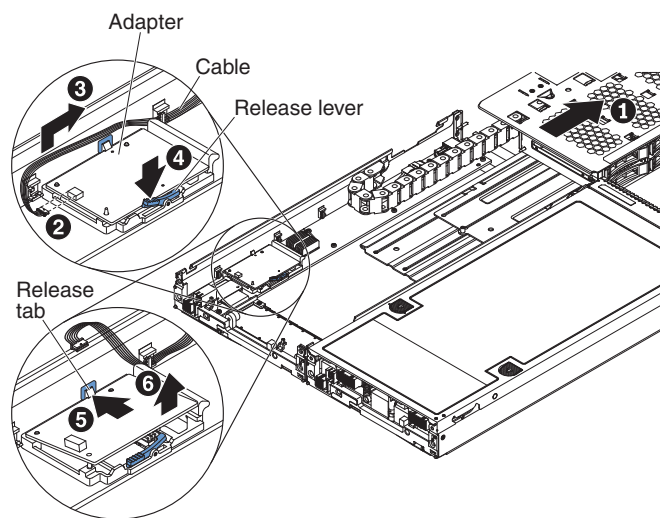
1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. If the storage expansion node assembly is installed in an Flex System Enterprise Chassis, remove it (see “Removing the storage expansion node assembly from the Flex System Enterprise Chassis” on page 18 for instructions).

3. Carefully lay the storage expansion node assembly on a flat, static-protective surface.
4. Remove the cover from the storage expansion node (see “Removing the cover from the storage expansion node” on page 8 for instructions).
 

**Attention:** Make sure that the drive drawer is supported when it is open. The weight of installed drives can cause the storage expansion node assembly to be unstable when the drive drawer is open.
5. Open the drive drawer approximately 30 cm (12 in.).
6. See the illustration in “System board” on page 3 for the location of the flash/RAID adapter connector.

## Procedure

To remove the flash/RAID adapter, complete the following steps.



1. Disconnect the connector from the flash/RAID adapter.
2. Press the blue latch on the flash/RAID adapter connector slightly away from the adapter and then down to release the adapter from the connector.
3. Press the small black retention clip toward the inside wall of the storage expansion node and pull the adapter out of the connector.

## What to do next

If you are installing a replacement flash/RAID adapter, continue to “Replacing the flash/RAID adapter.” If you are instructed to return the flash/RAID adapter, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

If you are not installing a replacement flash/RAID adapter, close the drive drawer and go to “Completing the installation” on page 14.

## Replacing the flash/RAID adapter

Use these instructions to install a replacement flash/RAID adapter in the storage expansion node.

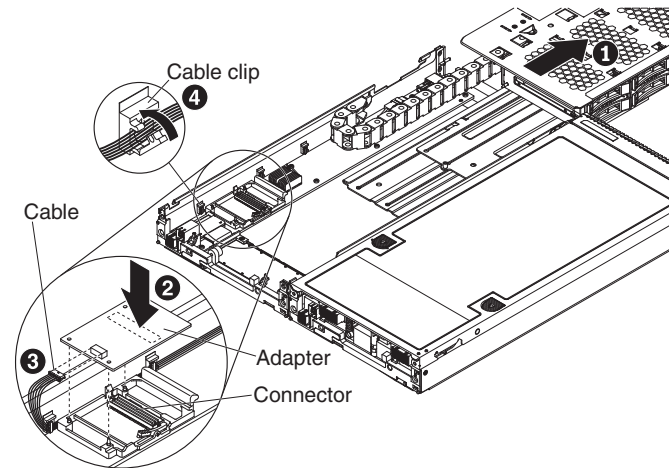


## Before you begin

Before you install the flash/RAID adapter, read “Safety” on page v and “Installation guidelines” on page 7.

## Procedure

To install a flash/RAID adapter, complete the following steps.



**Attention:** Make sure that the drive drawer is supported when it is open. The weight of installed drives can cause the storage expansion node assembly to be unstable when the drive drawer is open.

