

IBM Storwize V5000E

*Quick Installation Guide  
Storwize V5010E and Storwize V5030E  
and expansion enclosures*



**Note**

Before using this information and the product it supports, read the following information:

- The general information in [“Notices” on page 105](#)
- The information in the [“Safety and environmental notices” on page xiii](#)
- The information in the *IBM Environmental Notices and User Guide* (provided on a DVD)

This edition applies to version 8, release 2, modification 1 and to all subsequent modifications until otherwise indicated in new editions.

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## Compliance standards

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**Note:** This product was designed, tested, manufactured, and certified for safe operation. It complies with IEC 60950-1 and/or IEC 62368-1 and where required, to relevant national differences/deviations (NDs) to these IEC base standards. This includes, but is not limited to: EN (European Norms including all Amendments under the Low Voltage Directive), UL/CSA (North America bi-national harmonized and marked per accredited NRTL agency listings), and other such derivative certifications according to corporate determinations and latest regional publication compliance standardized requirements.

Regulatory Model ID (RMID) or Machine Type - Models (MT-Ms) may also be used to supplement identification (ID) for worldwide (WW) co-compliance filings or registrations with regulatory bodies.



# Safety and environmental notices

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Review all safety notices, environmental notices, and electronic emission notices before you install and use the product.

**Suitability for telecommunication environment:** This product is not intended to connect directly or indirectly by any means whatsoever to interfaces of public telecommunications networks.

To find the translated text for a caution or danger notice, complete the following steps.

1. Look for the identification number at the end of each caution notice or each danger notice. In the following examples, the numbers (C001) and (D002) are the identification numbers.



**CAUTION:** A caution notice indicates the presence of a hazard that has the potential of causing moderate or minor personal injury. (C001)



**DANGER:** A danger notice indicates the presence of a hazard that has the potential of causing death or serious personal injury. (D002)

2. Locate the *IBM Systems Safety Notices* with the user publications that were provided with your system hardware.
3. Find the matching identification number in the *IBM Systems Safety Notices*. Then, review the topics about the safety notices to ensure that you are in compliance.
4. (Optional) Read the multilingual safety instructions on the system website.
  - a. Go to [www.ibm.com/support](http://www.ibm.com/support)
  - b. Search for " Storwize® V5000E "
  - c. Click the documentation link.

## Safety notices and labels

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Review the safety notices and safety information labels before you use this product.

To view a PDF file, you need Adobe Acrobat Reader. You can download it at no charge from the Adobe website:

[www.adobe.com/support/downloads/main.html](http://www.adobe.com/support/downloads/main.html)

### IBM Systems Safety Notices

This publication contains the safety notices for the IBM Systems products in English and other languages. Anyone who plans, installs, operates, or services the system must be familiar with and understand the safety notices. Read the related safety notices before you begin work.

#### Notes:

- The *IBM System Safety Notices* document is organized into two sections. The danger and caution notices without labels are organized alphabetically by language in the "Danger and caution notices by language" section. The danger and caution notices that are accompanied with a label are organized by label reference number in the "Labels" section.
- You can find and download the current *IBM System Safety Notices* by searching for Publication number **G229-9054** in the [IBM Publications Center](#).

The following notices and statements are used in IBM documents. They are listed in order of decreasing severity of potential hazards.

#### Danger notice definition

A special note that emphasizes a situation that is potentially lethal or extremely hazardous to people.

### Caution notice definition

A special note that emphasizes a situation that is potentially hazardous to people because of some existing condition, or to a potentially dangerous situation that might develop because of some unsafe practice.

**Note:** In addition to these notices, labels might be attached to the product to warn of potential hazards.

### Finding translated notices

Each safety notice contains an identification number. You can use this identification number to check the safety notice in each language.

To find the translated text for a caution or danger notice:

1. In the product documentation, look for the identification number at the end of each caution notice or each danger notice. In the following examples, the numbers (D002) and (C001) are the identification numbers.



**DANGER:** A danger notice indicates the presence of a hazard that has the potential of causing death or serious personal injury. (D002)



**CAUTION:** A caution notice indicates the presence of a hazard that has the potential of causing moderate or minor personal injury. (C001)

2. After you download the *IBM System Safety Notices* document, open it.
3. Under the language, find the matching identification number. Review the topics about the safety notices to ensure that you are in compliance.

### Caution notices for the system

Ensure that you understand the caution notices for the system.

Use the reference numbers in parentheses at the end of each notice (for example, D005) to find the matching translated notice in *IBM Systems Safety Notices*.



#### CAUTION:

33.6-46.3 kg (74-102 lbs)	46.3-61.7 kg (102-136 lbs)	≥61.7-100 kg (136-220 lbs)

snc01053

The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)



**CAUTION:** To avoid personal injury, before lifting this unit, remove all appropriate subassemblies per instructions to reduce the system weight. (C012)



**CAUTION:** CAUTION regarding IBM provided VENDOR LIFT TOOL:

- Operation of LIFT TOOL by authorized personnel only
- LIFT TOOL intended for use to assist, lift, install, remove units (load) up into rack elevations. It is not to be used loaded transporting over major ramps nor as a replacement for such designated tools like pallet jacks, walkies, fork trucks and such related relocation practices. When this is not practicable, specially trained persons or services must be used (for instance, riggers or movers). Read and completely understand the contents of LIFT TOOL operator's manual before using.
- Read and completely understand the contents of LIFT TOOL operator's manual before using. Failure to read, understand, obey safety rules, and follow instructions may result in property damage and/or personal injury. If there are questions, contact the vendor's service and support. Local paper manual must remain with machine in provided storage sleeve area. Latest revision manual available on vendor's website.
- Test verify stabilizer brake function before each use. Do not over-force moving or rolling the LIFT TOOL with stabilizer brake engaged.
- Do not raise, lower or slide platform load shelf unless stabilizer (brake pedal jack) is fully engaged. Keep stabilizer brake engaged when not in use or motion.
- Do not move LIFT TOOL while platform is raised, except for minor positioning.
- Do not exceed rated load capacity. See LOAD CAPACITY CHART regarding maximum loads at center versus edge of extended platform.
- Only raise load if properly centered on platform. Do not place more than 200 lb (91 kg) on edge of sliding platform shelf also considering the load's center of mass/gravity (CoG).
- Do not corner load the platform tilt riser accessory option. Secure platform riser tilt option to main shelf in all four (4x) locations with provided hardware only, prior to use. Load objects are designed to slide on/off smooth platforms without appreciable force, so take care not to push or lean. Keep riser tilt option flat at all times except for final minor adjustment when needed.
- Do not stand under overhanging load.
- Do not use on uneven surface, incline or decline (major ramps).
- Do not stack loads. (C048, part 1 of 2)

- **Do not operate while under the influence of drugs or alcohol.**
- **Do not support ladder against LIFT TOOL.**
- **Tipping hazard. Do not push or lean against load with raised platform.**
- **Do not use as a personnel lifting platform or step. No riders.**
- **Do not stand on any part of lift. Not a step.**
- **Do not climb on mast.**
- **Do not operate a damaged or malfunctioning LIFT TOOL machine.**
- **Crush and pinch point hazard below platform. Only lower load in areas clear of personnel and obstructions. Keep hands and feet clear during operation.**
- **No Forks. Never lift or move bare LIFT TOOL MACHINE with pallet truck, jack or fork lift.**
- **Mast extends higher than platform. Be aware of ceiling height, cable trays, sprinklers, lights, and other overhead objects.**
- **Do not leave LIFT TOOL machine unattended with an elevated load.**
- **Watch and keep hands, fingers, and clothing clear when equipment is in motion.**
- **Turn Winch with hand power only. If winch handle cannot be cranked easily with one hand, it is probably over-loaded. Do not continue to turn winch past top or bottom of platform travel. Excessive unwinding will detach handle and damage cable. Always hold handle when lowering, unwinding. Always assure self that winch is holding load before releasing winch handle.**
- **A winch accident could cause serious injury. Not for moving humans. Make certain clicking sound is heard as the equipment is being raised. Be sure winch is locked in position before releasing handle. Read instruction page before operating this winch. Never allow winch to unwind freely. Freewheeling will cause uneven cable wrapping around winch drum, damage cable, and may cause serious injury. (C048, part 2 of 2)**



**CAUTION:** Removing components from the upper positions in the rack cabinet improves rack stability during a relocation. Follow these general guidelines whenever you relocate a populated rack cabinet within a room or building.

- Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet. When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must observe the following precautions.
  - Remove all devices in the 32U position and above.
  - Ensure that the heaviest devices are installed in the bottom of the rack cabinet.
  - Ensure that there are no empty U-levels between devices installed in the rack cabinet below the 32U level.
- If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
- If the rack cabinet you are relocating was supplied with removable outriggers they must be reinstalled before the cabinet is relocated.
- Inspect the route that you plan to take to eliminate potential hazards.
- Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that comes with your rack cabinet for the weight of a loaded rack cabinet.
- Verify that all door openings are at least 760 x 230 mm (30 x 80 in.).
- Ensure that all devices, shelves, drawers, doors, and cables are secure.
- Ensure that the four leveling pads are raised to their highest position.
- Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.
- Do not use a ramp inclined at more than 10 degrees.
- When the rack cabinet is in the new location, complete the following steps:



- Lower the four leveling pads.
- Install stabilizer brackets on the rack cabinet.
- If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.
- If a long-distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also lower the leveling pads to raise the casters off the pallet and bolt the rack cabinet to the pallet. (R002)

## Danger notices for the system

Ensure that you are familiar with the danger notices for your system.

Use the reference numbers in parentheses at the end of each notice (for example, D005) to find the matching translated notice in *IBM Systems Safety Notices*.



**DANGER:** When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:

- If IBM supplied a power cord(s), connect power to this unit only with the IBM provided power cord. Do not use the IBM provided power cord for any other product.
- Do not open or service any power supply assembly.
- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.
- Connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.
- Connect any equipment that will be attached to this product to properly wired outlets.
- 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 procedures when installing, moving, or opening covers on this product or attached devices.

To disconnect:

1. Turn off everything (unless instructed otherwise).
2. Remove the power cords from the outlets.
3. Remove the signal cables from the connectors.
4. Remove all cables from the devices.

To connect:

1. Turn off everything (unless instructed otherwise).
  2. Attach all cables to the devices.
  3. Attach the signal cables to the connectors.
  4. Attach the power cords to the outlets.
  5. Turn on the devices.
- Sharp edges, corners and joints might be present in and around the system. Use care when handling equipment to avoid cuts, scrapes and pinching. (D005)



**DANGER:** Heavy equipment–personal injury or equipment damage might result if mishandled. (D006)



**DANGER:** DANGER: Serious injury or death can occur if loaded lift tool falls over or if a heavy load falls off the lift tool. Always completely lower the lift tool load plate and properly secure the load on the lift tool before moving or using the lift tool to lift or move an object. (D010)



**DANGER:** Racks with a total weight of > 227 kg (500 lb.), Use Only Professional Movers! (R003)




**DANGER:** Do not transport the rack via fork truck unless it is properly packaged, secured on top of the supplied pallet. (R004)

**DANGER:**



**Main Protective Earth (Ground):**

This symbol is marked on the frame of the rack.

The **PROTECTIVE EARTHING CONDUCTORS** should be terminated at that point. A recognized or certified closed loop connector (ring terminal) should be used and secured to the frame with a lock washer using a bolt or stud. The connector should be properly sized to be suitable for the bolt or stud, the locking washer, the rating for the conducting wire used, and the considered rating of the breaker. The intent is to ensure the frame is electrically bonded to the **PROTECTIVE EARTHING CONDUCTORS**. The hole that the bolt or stud goes into where the terminal conductor and the lock washer contact should be free of any non-conductive material to allow for metal to metal contact. All **PROTECTIVE EARTHING CONDUCTORS** should terminate at this main protective earthing terminal or at points marked with . (R010)

## Special caution and safety notices

This information describes special safety notices that apply to the system. These notices are in addition to the standard safety notices that are supplied; they address specific issues that are relevant to the equipment provided.

### General safety

When you service the system, you must follow these general safety guidelines.

Use the following general rules to ensure safety to yourself and others.

- Observe good housekeeping in the area where the devices are kept during and after maintenance.
- Follow the guidelines when lifting any heavy object:
  1. Ensure that you can stand safely without slipping.
  2. Distribute the weight of the object equally between your feet.
  3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
  4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any objects that weigh more than 18 kg (40 lb) or objects that you think are too heavy for you.*
- Do not perform any action that causes a hazard or makes the equipment unsafe.
- Before you start the device, ensure that other personnel are not in a hazardous position.
- Place removed covers and other parts in a safe place, away from all personnel, while you are servicing the unit.
- Keep your tool case away from walk areas so that other people cannot trip over it.

- Do not wear loose clothing that can be trapped in the moving parts of a device. Ensure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconducting clip, approximately 8 cm (3 in.) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

**Remember:** Metal objects are good electrical conductors.

- Wear safety glasses when you are hammering, drilling, soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that might be hazardous to your eyes.
- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.
- Reinstall all covers correctly after you have finished servicing the unit.

## Handling static-sensitive devices

Ensure that you understand how to handle devices that are sensitive to static electricity.



**Attention:** Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective bags until you are ready to install them.

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

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its antistatic bag, touch it to an unpainted metal part of the system unit for at least 2 seconds. (This action removes static electricity from the package and from your body).
- Remove the device from its package and install it directly into your system, without putting it down. If it is necessary to put the device down, place it onto its static-protective bag. (If your device is an adapter, place it component-side up.) Do not place the device onto the cover of the system or onto a metal table.
- Take additional care when you handle devices during cold weather. Indoor humidity tends to decrease in cold weather, causing an increase in static electricity.