1. With the drive drawer open approximately 30 cm (12 in.), touch the static-protective package that contains the adapter to any *unpainted* metal surface on the Flex System Enterprise Chassis or any *unpainted* metal surface on any other grounded rack component; then, remove the adapter from the package.
2. Orient the adapter with the connector on the system board; then, firmly press on the indicated location on the adapter until the blue latch snaps up and over the edge of the adapter.
3. Connect the cable to the adapter. The connector is keyed to prevent incorrect insertion.
4. Make sure that the cable is secured in the cable clip on the inside wall of the storage expansion node.

## What to do next

After you install the flash/RAID adapter, complete the following steps:

1. Close the drive drawer.
2. Install the cover on the storage expansion node (see “Installing the cover on the storage expansion node” on page 14 for instructions).
3. Install the storage expansion node assembly into the chassis (see “Installing the storage expansion node in an Flex System Enterprise Chassis” on page 15 for instructions).

## Removing the flash power module

Use these instructions to remove the flash power module from the storage expansion node.

## Before you begin

Before you remove the flash power module, complete the following steps:

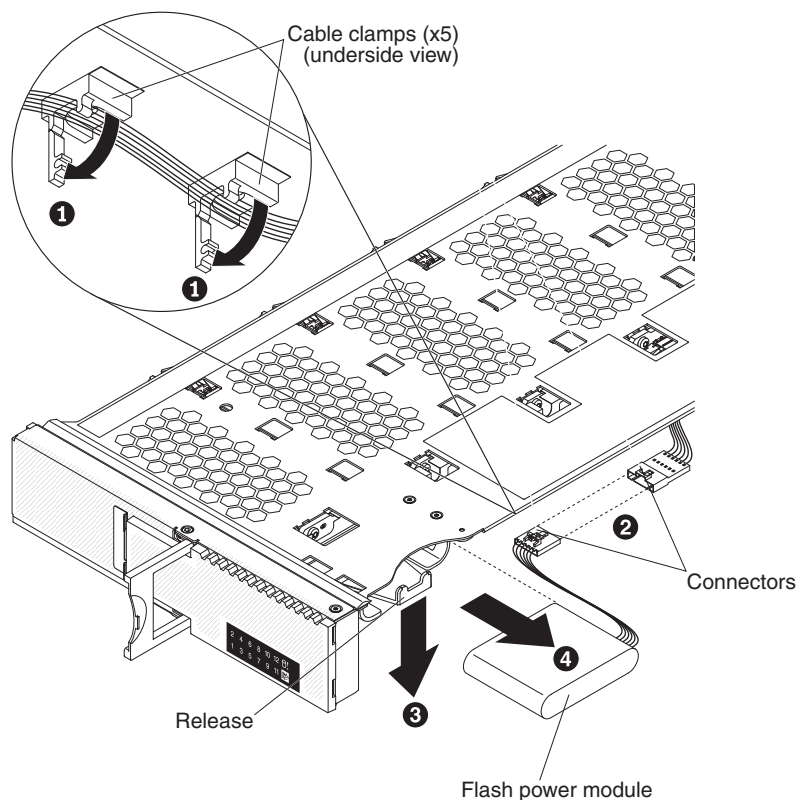
1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. If the storage expansion node assembly is installed in an Flex System Enterprise Chassis, remove it (see “Removing the storage expansion node assembly from the Flex System Enterprise Chassis” on page 18 for instructions).
3. Carefully lay the storage expansion node assembly on a flat, static-protective surface.
4. Remove the cover from the storage expansion node (see “Removing the cover from the storage expansion node” on page 8 for instructions).

**Attention:** Make sure that the drive drawer is supported when it is open. The weight of installed drives can cause the storage expansion node assembly to be unstable when the drive drawer is open.

5. Open the drive drawer approximately 30 cm (12 in.).

## Procedure

To remove the flash power module, complete the following steps.



1. Disconnect the flash power module from the connector.
2. Pull down slightly on the outer edge of the blue flash power module bracket and remove the flash power module.

## What to do next

If you are installing a replacement flash power module, continue to “Replacing the flash power module.” If you are instructed to return the flash power module, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

If you are not installing a replacement flash power module, close the drive drawer and go to “Completing the installation” on page 14.

## Replacing the flash power module

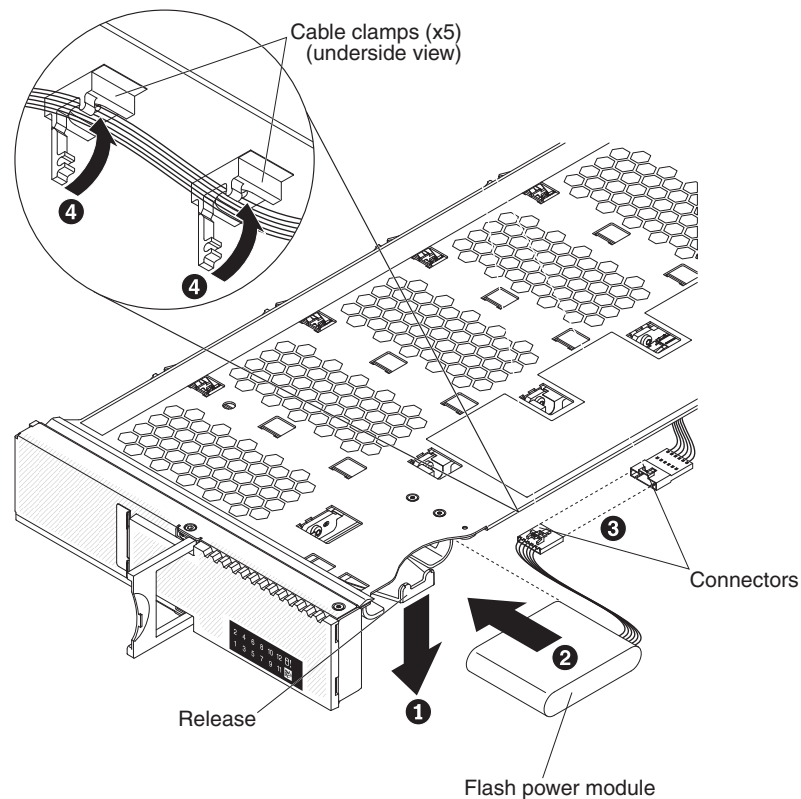
Use these instructions to install a replacement flash power module in the storage expansion node.

### Before you begin

Before you install the flash power module, read “Safety” on page v and “Installation guidelines” on page 7.

### Procedure

To install a flash power module, complete the following steps.



**Attention:** Make sure that the drive drawer is supported when it is open. The weight of installed drives can cause the storage expansion node assembly to be unstable when the drive drawer is open.

1. With the drive drawer open approximately 15 cm (6 in.), press down slightly on the release on the outer edge of the blue flash power module bracket and insert the flash power module into the bracket, with the cable oriented toward the outside of the drive drawer, as shown in the following illustration.

2. Connect the flash power module to the connector on the underside of the drawer. The connectors are keyed to prevent incorrect insertion.
3. Route the cable through the cable clamps on the underside of the drawer and close the cable clamps.

## What to do next

After you install the flash power module, complete the following steps:

1. Close the drive drawer.
2. Install the cover on the storage expansion node (see “Installing the cover on the storage expansion node” on page 14 for instructions).
3. Install the storage expansion node assembly into the chassis (see “Installing the storage expansion node in an Flex System Enterprise Chassis” on page 15 for instructions).

## Removing the storage expansion node from the expansion shelf

Use these instructions to remove the storage expansion node from the expansion shelf.