## Power and cabling information for NEBS (Network Equipment-Building System) GR-1089-CORE

The following comments apply to IBM storage devices that have been designated as conforming to NEBS (Network Equipment-Building System) GR-1089-CORE.

The equipment is suitable for installation at:

- Network telecommunications facilities
- Locations where the NEC (National Electrical Code) applies

### Note:

- This product is not intended to connect directly or indirectly by any means whatsoever to interfaces of public telecommunications networks.
- The AC-powered system does not require the use of an external surge protection device (SPD).
- The DC-powered system employs an isolated DC return (DC-I) design. The DC battery return terminal *shall not* be connected to the chassis or frame ground.
- The storage device (DC power) is intended to be installed in a Common Bonding Network (or mesh network) as described in GR-1089-CORE, Issue 6 or latest revision.

## Environmental notices

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This information contains all the required environmental notices for IBM Systems products in English and other languages.

The *[IBM Systems Environmental Notices](#)* includes statements on limitations, product information, product recycling and disposal, battery information, flat panel display, refrigeration and water-cooling systems, external power supplies, and safety data sheets.

## About this guide

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This publication provides information that helps you install and initialize IBM Storwize V5000E systems.

### References to control enclosures

Unless otherwise stated, references to 2072-212 control enclosures are assumed to include 2072-S12 control enclosures.

References to 2072-312 control enclosures are assumed to include 2072-T12 control enclosures.

References to 2072-224 control enclosures are assumed to include 2072-S24 control enclosures.

References to 2072-324 control enclosures are assumed to include 2072-T24 control enclosures.

### References to expansion enclosures

Unless otherwise stated, references to 2072-12F expansion enclosures are assumed to include 2072-E12 expansion enclosures.

References to 2072-24F expansion enclosures are assumed to include 2072-E24 expansion enclosures.

References to 2072-92F expansion enclosures are assumed to include 2072-E92 expansion enclosures.

## Who should use this guide

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This guide is intended for installers of the system.

Before configuring your system, ensure that you follow the procedures as listed. Be sure to gather IP addresses that you will need before you begin the installation.

## Publications and related libraries

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Product manuals, other publications, and websites that contain information that is related to your system are available.

### IBM Knowledge Center for Storwize V5000E

The information collection in the IBM Knowledge Center contains all of the information that is required to install, configure, and manage the system. The information collection in the IBM Knowledge Center is updated between product releases to provide the most current documentation. The information collection is available at the following website:

[Knowledge Center](#)

### IBM websites for help, services, and information

Table 1 on page [xxi](#) lists websites where you can find help, services, and more information.

Website	Address
Directory of worldwide contacts	<a href="http://www.ibm.com/planetwide">http://www.ibm.com/planetwide</a>
Support for Storwize V5000E 2072	<a href="http://www.ibm.com/support">www.ibm.com/support</a>
IBM Redbooks® publications	<a href="http://www.redbooks.ibm.com/">www.redbooks.ibm.com/</a>

## Publications in the Knowledge Center

Each PDF publication in the library is available in the IBM Knowledge Center by clicking the title in the "Link to PDF" column:

Title	Description	Link to PDF file
<i>IBM Spectrum Virtualize Software Command-Line Interface User's Guide</i> <i>For IBM Spectrum Virtualize as Software Only, IBM Spectrum Virtualize for Public Cloud, IBM SAN Volume Controller, IBM Storwize V7000, IBM Storwize V5000, IBM Storwize V5000E, IBM Storwize V5100, IBM FlashSystem V9000, and IBM FlashSystem 9100</i>	The guide describes the commands that you can use from the Storwize V5000E command-line interface (CLI).	<a href="#">Command-Line Interface User's Guide</a>

### Related accessibility information

To view a PDF file, you need Adobe Reader, which can be downloaded from the Adobe website:  
[www.adobe.com/support/downloads/main.html](http://www.adobe.com/support/downloads/main.html)

## Related websites

The following websites provide information about the system, related products, or technologies.

Type of information	Website
Technical support for IBM products	<a href="http://www.ibm.com/support">www.ibm.com/support</a>
IBM Electronic Support registration	<a href="http://www-01.ibm.com/support/electronicssupport/">www-01.ibm.com/support/electronicssupport/</a>

## Sending your comments

Your feedback is important in helping to provide the most accurate and highest-quality information.

To submit any comments, send your comments by email to [ibmkc@us.ibm.com](mailto:ibmkc@us.ibm.com). Include the following information in your email:

- Exact publication title and version.
- Page, table, or illustration numbers that you are commenting on.
- A detailed description of any information that needs to be changed.

## How to get information, help, and technical assistance

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

### Information

IBM maintains pages on the web where you can get information about IBM products and fee services, product implementation and usage assistance, break and fix service support, and the latest technical information. For more information, refer to [Table 3 on page xxiii](#).

Table 3. IBM websites for help, services, and information

Website	Address
IBM home page	<a href="http://www.ibm.com">http://www.ibm.com</a>
Directory of worldwide contacts	<a href="http://www.ibm.com/planetwide">http://www.ibm.com/planetwide</a>
Support for products	<a href="http://www.ibm.com/support">www.ibm.com/support</a>

**Note:** Available services, telephone numbers, and web links are subject to change without notice.

### Help and service

Before you call for support, be sure to have your IBM Customer Number available. If you are in the US or Canada, you can call 1 (800) IBM SERV for help and service. From other parts of the world, see <http://www.ibm.com/planetwide> for the number that you can call.

When you call from the US or Canada, choose the **storage** option. The agent decides where to route your call, to either storage software or storage hardware, depending on the nature of your problem.

If you call from somewhere other than the US or Canada, you must choose the **hardware** option when you call for assistance. When you call IBM to service the product, follow these guidelines for the **software** and **hardware** option:

#### Software option

Identify the Storwize V5000E product as your product and supply your customer number as proof of purchase. The customer number is a 7-digit number (0000000 - 9999999) assigned by IBM when the product is purchased. Your customer number might be on the customer information worksheet or on the invoice from your storage purchase. If asked for an operating system, use **Storage**.

#### Hardware option

Provide the serial number and appropriate 4-digit machine type. For Storwize V5000E, the machine type is 2072.

In the US and Canada, hardware service and support can be extended to 24 x 7 on the same day. The base warranty is 9x5 on the next business day.

### Getting help online

You can find information about products, solutions, partners, and support on the IBM website.

To find up-to-date information about products, services, and partners, visit the IBM website at [www.ibm.com/support](http://www.ibm.com/support).

### Before you call

Make sure that you take steps to try to solve the problem yourself before you call. Some suggestions for resolving the problem before you call IBM Support include:

- Check all cables to make sure that they are connected.
- Check all power switches to make sure that the system and optional devices are turned on.
- Use the troubleshooting information in your system documentation. The troubleshooting section of IBM Knowledge Center contains procedures to help you diagnose problems.
- Go to the IBM Support website at [www.ibm.com/support](http://www.ibm.com/support) to check for technical information, hints, tips, and new device drivers or to submit a request for information.

### Using the documentation

Information about your IBM storage system is available in the documentation that comes with the product.

That documentation includes printed documents, online documents, readme files, and help files in addition to the Knowledge Center. See the troubleshooting information for diagnostic instructions. The troubleshooting procedure might require you to download updated device drivers or software . IBM maintains pages on the web where you can get the latest technical information and download device drivers and updates. To access this information, go to [www.ibm.com/support](http://www.ibm.com/support) and follow the instructions. Also, some documents are available through the IBM Publications Center.

### **Sign up for the Support Line Offering**

If you have questions about how to use and configure the machine, sign up for the IBM Support Line offering to get a professional answer.

The maintenance that is supplied with the system provides support when there is a problem with a hardware component or a fault in the system machine code. At times, you might need expert advice about using a function that is provided by the system or about how to configure the system. Purchasing the IBM Support Line offering gives you access to this professional advice for your system, and in the future.

Contact your local IBM sales representative or your support group for availability and purchase information.



# Chapter 1. System overview

Each Storwize V5000E system is a virtualizing RAID storage system. Storwize V5010E and Storwize V5030E system models are available.

## IBM Spectrum Virtualize software

IBM Storwize V5000E systems are built with IBM Spectrum Virtualize software, which is part of the IBM Spectrum Storage™ family.

IBM Spectrum Virtualize is a key member of the IBM Spectrum Storage portfolio. It is a highly flexible storage solution that enables rapid deployment of block storage services for new and traditional workloads, on-premises, off-premises and in a combination of both. Designed to help enable cloud environments, it is based on the proven technology. For more information about the IBM Spectrum Storage portfolio, see the following website.

<http://www.ibm.com/systems/storage/spectrum>

The software provides these functions for the host systems that attach to the system:

- Creates a single pool of storage
- Provides logical unit virtualization
- Manages logical volumes

## System hardware

Each Storwize V5000E storage system consists of a set of drive enclosures. The *control enclosure* contains disk drives and two node canisters. *Expansion enclosures* contain disk drives and two expansion canisters.

Figure 1 on page 1 shows the front view of the of the large form factor (LFF) and small form factor (SFF) Storwize V5000E systems.



Figure 1. Front view of the control enclosures

Table 4 on page 2 summarizes the features and machine type and model (MTM) of the Storwize V5000E control enclosures.

System model	MTM	Drives	Features
IBM Storwize V5010E	2072-212	Up to 12 (LFF) 3.5-inch drives.	<ul style="list-style-type: none"> <li>Two node canisters, each with a 2-core, HyperThreaded processor and 8 GB memory per canister.</li> <li>Node canister memory can be expanded to 16 GB or 32 GB, for a maximum of 64 GB per I/O group.</li> <li>Two 1 Gbps Ethernet ports per canister. The second Ethernet port 2 is also the technician port, which is used for system setup.</li> <li>One 12 Gbps SAS port, per node canister, to attach to expansion enclosures.</li> </ul>
	2072-224	Up to 24 (SFF) 2.5-inch drives.	
IBM Storwize V5030E	2072-312	Up to 12 (LFF) 3.5-inch drives.	<ul style="list-style-type: none"> <li>Two node canisters, each with a 6-core, 12-thread processor and 16 GB memory per canister.</li> <li>Node canister memory can be expanded to 32 GB, with a maximum memory of 64 GB per I/O group.</li> <li>One 1 Gbps Ethernet technician port per node canister, which is used for system setup and node service interface.</li> <li>Two 10 Gbps Ethernet ports per canister, which are both used for iSCSI and system management.</li> <li>Two 12 Gbps SAS port per canister for expansion enclosure attachment.</li> </ul>
	2072-324	Up to 24 (SFF) 2.5-inch drives..	

The system also provides the following functions:

- Large scalable cache
- Copy Services:
  - IBM FlashCopy® (point-in-time copy) function, including thin-provisioned FlashCopy to make multiple targets affordable
  - IBM HyperSwap® (active-active copy) function (for Storwize V5030E systems only)
  - Metro Mirror (synchronous copy)
  - Global Mirror (asynchronous copy)
  - Data migration
- Space management:
  - IBM Easy Tier® function to migrate the most frequently used data to higher-performance storage
  - Metering of service quality when combined with IBM Spectrum® Connect. For information, refer to the IBM Spectrum Connect documentation.
  - Thin-provisioned logical volumes
  - Compressed volumes to consolidate storage using data reduction pools
  - Data Reduction pools with deduplication

In addition, Storwize V5010E and Storwize V5030E systems support the expansion enclosures that are listed in [Table 5 on page 2](#).

Enclosure (MTM)	Description	Enclosure height
2072-12F	12-slot expansion enclosure for 3.5-inch drives	2U

Table 5. Supported expansion enclosures (continued)		
Enclosure (MTM)	Description	Enclosure height
2072-24F	24-slot expansion enclosure for 2.5-inch drives	2U
2072-92F	92-slot expansion enclosure for 2.5-inch or 3.5-inch drives	5U

Figure 2 on page 3 shows an example of a Storwize V5000E system as a traditional RAID storage system. The internal drives are configured into arrays. Volumes are created from those arrays.

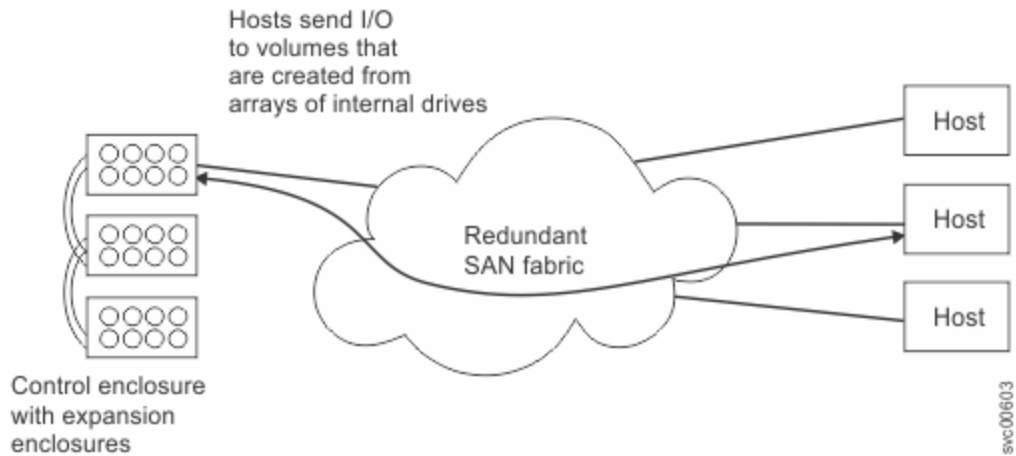


Figure 2. Example of the system as a RAID storage system

The two node canisters are known as an *I/O group*. The node canisters are responsible for serving I/O on the volumes. Because a volume is served by both node canisters, no availability is lost if one node canister fails or is taken offline. The Asymmetric Logical Unit Access (ALUA) features of SCSI are used to disable the I/O for a node before it is taken offline or when a volume cannot be accessed through that node.