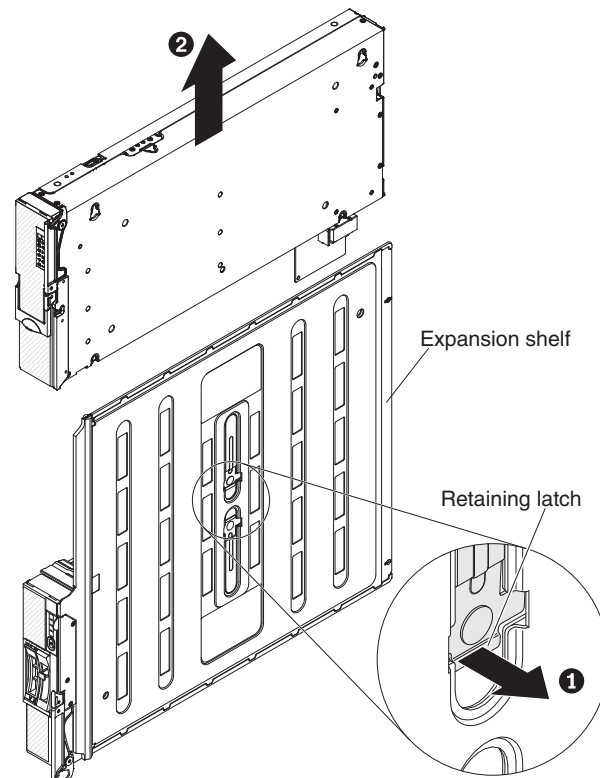
### Before you begin

Before you remove the storage expansion node, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. Remove any drives that are installed in the storage expansion node.
3. If the storage expansion node assembly is installed in an Flex System Enterprise Chassis, remove it (see “Removing the storage expansion node assembly from the Flex System Enterprise Chassis” on page 18 for instructions).
4. Carefully lay the storage expansion node assembly on a flat, static-protective surface with the storage expansion node bezel facing you.
5. If a compute node is installed in the storage expansion node assembly, complete the following steps:
  - a. Remove the compute node cover (see the compute node *Installation and Service Guide* for instructions).
  - b. If any I/O expansion adapters in the compute node are blocking access to the interposer connector, remove them (see the compute node *Installation and Service Guide* for instructions).
  - c. Disconnect the interposer cable from the interposer connector on the compute node system board.
  - d. If you removed any I/O expansion adapters from the compute node, install them (see the compute node *Installation and Service Guide* for instructions).
  - e. Install the compute node cover (see the compute node *Installation and Service Guide* for instructions).
6. If a flash/RAID adapter and flash power module are installed in the storage expansion node, remove them (see “Removing the flash/RAID adapter” on page 43 and “Removing the flash power module” on page 45 for instructions).

## Procedure

On the underside of the expansion shelf, lift the raised edge of the retaining latch that secures the storage expansion node to the shelf while you slide the storage expansion node away from the center of the shelf, as shown in the following illustration.



## What to do next

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

Continue to “Replacing the storage expansion node.”

## Replacing the storage expansion node

Use these instructions to attach a replacement storage expansion node to the expansion shelf.

### Before you begin

Before you attach the storage expansion node to the expansion shelf, complete the following steps:

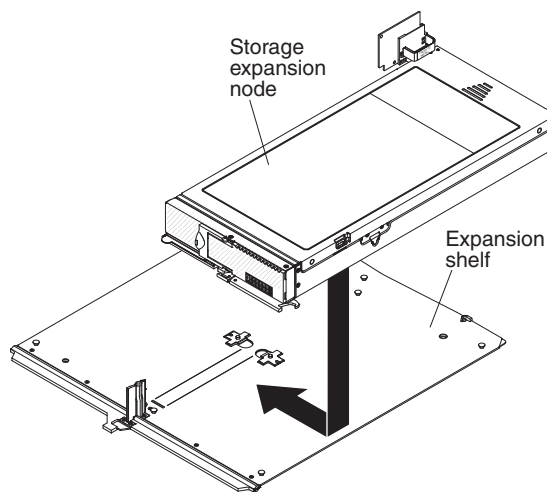
1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. Lay the expansion shelf on a flat, static-protective surface with the black edge facing you.

3. If a compute node is attached to the shelf, remove the compute node cover, if you have not already done so (see the compute node *Installation and Service Guide* for instructions).