### System topology

The system topology can be set up in several different ways.

- *Standard topology*, where all node canisters in the system are at the same site.

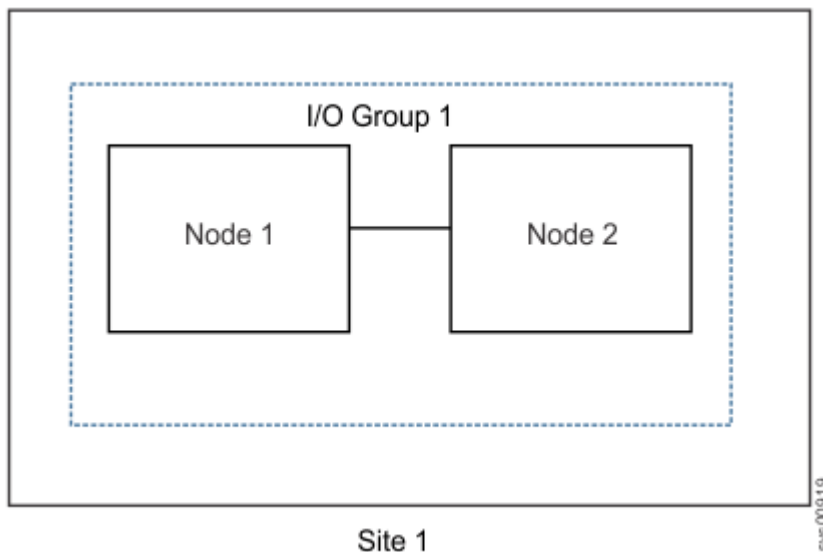


Figure 3. Example of a standard system topology

- *HyperSwap* topology, where the system consists of at least two I/O groups. Each I/O group is at a different site. Both nodes of an I/O group are at the same site. A volume can be active on two I/O groups so that it can immediately be accessed by the other site when a site is not available. The *HyperSwap* topology is supported on Storwize V5030E systems.

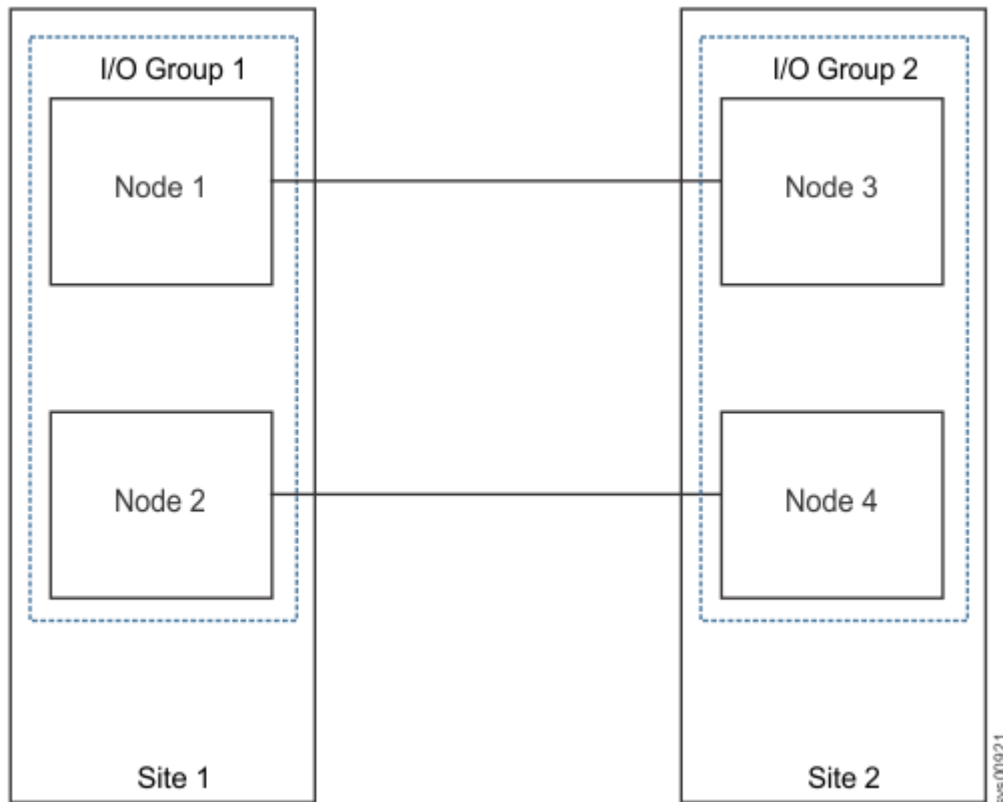


Figure 4. Example of a HyperSwap system topology

### Volumes types

You can create the following types of volumes on the system.

- *Basic volumes*, where a single copy of the volume is cached in one I/O group. Basic volumes can be established in any system topology; however, [Figure 5 on page 5](#) shows a standard system topology.

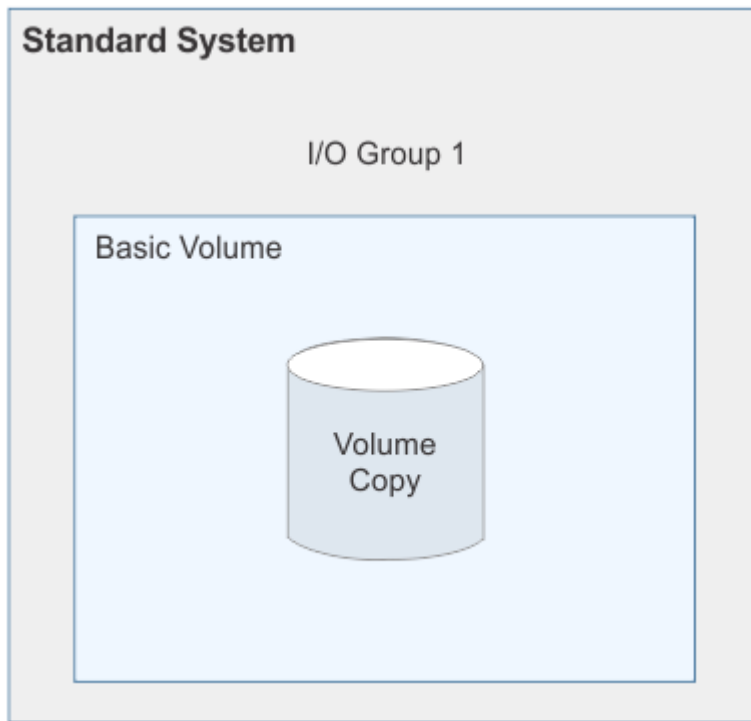


Figure 5. Example of a basic volume

- *Mirrored volumes*, where copies of the volume can either be in the same storage pool or in different storage pools. The volume is cached in a single I/O group, as Figure 6 on page 5 shows. Typically, mirrored volumes are established in a standard system topology.

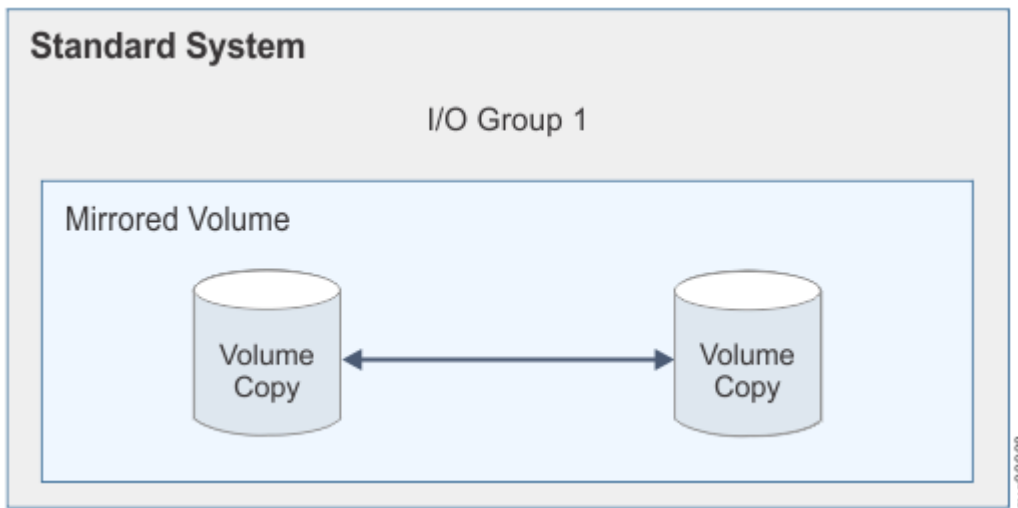


Figure 6. Example of mirrored volumes

- *HyperSwap volumes*, where copies of a single volume are in different storage pools that are on different sites. As Figure 7 on page 6 shows, the volume is cached in two I/O groups that are on different sites. These volumes can be created only on Storwize V5030E systems when the system topology is HyperSwap.

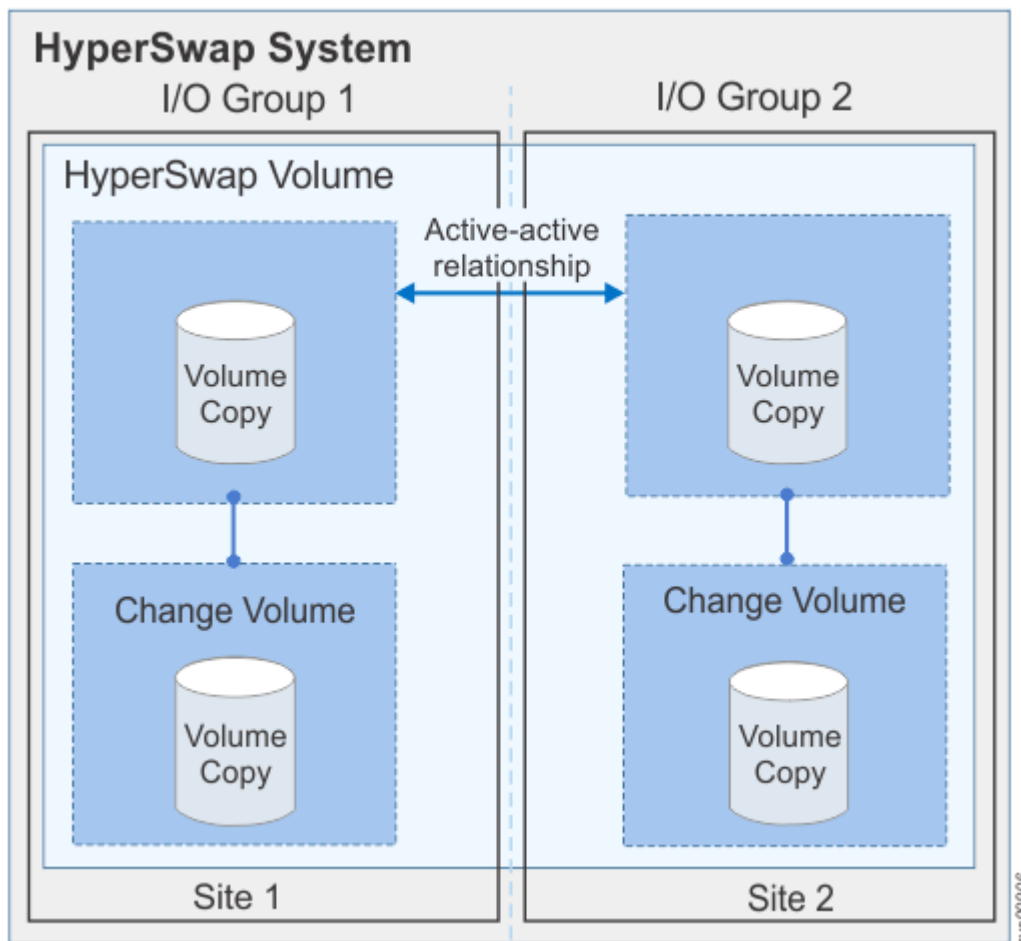


Figure 7. Example of HyperSwap volumes

### System management

Each control enclosure contains two node canisters. Together, the system nodes canisters operate as a single system. System management and error reporting are provided through an Ethernet interface to one of the nodes in the system, which is called the *configuration node*. The configuration node runs a web server and provides a command-line interface (CLI). The configuration node is a role that either node can take. If the current configuration node fails, the other node becomes the configuration node. Each node also provides a command-line interface and web interface for servicing hardware.

### Fabric types

I/O operations between hosts and system nodes and between the system nodes and RAID storage systems use the SCSI standard. The system nodes communicate with each other by using private SCSI commands.

Table 6 on page 6 shows the fabric types that can be used for communicating between hosts, nodes, and RAID storage systems. All installed fabric types can be used at the same time.