## Procedure

**Attention:** If a compute node is attached to the shelf, bend the interposer cable up and over the storage expansion node to ensure that the cable and connector are clear of the compute node.

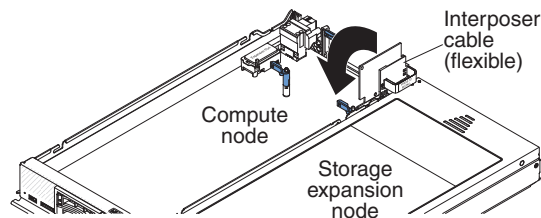
With the left edge of the storage expansion node aligned with the expansion node alignment mark on the expansion shelf, orient the slots on the bottom of the storage expansion node with the posts on the right side of the expansion shelf. Then, slide the storage expansion node toward the center of the shelf until the retention latch clicks into place, as shown in the following illustration.



## What to do next

Complete the following steps:

1. If a compute node is attached to the expansion shelf, complete the following steps:
  - a. If any I/O expansion adapters in the compute node are blocking access to the interposer connector, remove them (see the compute node *Installation and Service Guide* for instructions).
  - b. Connect the interposer cable to the interposer connector on the compute node system board, as shown in the following illustration.



- c. If you removed any I/O expansion adapters from the compute node, install them (see the compute node *Installation and Service Guide* for instructions).
- d. Install the compute node cover (see the compute node *Installation and Service Guide* for instructions).

2. Install a flash/RAID adapter and flash power module, if necessary (see “Installing a flash/RAID adapter and flash power module” on page 12 for instructions).
3. Install the storage expansion node assembly into the chassis (see “Installing the storage expansion node in an Flex System Enterprise Chassis” on page 15 for instructions).
4. Install drives in the storage expansion node (see “Installing a hot-swap drive” on page 17 for instructions).

## Removing a hot-swap drive

Use these instructions to remove a hot-swap drive from the storage expansion node.

### Before you begin

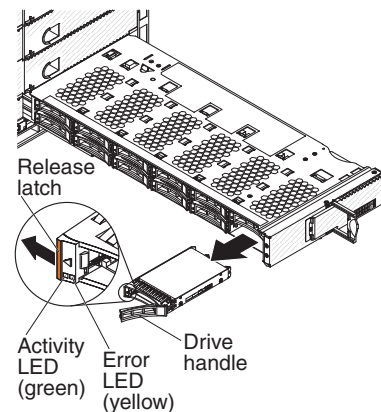
Before you remove a hot-swap drive, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. See the illustration in “Drive drawer” on page 4 for the locations of the drive bays.
3. Back up all important data before you make changes to drives.

**Attention:** To ensure proper cooling and protect system data integrity, do not operate the storage expansion node for an extended period of time with the drive drawer open. Keep the drive drawer closed when you are not installing or removing drives.

### Procedure

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



1. Open the drive drawer as far as necessary to access the drive that you want to remove.
2. Press the orange release latch on the drive to release the drive handle.
3. Pull the drive handle to remove the drive from the bay.
4. Close the drive drawer.

### What to do next

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

a replacement drive, continue to “Replacing a hot-swap drive.”

## Replacing a hot-swap drive

Use these instructions to install a replacement hot-swap drive in the storage expansion node.

### Before you begin

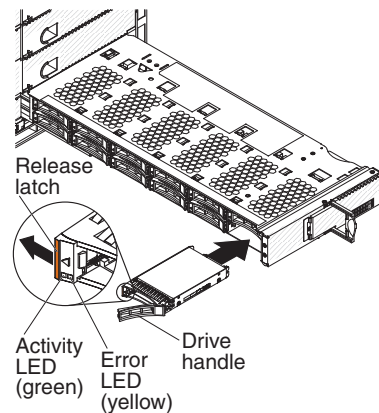
Before you install a hot-swap drive, complete the following steps:

1. Read “Safety” on page v and “Installation guidelines” on page 7.
2. See the illustration in “Drive drawer” on page 4 for the locations of the drive bays.