Table 6. System communications types		
Communications type	Host to system node	System node to storage system
Fibre Channel SAN	Yes, using an optional 4-port 16 Gbps Fibre Channel host interface adapter.	Yes, using an optional Fibre Channel host interface adapter

Table 6. System communications types (continued)

Communications type	Host to system node	System node to storage system
iSCSI (10 Gbps Ethernet)	Yes <ul style="list-style-type: none"> <li>• Storwize V5010E systems must have an optional 4-port 10 Gbps Ethernet host interface adapter installed.</li> <li>• Storwize V5030E systems have two onboard 10 Gbps Ethernet ports that can be used for host attachment.</li> </ul> The optional 4-port 10 Gbps Ethernet host interface adapter can also be installed.	Not supported
iSCSI (25 Gbps Ethernet)	Yes, using an optional 2-port 25 Gbps host interface adapter	Not supported
Serial-attached SCSI (SAS)	Yes, using an optional 4-port 12 Gbps SAS host interface adapter.	The system supports a one-time migration of external storage data to the system. In the management GUI, select <b>Pools &gt; Storage Migration &gt; New Migration</b> to start the storage migration wizard.





## Chapter 2. Environmental requirements

Before you install a system, your physical environment must meet certain requirements. This includes verifying that adequate space is available and that requirements for power and environmental conditions are met.

### Safety notices

Use the following general safety information for all rack-mounted devices:



**DANGER:** Observe the following precautions when working on or around your IT rack system:

- Heavy equipment—personal injury or equipment damage might result if mishandled.
- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
- Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.



- Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (R001 part 1 of 2)



**CAUTION:**

- Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.
- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- (For sliding drawers) Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.
- (For fixed drawers) This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack. (R001 part 2 of 2)

**Important:** In addition, remember the following guidelines:

- The rack design must support the total weight of the installed enclosures. Incorporate stabilizing features suitable to prevent the rack from tipping or being pushed over during installation or normal use.
- The rack design must consider the maximum enclosure operating ambient temperature of 35-degrees C (95-degrees Fahrenheit).
- The rack must have a safe electrical distribution system. It must provide overcurrent protection for the enclosure and must not be overloaded by the total number of enclosures installed. Observe the electrical power consumption rating that is shown on the nameplate.
- The electrical distribution system must provide a reliable ground for each enclosure in the rack.

### Power requirements for each power supply

To aid in power and cooling requirements planning, [Table 7 on page 10](#) lists the rating of each power supply unit (PSU) by enclosure. Each enclosure contains two AC PSUs for redundancy. The power rating values represent the total power that is drawn by both PSUs. The power that is used by the system depends on various factors, including the number of enclosures and drives in the system and the ambient temperature.

Model and type	PSU	Input power requirements	Maximum input current	Maximum power output	Caloric value (BTU/hr)
Storwize V5000E control enclosures	AC 800 W	Single phase AC: 100 V to 127 V or 200 V to 240 V Frequency: 50 - 60 Hz	100 V to 127 V 9 A 200 V to 240 V 4.5 A	800 W	2730
Storwize V5000E control enclosures	DC 800 W (optional)	-48 V to -60 V DC	-48 V to -60 V 25 A	800 W	2730
2072-92F Expansion enclosure with 92, 3.5-inch form factor SAS drive slots	2400 W (2)	180 V to 264 V single phase AC at a frequency of 47 Hz to 63 Hz	16 A Requires a C19 power socket (C19 power distribution unit)	2400 W	8189

**Note:** One or more C19 power distribution units (PDU) are needed in the rack to connect power to the power supplies of the 5U expansion enclosure.

The measurements that are shown in the following tables were obtained in the specific operating environment and under the conditions described. These measurements are presented as an illustration; measurements that are obtained in other operating environments might vary. Conduct your own testing to determine specific measurements for your environment.

[Table 8 on page 10](#) shows examples of the power ratings of Storwize V5000E systems with different drive configurations.

Control Enclosure	Drive Information			Watts		
	Type	Quantity	Block Size	Average	Peak	Idle
Storwize V5010E	800 GB Flash	16	4 K	230	231	225
			256 K	248	263	225

Control Enclosure	Drive Information			Watts		
	Type	Quantity	Block Size	Average	Peak	Idle
Storwize V5030E	200 GB	24	4 K	273	281	249
			256 K	299	315	249
	900 GB SAS 10 KPM 2.5-inch	24	256 K	350	359	316

Table 9 on page 11 shows examples of the power ratings of Storwize V5000E expansion enclosures with different drive configurations.

Drive quantity and type	Expansion enclosure		
	Average	Peak	Idle (Average)
24 SFF Flash	150 W - 180 W		
24 SFF NL	193 W		
12 LFF Flash	150 W - 180 W		
12 LFF NL	166 W		165 W

**Workload:** 70/30 random cache miss; 4 K block size.

Table 10 on page 11 shows examples of the power ratings of 2072-92F expansion enclosures with different drive configurations.

Model and type	Configuration	Total power consumption	Caloric value (BTU/hr)
2072-92F	1 enclosure with 92 10 TB nearline SAS drives	848 W	-
2072-92F	1 enclosure with 92 15 TB tier 1 flash drives	748 W	-

### Temperature requirements

Ensure that the temperature and humidity in the environment falls within the ranges that are shown in Table 11 on page 12. System airflow is from the front to the rear of each enclosure:

- Airflow passes between drive carriers and through each enclosure.
- Airflow for the upper 4U of the 5U expansion enclosure enters the front, passes between the disk drives, and exits through the large fans in the rear of the enclosure.
- Airflow for the lower 1U of the 5U expansion enclosure is driven through the power supplies through 40 mm X 56 mm fans. Air continues through the chassis cooling the ESMs or controllers and exits the rear of the enclosure.
- The combined power and cooling module exhausts air from the rear of each canister.

Table 11. Temperature requirements

Environment	Ambient temperature	Altitude	Relative humidity	Maximum dew point
Operating	10° C to 35° C (50° F to 95° F)	0 - 3050 m (0 - 10,006 ft)	20% to 80% non-condensing	21°C (69° F)
Non-operating	-10° C to 50° C (14° F to 125° F)	0 - 3050 m (0 - 10,006 ft)	8% to 80% non-condensing	27°C (80° F)
Storage	1° C to 60° C (33° F to 140° F)	No limit	5% to 80% non-condensing	29°C (84° F)
Shipping	-40° C to 60° C (-40° F to 140° F)	No limit	5% to 100% non-condensing	29°C (84° F)

### Physical characteristics

Table 12 on page 12 summarizes the dimension and weight information for the Storwize V5000E control and expansion enclosures. Ensure that the rack has enough available space to support each type of enclosure.

Table 12. Enclosure physical characteristics

Enclosure type	Model	Height	Width	Depth	Maximum weight	
					Drive ready (without drives)	Fully configured (with drives)
Control enclosures (12 LFF drive slots)	Storwize V5010E ( 2072-212 ) Storwize V5030E ( 2072-312 )	8.7 cm (3.4 in)	48.3 cm (19.0 in)	55.6 cm (21.9 in)	18.0 kg (39.6 lb)	28.3 kg (62.2 lb)
Control enclosures (24 SFF drive slots)	Storwize V5010E ( 2072-224 ) Storwize V5030E ( 2072-324 )	8.7 cm (3.4 in)	48.3 cm (19.0 in)	55.6 cm (21.9 in)	19.0 kg (41.8 lb)	27.3 kg (60.0 lb)
Expansion enclosure (12 LFF drive slots)	Storwize V5000E ( 2072-12F )	8.7 cm (3.4 in)	48.3 cm (19.0 in)	55.6 cm (21.9 in)	16.4 kg (36.1 lb)	26.7 kg (58.9 lb)
Expansion enclosure (24 SFF drive slots)	Storwize V5000E 2072-24F )	8.7 cm (3.4 in)	48.3 cm (19.0 in)	55.6 cm (21.9 in)	16.7 kg (36.8 lb)	25.0 kg (55.1 lb)
Expansion enclosure (92 drive slots)	Storwize V5000E ( 2072-92F )	222.2 mm (8.75 in.)	483 mm (19.0 in.)	968 mm (38.1 in.)	67 kg (147.7 lb)	135 kg (297 lb)



**Warning:** 2072-92F (5U) expansion enclosure models need 968 mm from the rack front post to the back of the cable management arm (CMA). There are racks that will not provide sufficient space to close the rear door. In addition, allow 905 mm from the front post to the back of the enclosure. To allow space for the power cables, provide 60 - 70 mm from the back of the enclosure.

Figure 8 on page 13 shows the rack space requirements for the 92F (5U) models.

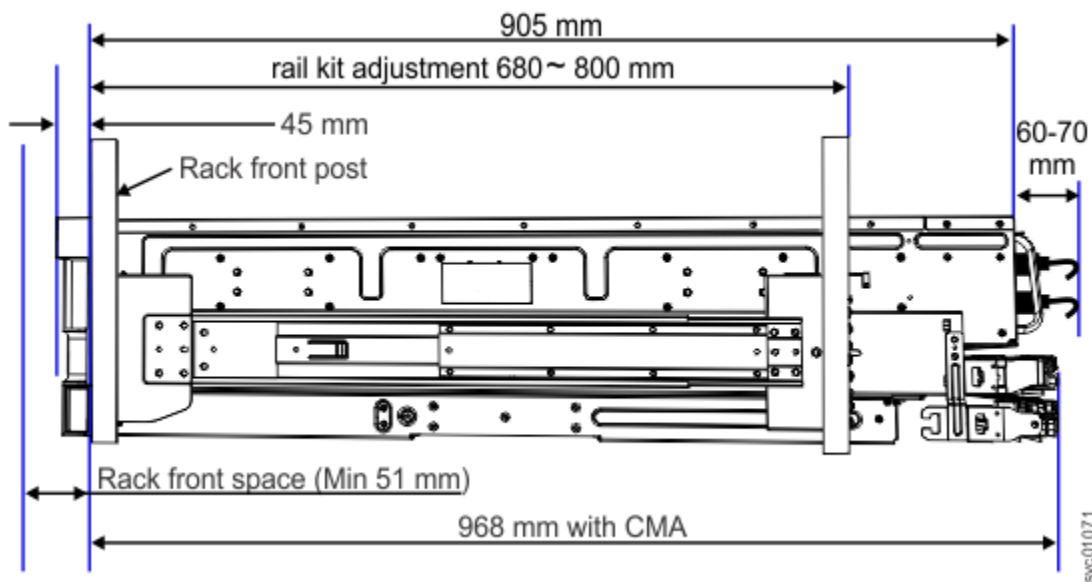


Figure 8. Rack space requirements for the 5U expansion enclosure

### Enclosure clearances

Ensure that additional clearance, as shown in Table 13 on page 13, is available around each of the control and expansion enclosures.

Location	Space requirement	Reason
Left and right sides	50 mm (2 in.)	Cooling air flow
Back	Minimum: 100 mm (4 in.). This is not needed for 2072-92F models.	Cable exit

### Supported drives for enclosures

Storwize V5000E control enclosures and expansion enclosures support drives of different types and storage capacities. For a summary of the drives and other supported parts, see “[System replaceable units](#)” on page 33.

### Acoustical noise emissions

Table 14 on page 13 provides the acoustical specifications for Storwize V5000E systems. The noise emission level that is stated is the declared (upper limit) sound power level, in decibels, for a random sample of enclosures. All measurements are made in accordance with ISO 7779 and reported in conformance with ISO 9296.

Enclosure type	Drive configuration	Acoustical output per enclosure	
		Idling	Operating
Control enclosure	12 LFF drives	6.2 bels	6.1 bels
	24 SFF drives	6.2 bels	6.1 bels
Expansion enclosure (2U)	12 LFF drives	6.1 bels	6.1 bels
	24 SFF drives	6.2 bels	6.2 bels

Table 15 on page 14 provides the acoustical specifications for the 2072-92F SAS expansion enclosures in accordance with ISO 9296<sup>(1,2,3)</sup>.

**Important:** Hearing conservation program (HCP) procedures are required for field service personnel servicing a 2072-92F SAS expansion enclosure.

<i>Table 15. Declared noise emissions for 2072-92F SAS expansion enclosures in accordance with ISO 9296</i>				
Model and type	Declared A-Weighted Sound Power Level, $L_{WAd}$ (B)		Declared A-Weighted Sound Pressure Level, $L_{pAm}$ (dB)	
	Operating	Idling	Operating	Idling
Fully configured 5U expansion enclosure (2072-92F)	8.5	8.5	85	85

**Notes:**

1. Declared level  $L_{WAd}$  is the upper-limit A-weighted sound power level. Declared level  $L_{pAm}$  is the mean A-weighted sound pressure level that is measured at the 1-meter bystander positions.
2. All measurements are made in conformance with ISO 7779 and declared in conformance with ISO 9296.
3. "B" and "dB" are abbreviations for bels and decibels. 1 B = 10 dB.

**Important:** Government regulations (such as those prescribed by OSHA or European Community Directives) might govern noise level exposure in the workplace and might apply to you and your server installation. This system is available with an optional acoustical door feature that can help reduce the noise that is emitted from this system. The actual sound pressure levels in your installation depend upon a variety of factors, including the number of racks in the installation; the size, materials, and configuration of the room where you designate the racks to be installed; the noise levels from other equipment; the room ambient temperature, and employees' location in relation to the equipment. Further, compliance with such government regulations also depends upon a variety of additional factors, including the duration of employees' exposure and whether employees wear hearing protection. IBM recommends that you consult with qualified experts in this field to determine whether you are in compliance with the applicable regulations.

### Shock and vibration specifications

Table 16 on page 14 provides the shock testing results for each Storwize V5000E system.

<i>Table 16. Shock testing specifications</i>		
Shock categories	Test level	Performance
Operational	5 g 10 ms 1/2 Sine	$\leq 25$ g 10 ms
Non-operational	30 g 10 ms 1/2 Sine	$\leq 75$ g 11 ms

Table 17 on page 14 provides the vibration testing results for Storwize V5000E systems.

<i>Table 17. Vibration testing specifications</i>		
Vibration categories	Test level	Performance
Operational	0.21 grms 5 - 500 Hz Random	Throughput loss $\leq 10\%$ FCAL $\leq 0.68$ grms
Non-operational	1.04 grms 2 - 200 Hz Random	$\leq 3.12$ grms
Shipping	0.3 g 2 - 200 Hz Sine	$\leq 5$ g
Rotational vibration	Normal operation performance measurements in enclosure with no external vibration.	Throughput loss for all drives of the same type within performance profile.

### Support rail specifications

Table 18 on page 15 provides the supported depth of the rack for each Storwize V5000E system.

<i>Table 18. Supported rack depth</i>	
<b>Rack</b>	<b>Supported depth</b>
Standard, 19-inch	69.0 cm to 75.0 cm





## Chapter 3. Before you begin the installation

Before you can begin installing your system, you must unpack and verify your order and make other preparations.

This *Quick Installation Guide* contains a set of instructions to help you unpack and install your system. The guide is divided into three chapters.

1. The steps in Chapter 3, “Before you begin the installation,” on page 17 (the chapter you are now reading) involve verifying your order, becoming familiar with the hardware component terminology, and ensuring that you have met the environmental requirements.
2. The steps in Chapter 4, “Installing the system hardware,” on page 27 involve installing the hardware and attaching the data cables and power cords.
3. Chapter 5, “Configuring the system,” on page 95 helps you create your configuration file and access the management GUI. The management GUI guides you through the initial configuration process.

Important information:

- This guide presumes that you have read the planning information regarding your physical environment that is available in the IBM Knowledge Center for Storwize V5000E .
- Ensure that any cables that you are supplying are available for installation.

### Be familiar with the following information

- See “Caution notices for the system” on page xiv and “Danger notices for the system ” on page xvii for a summary of the situations that can be potentially hazardous to you. Before installing, read and understand the following caution and danger statements.
- Use safe practices when lifting. The fully populated enclosure weighs about 37 kg (82 lbs). At least three people are required to lift and install the enclosure into the rack or to remove an enclosure from the rack.



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

		
33.6-46.3 kg (74-102 lbs)	46.3-61.7 kg (102-136 lbs)	≥61.7-100 kg (136-220 lbs)

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(27)

Also keep in mind that a rack full of equipment is extremely heavy.



**DANGER:** Heavy equipment—personal injury or equipment damage might result if mishandled. (D006)

- The following general precautions should be observed, even though the power-on steps differ slightly from the directions that you will follow for this product:



**DANGER:** When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:

- If IBM supplied a power cord(s), connect power to this unit only with the IBM provided power cord. Do not use the IBM provided power cord for any other product.
- Do not open or service any power supply assembly.
- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.

- The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.
- Connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.
- Connect any equipment that will be attached to this product to properly wired outlets.
- 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 procedures when installing, moving, or opening covers on this product or attached devices.

To disconnect:

1. Turn off everything (unless instructed otherwise).
2. Remove the power cords from the outlets.
3. Remove the signal cables from the connectors.
4. Remove all cables from the devices.

To connect:

1. Turn off everything (unless instructed otherwise).
  2. Attach all cables to the devices.
  3. Attach the signal cables to the connectors.
  4. Attach the power cords to the outlets.
  5. Turn on the devices.
- Sharp edges, corners and joints might be present in and around the system. Use care when handling equipment to avoid cuts, scrapes and pinching. (D005)

### Tools needed

A flat-blade screwdriver with a 7 mm (1/4 inch) head is the only tool needed for installation.

## Reviewing your packing slip

---

After you open your shipment, you must verify the contents against the packing slip.

In each box, locate the packing slip. Verify that the items that are listed in the packing slip match what is in the box, and that any optional items that you ordered are included in the list. Your shipment might contain extra items, depending on the order.

**Note:** If you purchased your equipment through a reseller, some of the options might be preinstalled. Contact your supplier for details.

Use the following checklist to check off the items in your order as you verify that they are included in your shipment.

- \_\_\_ • Control enclosures and expansion enclosures. For more information about the supported machine types and models, see [Chapter 1, “System overview,” on page 1](#)
- \_\_\_ • Rack-mounting hardware kit:
  - \_\_\_ – Two rails (right and left assembly)

**Note:** The length and appearance of the rails may differ between different types of control enclosures and expansion enclosures. Be sure to use the specific rail kit that is supplied with each enclosure.

- \_\_\_ – Two rail springs (if appropriate for the model of rails)
- \_\_\_ – Two sets of rail-mount screws and alternative rail-mount pins (large and small) for non-IBM racks
- \_\_\_ • Drive bay blanking plates (installed in the enclosure)

#### Options applicable to control enclosures

- \_\_\_ • Cache memory upgrade
- \_\_\_ • Fibre Channel cables
- \_\_\_ • SAS cables
- \_\_\_ • Drives
- \_\_\_ • Power cords for connection to wall sockets
- \_\_\_ • Four-port 16 Gbps Fibre Channel host interface adapter
- \_\_\_ • Four-port 12 Gbps SAS host interface adapter
- \_\_\_ • DC power supply (if applicable to the feature number ordered)

#### Options applicable to expansion enclosures

- \_\_\_ • Expansion enclosure attachment cables
- \_\_\_ • Drives
- \_\_\_ • DC power supply (if applicable to the feature number ordered)
- \_\_\_ • Power cords for connection to wall sockets

## Identify the hardware components

The following graphics identify the hardware components and port locations for the control enclosure and expansion enclosure on the system.

#### Control enclosure components

The following figures show the rear view of the Storwize V5010E and Storwize V5030E control enclosures. The location of the power supply units and node canisters are also shown.

[Figure 9 on page 19](#) shows the Storwize V5010E control enclosure.



*Figure 9. Storwize V5010E control enclosure*

[Figure 10 on page 19](#) shows a rear view of the Storwize V5030E control enclosure



*Figure 10. Storwize V5030E control enclosure*

## Data ports

The following figures show the location of the ports that are available at the back of the Storwize V5010E and Storwize V5030E control enclosures.

**Note:** The figures show an enclosure that is equipped with alternating current (AC) power supplies. Some enclosure models have direct current (DC) power supplies. For more information about DC power supply units, see “Direct current power supply units” on page 21.

Figure 11 on page 20 shows the Storwize V5010E control enclosure.



Figure 11. Data ports on the rear of the Storwize V5010E control enclosure

Figure 12 on page 20 shows the data ports on the back of a Storwize V5030E control enclosure.



Figure 12. Data ports on the rear of the Storwize V5030E control enclosure

- **T** Technician port
- **1** Ethernet port 1
- **2** Ethernet port 2
- **2/T** Ethernet port 2/Technician port
- **3** SAS expansion ports

## 2U Expansion enclosure components

Figure 13 on page 20 shows the location of the power supply units and expansion canisters.

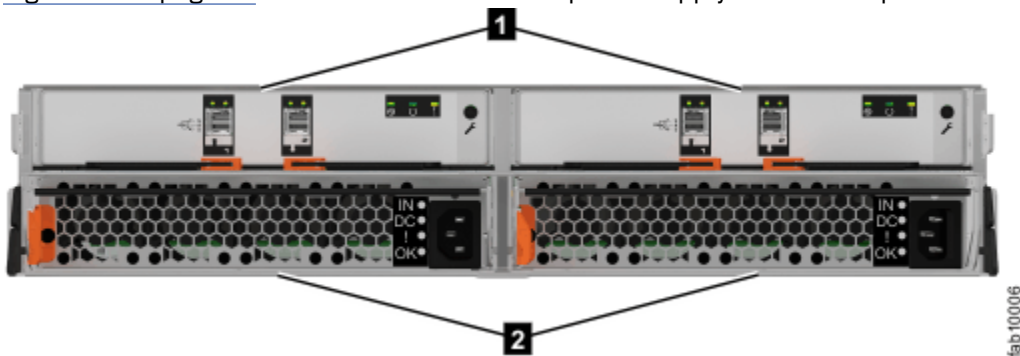


Figure 13. Rear view of a 2U expansion enclosure

- **1** Expansion canisters

- **2** Power supply units

Figure 14 on page 21 shows the LEDs and SAS port locations from the rear view of an expansion canister.

- **1** LEDs
- **2** SAS expansion ports

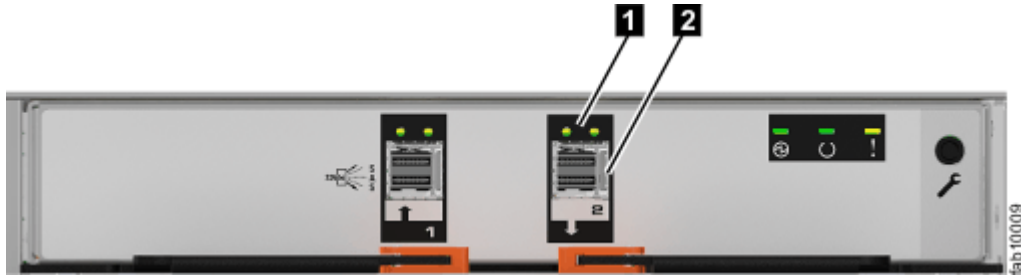


Figure 14. SAS ports and LEDs in rear view of a 2U expansion canister

### Direct current power supply units

When the appropriate feature code is selected for the system model, two direct current (DC) power supply units are installed in the control enclosure or expansion enclosure.



**DANGER:**



Hazardous voltage, current, or energy levels are present inside any component that has this label attached. Do not open any cover or barrier that contains this label. (L001)



**DANGER:** When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:

- If IBM supplied a power cord(s), connect power to this unit only with the IBM provided power cord. Do not use the IBM provided power cord for any other product.
- Do not open or service any power supply assembly.
- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.
- Connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.
- Connect any equipment that will be attached to this product to properly wired outlets.
- 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 procedures when installing, moving, or opening covers on this product or attached devices.

**To disconnect:**

1. Turn off everything (unless instructed otherwise).
2. Remove the power cords from the outlets.
3. Remove the signal cables from the connectors.
4. Remove all cables from the devices.

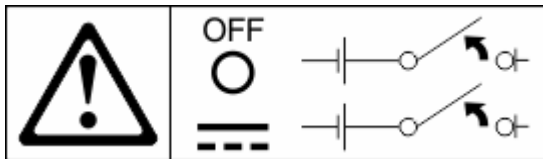
**To connect:**

1. Turn off everything (unless instructed otherwise).
  2. Attach all cables to the devices.
  3. Attach the signal cables to the connectors.
  4. Attach the power cords to the outlets.
  5. Turn on the devices.
- Sharp edges, corners and joints may be present in and around the system. Use care when handling equipment to avoid cuts, scrapes and pinching. (D005)

**Statement 19:**



**CAUTION:** The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to DC power. To remove all electrical current from the device, ensure that all connections to DC power are disconnected at the DC power input terminals.



**Statement 34:**



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

- This equipment must be installed by trained service personnel in a restricted-access location, as defined by the NEC and IEC 60950-1, First Edition, The Standard for Safety of Information Technology Equipment.
- Connect the equipment to a properly grounded safety extra low voltage (SELV) source. A SELV source is a secondary circuit that is designed so that normal and single fault conditions do not cause the voltages to exceed a safe level (60 V direct current).
- Incorporate a readily available approved and rated disconnect device in the field wiring.
- See the specifications in the product documentation for the required circuit-breaker rating for branch circuit overcurrent protection.
- Use copper wire conductors only. See the specifications in the product documentation for the required wire size.
- See the specifications in the product documentation for the required torque values for the wiring-terminal screws.

**Note:** In Statement 34 above:

- Replace IEC 60950-1, First Edition with IEC 60950-1, Second Edition Amendment 1.
- The required circuit breaker rating is 20 amps.

### DC power supply unit connectors and indicators

Each enclosure can contain two DC power supply units. Each power supply unit can provide power to the whole enclosure.

The DC power supply units have the components that are shown in [Figure 15 on page 23](#).

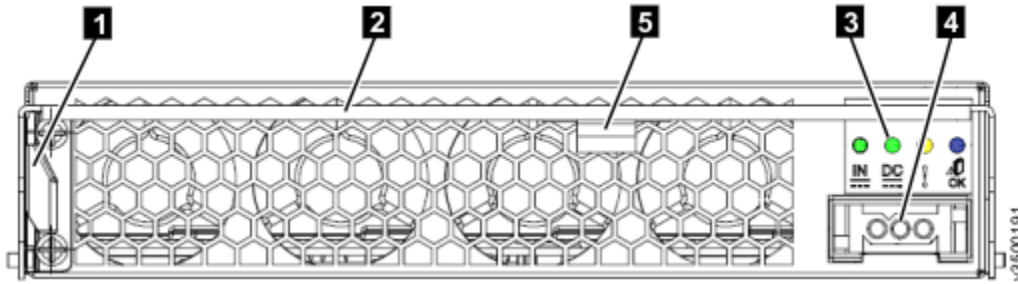


Figure 15. DC power supply unit connectors and indicators

- 1 Release tab
- 2 Handle
- 3 Power supply LED indicators
- 4 Direct current power connector
- 5 Cable retainer

Each power supply also contains fans that cool the enclosure. Cool air is drawn in through the front of the enclosure. The air passes over the drives, node canisters, and power supplies. The warmed air is ejected through the rear of each power supply. For optimal cooling, do not obstruct the airflow and ensure that all enclosure components or fillers are installed while the system is operational.

### DC power supply LED indicators

Each power supply unit has four LED indicators. [Table 19 on page 23](#) summarizes their possible values and meaning.

The LEDs have a comparable meaning to the LEDs on the AC power supply. Problem diagnosis and service procedures are the same.