**Attention:** To ensure proper cooling and protect system data integrity, do not operate the storage expansion node for an extended period of time with the drive drawer open. Keep the drive drawer closed when you are not installing or removing drives.

### Procedure

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



1. Open the drive drawer as far as necessary to access the drive bay that you want to use.
2. Touch the static-protective package that contains the drive to any *unpainted* metal surface on the Flex System Enterprise Chassis or any *unpainted* metal surface on any other grounded rack component; then, remove the drive from the package.
3. Press the orange release latch on the drive to release the drive handle.
4. Slide the drive into the bay until it is firmly seated in the connector.
5. Lock the drive in place by closing the drive handle.
6. Close the drive drawer.
7. Check the drive status LED on the control panel on the front of the storage expansion node to make sure that the drive is operating correctly (see “Control panel” on page 5 for the location of the drive status LED).



---

## Appendix. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you.

Use this information to obtain additional information about Lenovo and Lenovo products, and determine what to do if you experience a problem with your Lenovo system or optional device.

**Note:** This section includes references to IBM web sites and information about obtaining service. IBM is Lenovo's preferred service provider for the System x, Flex System, and NeXtScale System products.

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### Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself.

If you believe that you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare before you call.

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated software, firmware, and operating-system device drivers for your Lenovo product. The Lenovo Warranty terms and conditions state that you, the owner of the Lenovo product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us> to make sure that the hardware and software is supported by your product.
- Go to <http://www.ibm.com/supportportal> to check for information to help you solve the problem.
- Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.
  - Hardware and Software Maintenance agreement contract numbers, if applicable
  - Machine type number (Lenovo 4-digit machine identifier)
  - Model number
  - Serial number
  - Current system UEFI and firmware levels
  - Other pertinent information such as error messages and logs
- Go to [http://www.ibm.com/support/entry/portal/Open\\_service\\_request](http://www.ibm.com/support/entry/portal/Open_service_request) to submit an Electronic Service Request. Submitting an Electronic Service Request

will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The Lenovo product documentation also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

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## Using the documentation

Information about your Lenovo system and preinstalled software, if any, or optional device is available in the product documentation. That documentation can include printed documents, online documents, readme files, and help files.

See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. Lenovo maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/supportportal>.

---

## Getting help and information from the World Wide Web

Up-to-date information about Lenovo products and support is available on the World Wide Web.

On the World Wide Web, up-to-date information about Lenovo systems, optional devices, services, and support is available at <http://www.ibm.com/supportportal>. The most current version of the product documentation is available in the following product-specific Information Centers:

**Flex System products:**

<http://pic.dhe.ibm.com/infocenter/flexsys/information/index.jsp>

**System x products:**

<http://www.ibm.com/systems/x>

**NeXtScale System products:**

<http://pic.dhe.ibm.com/infocenter/nxtscale/documentation/index.jsp>

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## How to send DSA data

You can use the Enhanced Customer Data Repository to send diagnostic data to IBM.

Before you send diagnostic data to IBM, read the terms of use at <http://www.ibm.com/de/support/ecurep/terms.html>.

You can use any of the following methods to send diagnostic data:

- **Standard upload:** [http://www.ibm.com/de/support/ecurep/send\\_http.html](http://www.ibm.com/de/support/ecurep/send_http.html)
- **Standard upload with the system serial number:** [http://www.ecurep.ibm.com/app/upload\\_hw](http://www.ecurep.ibm.com/app/upload_hw)

- **Secure upload:** [http://www.ibm.com/de/support/ecurep/send\\_http.html#secure](http://www.ibm.com/de/support/ecurep/send_http.html#secure)
- **Secure upload with the system serial number:** [https://www.ecurep.ibm.com/app/upload\\_hw](https://www.ecurep.ibm.com/app/upload_hw)

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## Creating a personalized support web page

You can create a personalized support web page by identifying Lenovo products that are of interest to you.