Name	Label	Color	State	Description
Input status	IN ~	Green	OFF	No input power detected.
			ON	DC input power detected.
Output status	DC =	Green	OFF	PSU is not providing DC output power.
			ON	PSU is providing DC output power.
Fault	!	Amber	OFF	No fault detected.
			ON	PSU fault was detected.
			BLINK	PSU is being identified. A fault might have been detected.
(None)	OK	Blue	N/A	Not used.

### Connecting a DC power supply to a DC power source

An enclosure that is DC powered contains two DC power supply units (PSUs). Each unit must be connected to a suitable -48V DC power source. To provide redundancy in a power circuit failure, connect the two PSUs to different DC power sources.

**Note:** The connection to the DC power source must be made by trained service personnel. Ensure that the connection is made in accordance with all the requirements of the equipment that is being used.

Use the supplied cables to connect the DC PSUs to the power sources. Use only the IBM supplied DC power cable (IBM part number 00AR087) to connect the unit to a DC power source.

The supplied power must meet the input requirements that are listed in [Table 20 on page 24](#).

<i>Table 20. DC power supply input requirements</i>		
<b>Requirement</b>	<b>Min</b>	<b>Max</b>
Voltage (V DC)	-48	-60
Instantaneous (V DC for < 1 second)	-36	-75
Inrush current at initial turn on (-48V DC)	34 A	
Out of spec time before power off is signaled	5 ms	

**Important:** Each PSU cable must be protected by a 20A circuit breaker. These instructions assume that the circuit breaker is separate from the DC power distribution unit. Refer to the DC power distribution unit documentation and the circuit breaker documentation for details. Follow the instructions that are given there for connecting the circuit breaker to the power distribution unit and for connecting the DC power cable to the circuit breaker.

One end of the cable ends in a plug that fits the DC PSU. At the other end of the cable, each individual wire ends with a 6 mm diameter ring terminal that is designed to fit an M6 stud. Provide adequate strain relief after you attach the ring terminals to the power source. [Table 21 on page 24](#) lists the wire colors.

If it is necessary to replace the ring terminals with a different connector, choose a suitably sized and rated UL-listed connector that is appropriate for the wire gauge and available current. Install the ring terminals according to the instructions provided by the manufacturer.

<i>Table 21. DC cable wire color coding</i>	
<b>Color</b>	<b>Function</b>
Blue	Return
Green / Yellow	Ground
Brown	-48V

### Securing the power cables

The DC power cable must be contained in a single rack and must not extend outside the rack to another rack. The DC power cable is 4 m long. Connect it to the DC power source before you connect it to the PSU. The PSU does not have a power switch. When power is connected, the outlets and the enclosure become live. Review [the information on securing the power cables](#) to ensure that the cables are securely attached to the enclosure.



## DC power replaceable units

The direct current (DC) power supply model has two replaceable units.

Description	FRU part number	Customer replaced
Direct current power supply	01AC311	Y
Direct current power cable	00AR087	Y

The procedure to remove and replace the DC power supply unit is the same as the AC power supply procedure.

When replacing the DC power cable, follow the instructions for disconnecting cables from the DC power distribution unit.

## Verify environmental requirements

The environmental and electrical requirements for the physical site must be met to ensure that your system works reliably.

Before installing a system, you must verify that adequate space in a suitable rack is available. You must also ensure that the requirements for power and environmental conditions are met.

This guide assumes that you have completed the physical planning for the environment of your system. If you have not done the environmental planning for your system, see the " Storwize V5000E physical installation planning" topic in the IBM Knowledge Center for Storwize V5000E .

## Review enclosure location guidelines

Before you install the system, you must be familiar with the location guidelines for control enclosures and expansion enclosures.

### Installing a control enclosure only

If you are installing a control enclosure only, follow these guidelines.

- Position the enclosure in the rack so that you can easily view it and access it for servicing.
- Locate the enclosure low enough for the rack to remain stable.
- Ensure that you provide a way for two or more people to install and remove the enclosure.

### Installing a control enclosure and one or more expansion enclosures

If you are installing a control enclosure plus one or more expansion enclosures, follow these guidelines.

- Each control enclosure requires 2U of rack space.
- Depending on the model, expansion enclosures require 2U or 5U of rack space.
- Each assembled control enclosure weighs more than 18 kg. Provide sufficient space at the front of the rack for two persons to carry the enclosure safely.
- Install all control enclosures that constitute one system in contiguous positions in a rack. Place the control enclosure in the middle of the rack.
- Each control enclosure supports connections to multiple 2U and 5U expansion enclosures. To allow for future expansion, reserve rack space directly above and below the system. expansion.
- Storwize V5010E control enclosures can support up to 10 expansion enclosures on one chain. Storwize V5030E systems can support two chains and each chain can support up to 10 expansion enclosures.

- If a rack is to be only partially filled, install the enclosures low enough for the rack to remain stable and enable easy access to the enclosures for servicing.

### **Adding an expansion enclosure chain to an existing system**

If you are adding an expansion enclosure chain to an existing Storwize V5030E system, follow these guidelines.

- You do not need to power off the system. You can add an expansion enclosure while the system is operational.
- Add the first expansion enclosure directly below the control enclosure.
- Add the second expansion enclosure directly above the control enclosure.
- Add the third expansion enclosure directly below the first.
- Add the fourth expansion directly above the second, and so on.

---

## Chapter 4. Installing the system hardware

After verification that you have all of the hardware components that you require, you can install them.

You completed the initial steps of verifying the shipping contents and becoming familiar with the hardware components. You verified that the power and environmental requirements are met and planned the location of the enclosures. You are now ready to begin installing the hardware components and connecting the data cables and power cords.

### NEBS-compliant earth connection

---

When you install enclosures into a Network Equipment-Building System (NEBS) compliant installation, each enclosure must have a reliable electrical earth connection that is separate to any earth connections provided by power supply cables.

On system enclosures, this connection is made by using the front enclosure mounting screws that are part of the standard installation that is described in “[Installing support rails for 2U enclosures](#)” on page 27 and “[Installing enclosures](#)” on page 31. To provide a reliable electrical earth connection, the upright mounting rails of the racks into which enclosures are installed must meet the following requirements before installing the support rails and enclosures:

- Upright mounting rails must not be painted, oxidized or otherwise insulated from the enclosure flanges and mounting rails. If paint, oxidization or other insulation is present, it must be removed and the metal must be brought to a bright, non-corroding finish.
- Upright mounting rails must have their own NEBS-compliant connection to earth, independent of the earth connections provided by any power supply cables.

#### Notes:

1. If the system is required to be NEBS-compliant, some system configuration settings must be made. For details, see “[Configuring a system to be NEBS-compliant](#)” on page 99.
2. For the latest information about configuration guidelines and possible restrictions, go to the following website; then, enter the product name and release in the search the field: <http://www.ibm.com/support>

### Installing support rails for 2U enclosures

---

Before you install a control enclosure or a 2U expansion enclosure in to the rack, you must first install the support rails. The same rails for are used for the control enclosures and the 2U expansion enclosures.

#### About this task

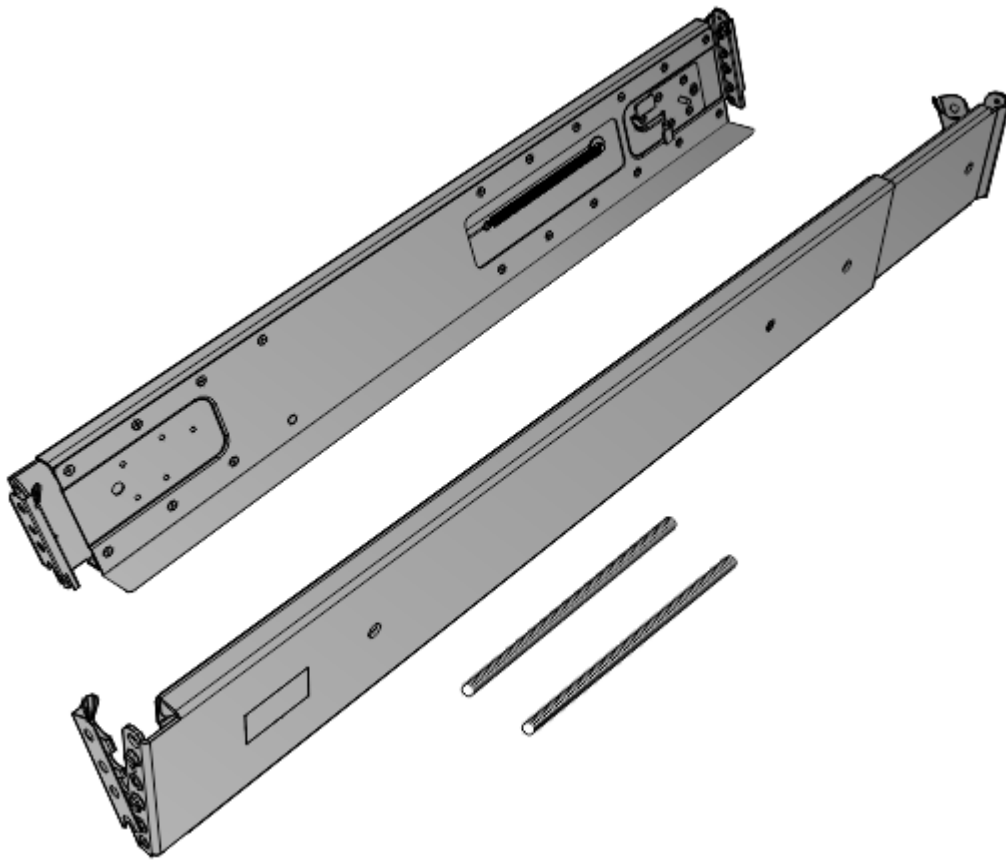
**Note:** For NEBS compliant installations, more requirements are placed on the rack into which the support rails and enclosures are to be installed. Before you proceed, ensure that the rack meets the requirements that are listed in “[NEBS-compliant earth connection](#)” on page 27.

#### Procedure

To install the support rails for an enclosure, complete the following steps.

1. Locate the enclosure rails ([Figure 16](#) on page 28).

The rail assembly consists of two rails that must be installed in the rack cabinet.



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*Figure 16. Enclosure support rails*

2. Install a spring on the rail rail.

- a) Push one looped end of a spring over one stud on the inside of the rail. (See [Figure 17](#) on page 29.)
- b) Stretch the spring slightly and push the other looped end of the spring onto the other stud on the inside of the rail.

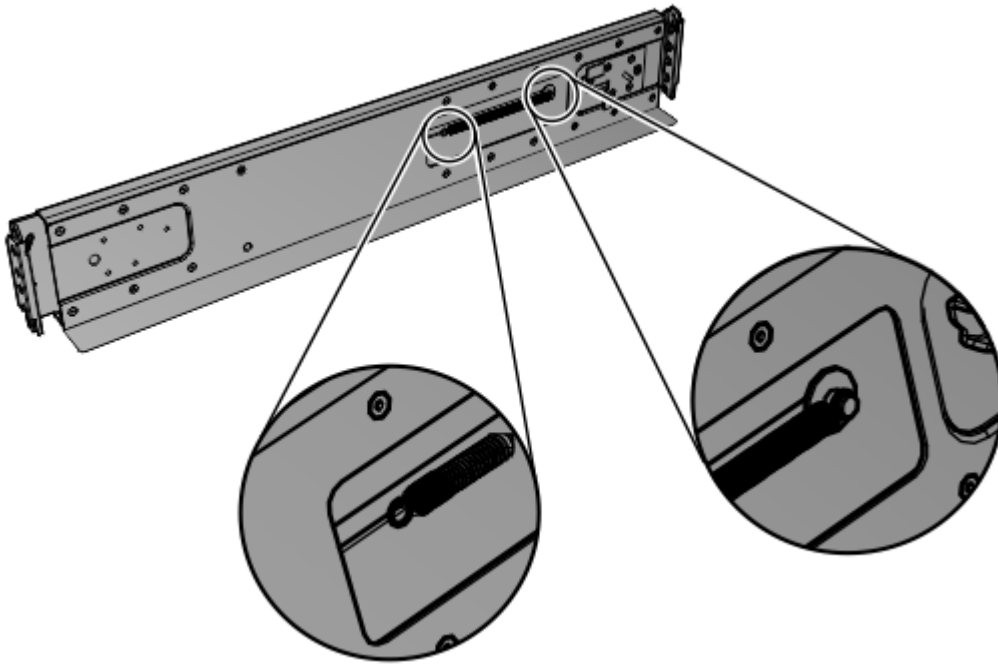


Figure 17. Installing the rail spring

3. Working at the front of the rack cabinet, identify the two standard rack units (2U) of space in the rack into which you want to install the support rails.

Figure 18 on page 29 shows two rack units with the front mounting holes identified.

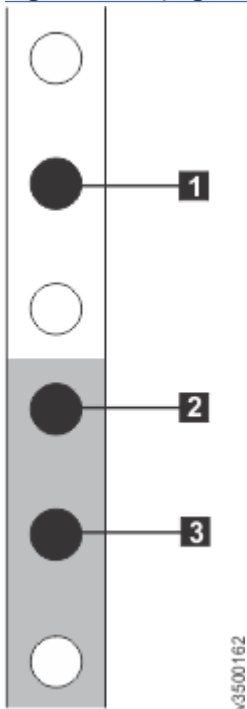


Figure 18. Hole locations in the front of the rack

- **1** Upper rail-mounting bracket pin
  - **2** Lower rail-mounting bracket pin
  - **3** Rack mounting screw hole
4. Ensure that the appropriate bracket pins are installed in the front and rear bracket of each rail.

Each rail comes with four medium pins preinstalled (two in the front bracket and two in the rear bracket). Large and small pins are provided separately. Use the pins that are appropriate for the mounting holes in your rack (see Table 23 on page 30).

Mounting holes	Bracket pins
Round, unthreaded	Use the preinstalled medium pins.
Round, threaded	Unscrew the medium pins and replace with the smaller pins supplied with the rails.
Square	Unscrew the medium pins and replace with the large pins supplied with the rails.

- At each end of the rail, grasp the tab and pull *firmly* to open the hinge bracket, as shown in [Figure 19](#) on page 30.

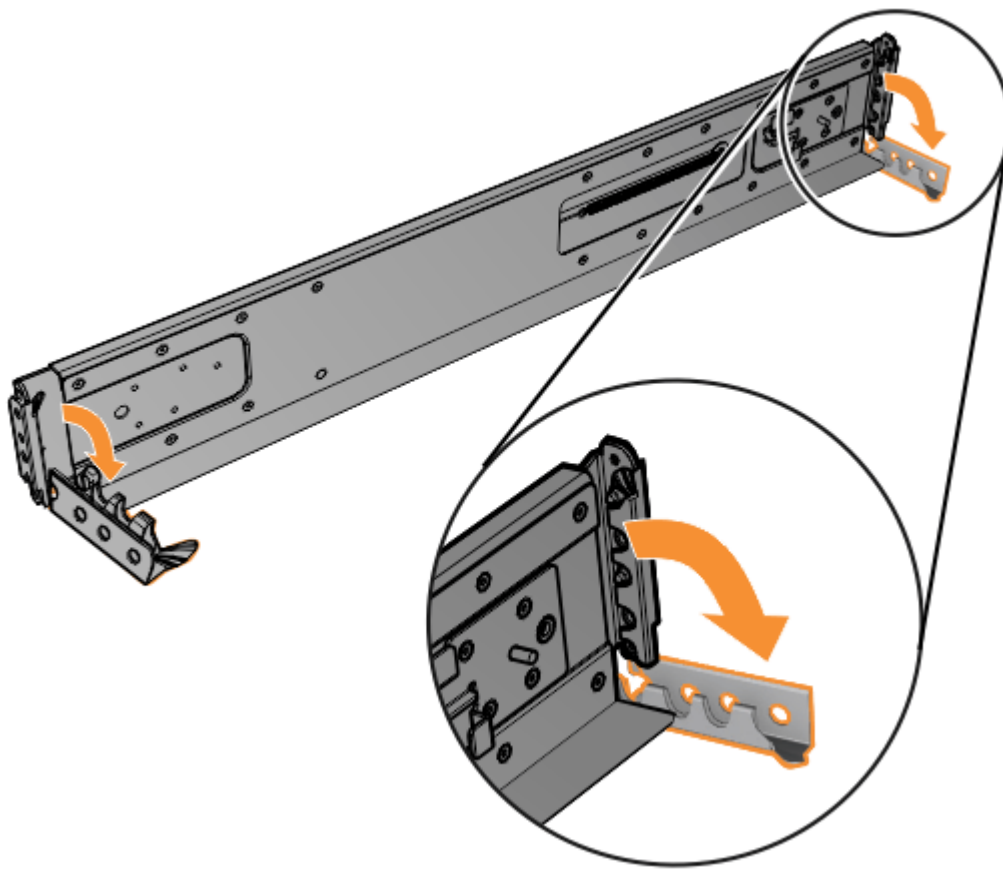


Figure 19. Opening the hinge brackets

- Align the holes in the rail bracket with the holes on the front and rear rack cabinet flanges. Ensure that the rails are aligned on the inside of the rack cabinet. See steps 1 through 3 in [Figure 20](#) on page 31.
- On the rear of the rail, press the two bracket pins into the holes in the rack flanges.
- Close the rear hinge bracket to secure the rail to the rack cabinet flange (step 4 in [Figure 20](#) on page 31).

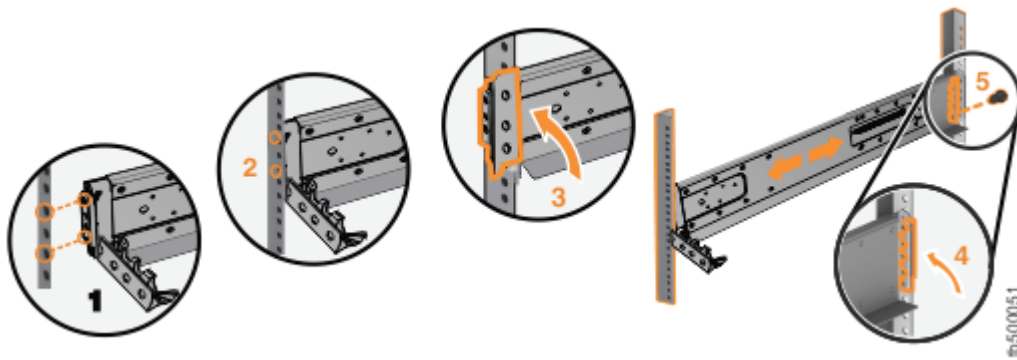


Figure 20. Closing the hinge brackets

9. Secure the rear bracket to the rail with a black M5 screw (step 5 in [Figure 20 on page 31](#)).
10. On the front of the rail, press the two bracket pins into the holes in the rack flanges.
11. Close the front hinge bracket to secure the rail to the rack cabinet flange.

[Figure 20 on page 31](#) shows an example.

12. Repeat step “2” on [page 28](#) through step “11” on [page 31](#) to secure the opposite rail to the rack cabinet.
13. Repeat the procedure to install rails for each additional control enclosure.

## Installing enclosures

Following your enclosure location plan, install the control enclosure (and optionally, one or more expansion enclosures).

### About this task

**Note:** For NEBS-compliant installations, more requirements are placed on the rack into which the support rails and enclosures are to be installed. Before you proceed, ensure that the rack meets the requirements that are listed in “NEBS-compliant earth connection” on [page 27](#).



**CAUTION:** Load the rack from the bottom up to ensure rack stability. Empty the rack from the top down.

### Procedure

To install an enclosure, complete the following steps.

1. On either side of the drive assemblies, remove the enclosure end caps by grasping the handle and pulling the bottom of the end cap free, then clearing the tab on the top of the enclosure.  
(See [Figure 21 on page 32](#).)

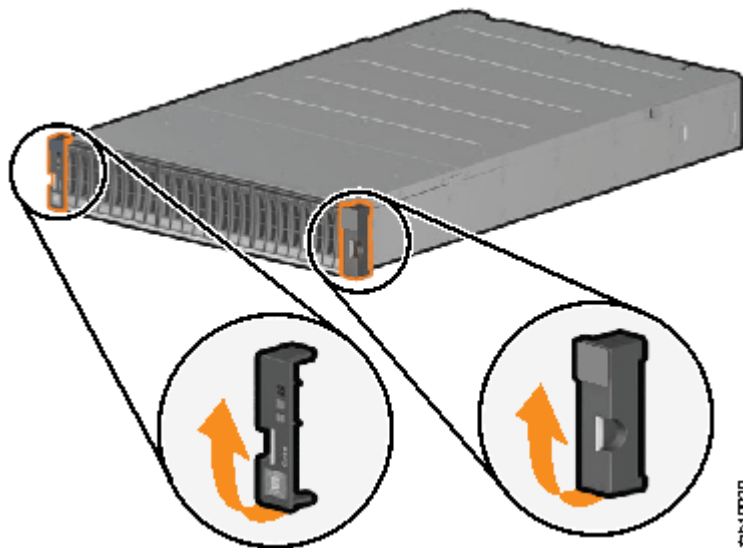


Figure 21. Removing enclosure end caps

2. Align the enclosure with the front of the rack cabinet.
3. Carefully slide the enclosure into the rack along the rails until the enclosure is fully inserted (see [Figure 22 on page 32](#)).

**Note:** The rails are not designed to hold an enclosure that is partially inserted. The enclosure must always be in a fully inserted position.

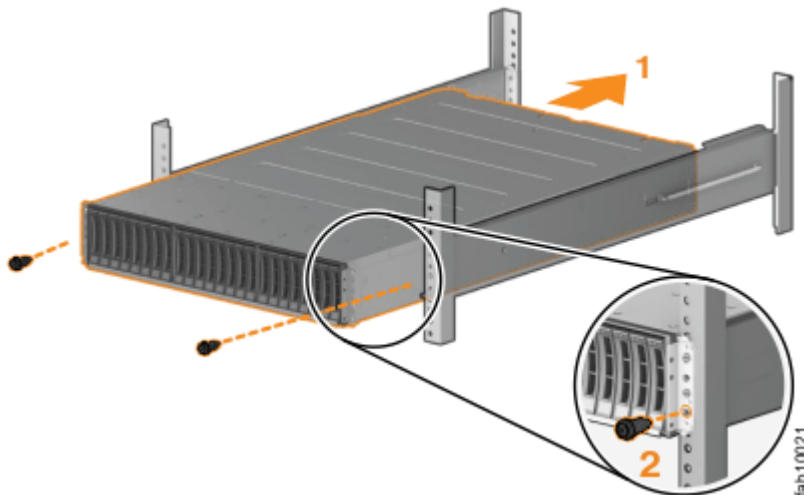


Figure 22. Inserting the enclosure in the rack

4. Secure the enclosure with a screw in the rack mounting screw hole.
5. Reinstall the left and right end caps.

(See [Figure 22 on page 32](#).) The left end cap has indicator windows that align with the status LEDs (light-emitting diodes) on the edge of the enclosure.

- a) Ensure that the serial number of the end cap matches the serial number on the rear of the enclosure.
- b) Fit the slot on the top of the end cap over the tab on the chassis flange.
- c) Rotate the end cap down until it snaps into place.
- d) Ensure that the inside surface of the end cap is flush with the chassis.



## System replaceable units

You might have to replace a part on a control enclosure or on a 2U expansion enclosures. Most replaceable parts are customer-replaceable units (CRUs); some are field-replaceable units (FRUs), which are replaced by trained service technicians.

Table 24 on page 33 summarizes the replaceable units and part numbers for Storwize V5000E control enclosures and the supported 2U expansion enclosures. Some parts are applicable to all enclosures; other parts are specific only to certain models. An "X" indicates the model for which the part is applicable. Unless otherwise noted, each part is a customer replaceable unit (CRU).

**Note:** For information about the replaceable parts for the 5U expansion enclosure ( 2072-92F ), see “ 5U expansion enclosure parts ” on page 84.

*Table 24. Summary of control enclosure and 2U expansion enclosure parts*

P/N	Description	Storwize V5010E		Storwize V5030E		2U Expansion enclosure	
		2072-212	2072-224	2072-312	2072-324	2072-12F	2072-24F
00AR272	0.6 m mSASHD					X	X
00AR311	1.5 m mSASHD					X	X
00D2142	Host 0.6 m mSAS-mSASHD	X	X	X	X		
00D2144	Host 1.5 m mSAS-mSASHD	X	X	X	X		
00D2148	Host 3m mSAS-mSASHD	X	X	X	X		
00RY190	16 Gbps SW SFP	X	X	X	X		
00RY191	16 Gbps LW SFP	X	X	X	X		
00RY309	Rack rail kit	X	X	X	X	X	X
00RY543	CMOS coin cell battery	X	X	X	X		
00WK715	Power cord - DC	X	X	X	X	X	X
00Y2436	LFF Enclosure bezel, right	X		X		X	
00Y2512	SFF Enclosure bezel, right		X		X		X
01AC311	DC power supply	X	X	X	X	X	X
01AC366	Node canister battery	X	X	X	X		
01AC381	SFF Enclosure midplane (see note)		X		X		X
01AC404	AC power supply	X	X	X	X	X	X
01AC555	LFF Enclosure midplane (see note)	X		X		X	
01AC579	Expansion canister					X	X
01EJ183	Node canister memory (16 GB SODIMM)	X	X	X	X		

Table 24. Summary of control enclosure and 2U expansion enclosure parts (continued)

P/N	Description	Storwize V5010E		Storwize V5030E		2U Expansion enclosure	
		2072-212	2072-224	2072-312	2072-324	2072-12F	2072-24F
01EJ184	4-port 12 Gbps SAS host interface adapter	X	X	X	X		
01EJ186	4-port 10 Gbps Ethernet host interface adapter	X	X	X	X		
01EJ187	4-port 16 Gbps Fibre Channel host interface adapter	X	X	X	X		
01EJ495	CMOS coin cell battery	X	X	X	X		
01FT777	25 Gbps short wave SFP28 (RoCE)	X	X	X	X		
01LJ589	2-port 25 Gbps Ethernet (iWARP) host interface adapter	X	X	X	X		
01NN193	25 Gbps short wave SFP28 (iWARP)	X	X	X	X		
02PX476	30 TB Flash Drive 3.5" in LFF carrier	X		X			
02PX516	Storwize V5010E node canister	X	X				
02PX517	Storwize V5030E node canister			X	X		
02PX518	Storwize V5000E control enclosure / expansion enclosure left bezel	X	X	X	X	X	X
02PX522	2.4 TB 10 K 2.5" HDD in LFF carrier	X		X		X	
02PX523	10 TB 7.2 K 3.5" NL HDD in LFF carrier	X		X		X	
02PX524	12 TB 7.2 K 3.5" NL HDD in LFF carrier	X		X		X	
02PX525	14 TB 7.2 K 3.5" NL HDD in LFF carrier	X		X		X	
02PX539	2.4 TB 10 K 2.5" HDD in SFF carrier		X		X		X
02PX540	800 GB 3DWPD Flash Drive 2.5" in SFF carrier		X		X		X
02PX541	1.92 TB Flash Drive 2.5" in SFF carrier		X		X		X