To create a personalized support web page, go to <http://www.ibm.com/support/mynotifications>. From this personalized page, you can subscribe to weekly email notifications about new technical documents, search for information and downloads, and access various administrative services.

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## Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with your Lenovo products.

For more information about Support Line and other IBM services, see <http://www.ibm.com/services> or see <http://www.ibm.com/planetwide> for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

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## Hardware service and support

IBM is Lenovo's preferred service provider for the System x, Flex System and NeXtScale System products.

You can receive hardware service through your Lenovo reseller or from IBM. To locate a reseller authorized by Lenovo to provide warranty service, go to <http://www.ibm.com/partnerworld/> and click **Business Partner Locator**. For IBM support telephone numbers, see <http://www.ibm.com/planetwide>. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

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## Taiwan product service

Use this information to contact IBM Taiwan product service.

台灣 IBM 產品服務聯絡方式：  
台灣國際商業機器股份有限公司  
台北市松仁路7號3樓  
電話：0800-016-888

IBM Taiwan product service contact information:

IBM Taiwan Corporation  
3F, No 7, Song Ren Rd.  
Taipei, Taiwan  
Telephone: 0800-016-888

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

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Internet Explorer, Microsoft, and Windows are trademarks of the Microsoft group of companies.

Linux is a registered trademark of Linus Torvalds.

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## Important notes

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

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

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

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

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

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

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as total bytes written (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. Lenovo is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

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

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

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## Recycling information

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

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## Particulate contamination

**Attention:** Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document.

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

*Table 1. Limits for particulates and gases*

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

Table 1. Limits for particulates and gases (continued)

Contaminant	Limits
	<p><sup>1</sup> ASHRAE 52.2-2008 - <i>Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size</i>. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.</p> <p><sup>2</sup> The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.</p> <p><sup>3</sup> ANSI/ISA-71.04-1985. <i>Environmental conditions for process measurement and control systems: Airborne contaminants</i>. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.</p>

---

## Telecommunication regulatory statement

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

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## Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

### Federal Communications Commission (FCC) statement

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

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

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

### Industry Canada Class A emission compliance statement

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



## **Avis de conformité à la réglementation d'Industrie Canada**

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

## **Australia and New Zealand Class A statement**

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

## **European Union EMC Directive conformance statement**

This product is in conformity with the protection requirements of EU Council Directive 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

## **Germany Class A statement**

**Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit**

**Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit** Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 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 Betriebsmitteln** Dieses Produkt entspricht dem „Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln“ EMVG (früher „Gesetz über die elektromagnetische Verträglichkeit von Geräten“). Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) in der Bundesrepublik Deutschland.

**Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007**

(früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EG Richtlinie 2004/108/EC (früher 89/336/EWG), für Geräte der Klasse A.

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

Informationen in Hinsicht EMVG Paragraph 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.

## Japan VCCI Class A statement

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波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

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

## Japan Electronics and Information Technology Industries Association (JEITA) statement

高調波ガイドライン準用品

Japan Electronics and Information Technology Industries Association (JEITA)  
Confirmed Harmonics Guidelines with Modifications (products greater than 20 A per phase)

## Korea Communications Commission (KCC) statement

이 기기는 업무용(A급)으로 전자파적합기기로  
서 판매자 또는 사용자는 이 점을 주의하시기  
바라며, 가정외의 지역에서 사용하는 것을 목  
적으로 합니다.

This is electromagnetic wave compatibility equipment for business (Type A). Sellers and users need to pay attention to it. This is for any areas other than home.

## Russia Electromagnetic Interference (EMI) Class A statement

ВНИМАНИЕ! Настоящее изделие относится к классу А.  
В жилых помещениях оно может создавать радиопомехи, для  
снижения которых необходимы дополнительные меры

## People's Republic of China Class A electronic emission statement

中华人民共和国“A类”警告声明

声明

此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

## Taiwan Class A compliance statement

警告使用者：  
這是甲類的資訊產品，在  
居住的環境中使用時，可  
能會造成射頻干擾，在這  
種情況下，使用者會被要  
求採取某些適當的對策。



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