Table 24. Summary of control enclosure and 2U expansion enclosure parts (continued)

P/N	Description	Storwize V5010E		Storwize V5030E		2U Expansion enclosure	
		2072-212	2072-224	2072-312	2072-324	2072-12F	2072-24F
02PX542	3.84 TB Flash Drive 2.5" in SFF carrier		X		X		X
02PX543	7.68 TB Flash Drive 2.5" in SFF carrier		X		X		X
02PX544	15.36 TB Flash Drive 2.5" in SFF carrier		X		X		X
02PX581	900 GB 10 K 3.5" HDD in LFF carrier	X		X		X	
02PX582	1.2 TB 10 K 3.5" HDD in LFF carrier	X		X		X	
02PX583	1.8 TB 10 K 3.5" HDD in LFF carrier	X		X		X	
02PX584	4 TB 7.2 K 3.5" NL HDD in LFF carrier	X		X		X	
02PX585	6 TB 7.2 K 3.5" NL HDD in LFF carrier	X		X		X	
02PX586	8 TB 7.2 K 3.5" NL HDD in LFF carrier	X		X		X	
02PX587	900 GB 10 K 2.5" HDD in SFF carrier		X		X		X
02PX588	1.2 TB 10 K 2.5" HDD in SFF carrier		X		X		X
02PX589	1.8 TB 10 K 2.5" HDD in SFF carrier		X		X		X
02PX590	2 TB 7.2 K 2.5" NL HDD in SFF carrier		X		X		X
02YC270	Node canister memory (8 GB SODIMM)	X	X				
15R8848	25 m OM3 optical cable	X	X	X	X		
31P1630	10 Gbps SW SFP	X	X	X	X		
33F8354	CMOS coin cell battery	X	X	X	X		
39M5068	Power Cord - Argentina	X	X	X	X	X	X
39M5080	Power Cord - Chicago	X	X	X	X	X	X
39M5081	Power Cord - US / Group 1	X	X	X	X	X	X
39M5102	Power Cord - Australia / NZ	X	X	X	X	X	X

Table 24. Summary of control enclosure and 2U expansion enclosure parts (continued)

P/N	Description	Storwize V5010E		Storwize V5030E		2U Expansion enclosure	
		2072-212	2072-224	2072-312	2072-324	2072-12F	2072-24F
39M5123	Power Cord - Europe / Africa	X	X	X	X	X	X
39M5130	Power Cord - Denmark	X	X	X	X	X	X
39M5144	Power Cord - South Africa	X	X	X	X	X	X
39M5151	Power Cord - EMEA	X	X	X	X	X	X
39M5158	Power Cord - Switzerland	X	X	X	X	X	X
39M5165	Power Cord - Chile / Italy	X	X	X	X	X	X
39M5172	Power Cord - Israel	X	X	X	X	X	X
39M5199	Power Cord - Japan	X	X	X	X	X	X
39M5206	Power Cord - China	X	X	X	X	X	X
39M5219	Power Cord - Korea	X	X	X	X	X	X
39M5226	Power Cord - India	X	X	X	X	X	X
39M5240	Power Cord - Brazil	X	X	X	X	X	X
39M5247	Power Cord - Taiwan	X	X	X	X	X	X
39M5377	Power Cord - 10 amp outlet F PDU (C13-C14 cord)	X	X	X	X	X	X
39M5392	Power Cord - 16 amp outlet J PDU (C13-C20 cord)	X	X	X	X	X	X
41V2120	10 m OM3 optical cable	X	X	X	X		
42R7992	LFF drive blank	X		X		X	
45D4773	1 m OM3 optical cable	X	X	X	X		
45D4774	5 m OM3 optical cable	X	X	X	X		
45W8680	SFF drive blank		X		X		X

**Note:** An enclosure midplane is a field replaceable unit (FRU),

## Installing an optional 5U SAS expansion enclosure

Use the procedures described in this section to complete the initial steps to install a 5U expansion controller to your system. Up to two chains of expansion enclosures can be attached to each I/O group in the system.

Installing an optional 5U SAS expansion enclosure requires the following steps:

1. Familiarize yourself with the safety requirements for the enclosure.
2. Remove the parts from the shipping container.
3. Install the enclosure in the rack by using the provided support rails.
4. Install the fascia.
5. Install the drives.
6. Install the cable management arm.
7. Connect the SAS expansion enclosures to the system.
8. Power on the expansion enclosure.

**Important:** The following topics contain information about the required steps to remove and install parts during the initial installation of a 5U expansion enclosure. For information about the procedures for other parts of the 5U expansion enclosure, refer to *IBM Knowledge Center*.

## Safety notices and considerations: 2072-92F

Before you install, service, or move the expansion enclosure, always read and follow the safety notices and guidelines.

### Safety notices

Use the reference numbers in parentheses at the end of each notice (for example, D005) to find the matching translated notice in *IBM Systems Safety Notices*.



**DANGER:** DANGER: Serious injury or death can occur if loaded lift tool falls over or if a heavy load falls off the lift tool. Always completely lower the lift tool load plate and properly secure the load on the lift tool before moving or using the lift tool to lift or move an object. (D010)



**DANGER:** Multiple power cords. The product might be equipped with multiple AC power cords or multiple DC power cables. To remove all hazardous voltages, disconnect all power cords and power cables. (L003)



or



**DANGER:**



Hazardous voltage present. Voltages present constitute a shock hazard, which can cause severe injury or death. (L004)



**CAUTION:**



Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in splattered metal, burns, or both. (L005)

**DANGER:**

**Observe the following precautions when working on or around your IT rack system:**

- **Heavy equipment—personal injury or equipment damage might result if mishandled.**
- **Always lower the leveling pads on the rack cabinet.**
- **Always install stabilizer brackets on the rack cabinet.**
- **To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.**
- **Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.**



- **Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.**
- **Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.**
- **An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (R001 part 1 of 2)**



**CAUTION:**

- Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.
- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- (For sliding drawers) Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.
- (For fixed drawers) This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack. (R001 part 2 of 2)



**CAUTION:** Removing components from the upper positions in the rack cabinet improves rack stability during a relocation. Follow these general guidelines whenever you relocate a populated rack cabinet within a room or building.

- Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet. When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must observe the following precautions.
  - Remove all devices in the 32U position and above.
  - Ensure that the heaviest devices are installed in the bottom of the rack cabinet.
  - Ensure that there are no empty U-levels between devices installed in the rack cabinet below the 32U level.
- If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
- If the rack cabinet you are relocating was supplied with removable outriggers they must be reinstalled before the cabinet is relocated.
- Inspect the route that you plan to take to eliminate potential hazards.
- Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that comes with your rack cabinet for the weight of a loaded rack cabinet.
- Verify that all door openings are at least 760 x 230 mm (30 x 80 in.).
- Ensure that all devices, shelves, drawers, doors, and cables are secure.
- Ensure that the four leveling pads are raised to their highest position.
- Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.
- Do not use a ramp inclined at more than 10 degrees.
- When the rack cabinet is in the new location, complete the following steps:
  - Lower the four leveling pads.
  - Install stabilizer brackets on the rack cabinet.
  - If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.
- If a long-distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also lower the leveling pads to raise the casters off the pallet and bolt the rack cabinet to the pallet. (R002)



**DANGER:** Racks with a total weight of > 227 kg (500 lb.), Use Only Professional Movers! (R003)




**DANGER:** Do not transport the rack via fork truck unless it is properly packaged, secured on top of the supplied pallet. (R004)

**DANGER:**



**Main Protective Earth (Ground):**

**This symbol is marked on the frame of the rack.**

The **PROTECTIVE EARTHING CONDUCTORS** should be terminated at that point. A recognized or certified closed loop connector (ring terminal) should be used and secured to the frame with a lock washer using a bolt or stud. The connector should be properly sized to be suitable for the bolt or stud, the locking washer, the rating for the conducting wire used, and the considered rating of the breaker. The intent is to ensure the frame is electrically bonded to the **PROTECTIVE EARTHING CONDUCTORS**. The hole that the bolt or stud goes into where the terminal conductor and the lock washer contact should be free of any non-conductive material to allow for metal to metal contact. **ALL PROTECTIVE EARTHING CONDUCTORS** should terminate at this main protective earthing terminal or at points marked with . (R010)



**CAUTION:**

		
33.6-46.3 kg (74-102 lbs)	46.3-61.7 kg (102-136 lbs)	≥61.7-100 kg (136-220 lbs)

swc01053

The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)



**CAUTION:** To avoid personal injury, before lifting this unit, remove all appropriate subassemblies per instructions to reduce the system weight. (C012)



**CAUTION:** CAUTION regarding IBM provided VENDOR LIFT TOOL:

- Operation of LIFT TOOL by authorized personnel only
- LIFT TOOL intended for use to assist, lift, install, remove units (load) up into rack elevations. It is not to be used loaded transporting over major ramps nor as a replacement for such designated tools like pallet jacks, walkies, fork trucks and such related relocation practices. When this is not practicable, specially trained persons or services must be used (for instance, riggers or movers). Read and completely understand the contents of LIFT TOOL operator's manual before using.
- Read and completely understand the contents of LIFT TOOL operator's manual before using. Failure to read, understand, obey safety rules, and follow instructions may result in property damage and/or personal injury. If there are questions, contact the vendor's service and support. Local paper manual must remain with machine in provided storage sleeve area. Latest revision manual available on vendor's website.
- Test verify stabilizer brake function before each use. Do not over-force moving or rolling the LIFT TOOL with stabilizer brake engaged.
- Do not raise, lower or slide platform load shelf unless stabilizer (brake pedal jack) is fully engaged. Keep stabilizer brake engaged when not in use or motion.
- Do not move LIFT TOOL while platform is raised, except for minor positioning.
- Do not exceed rated load capacity. See LOAD CAPACITY CHART regarding maximum loads at center versus edge of extended platform.
- Only raise load if properly centered on platform. Do not place more than 200 lb (91 kg) on edge of sliding platform shelf also considering the load's center of mass/gravity (CoG).
- Do not corner load the platform tilt riser accessory option. Secure platform riser tilt option to main shelf in all four (4x) locations with provided hardware only, prior to use. Load objects are designed to slide on/off smooth platforms without appreciable force, so take care not to push or lean. Keep riser tilt option flat at all times except for final minor adjustment when needed.
- Do not stand under overhanging load.
- Do not use on uneven surface, incline or decline (major ramps).
- Do not stack loads. (C048, part 1 of 2)



- **Do not operate while under the influence of drugs or alcohol.**
- **Do not support ladder against LIFT TOOL.**
- **Tipping hazard. Do not push or lean against load with raised platform.**
- **Do not use as a personnel lifting platform or step. No riders.**
- **Do not stand on any part of lift. Not a step.**
- **Do not climb on mast.**
- **Do not operate a damaged or malfunctioning LIFT TOOL machine.**
- **Crush and pinch point hazard below platform. Only lower load in areas clear of personnel and obstructions. Keep hands and feet clear during operation.**
- **No Forks. Never lift or move bare LIFT TOOL MACHINE with pallet truck, jack or fork lift.**
- **Mast extends higher than platform. Be aware of ceiling height, cable trays, sprinklers, lights, and other overhead objects.**
- **Do not leave LIFT TOOL machine unattended with an elevated load.**
- **Watch and keep hands, fingers, and clothing clear when equipment is in motion.**
- **Turn Winch with hand power only. If winch handle cannot be cranked easily with one hand, it is probably over-loaded. Do not continue to turn winch past top or bottom of platform travel. Excessive unwinding will detach handle and damage cable. Always hold handle when lowering, unwinding. Always assure self that winch is holding load before releasing winch handle.**
- **A winch accident could cause serious injury. Not for moving humans. Make certain clicking sound is heard as the equipment is being raised. Be sure winch is locked in position before releasing handle. Read instruction page before operating this winch. Never allow winch to unwind freely. Freewheeling will cause uneven cable wrapping around winch drum, damage cable, and may cause serious injury. (C048, part 2 of 2)**



**CAUTION:** If the System slide rails are installed above EIA location 29U, the [ServerLIFT®] tool (or other qualified lift tool) must be used as a safety precaution for servicing. Position the lift tool platform slightly below the bottom of the System drawer to account for the slight downward flex when the drawer is extended out fully on its slides. Then gently raise the lift tool platform to stably contact the bottom of the drawer, minding not to over force it as it could put upward stress to the slide rails. A service-qualified ladder may have to be used to reach or properly work around the System at such heights. While using a ladder, do not lean on or against the system drawer or lift tool during service, and follow safe practices. (C051)

## **Weight considerations: 5U SAS expansion enclosure**

Before you install, move, or perform service on a 5U SAS expansion enclosure, you must be prepared to handle the weight of the enclosure and its parts.

### **Safety notices and considerations**

**Important:** Always read and follow the safety notices and instructions before you install, move, or service the expansion enclosure and its parts. See [“Safety notices and considerations: 2072-92F”](#) on page 37 for information.

- Do not exceed the specified maximum load of the rack where the enclosure is to be installed.
- Do not exceed any load limit of the building and flooring where the enclosure is to be installed.
- Always use a suitably rated mechanical lift or four persons when you are performing any of the following tasks:
  - Removing the expansion enclosure from its packing material
  - Lifting and installing the expansion enclosure in the rack for the first time
  - Reinstalling the expansion enclosure after you complete a service task (for example, replacing the enclosure FRU).

- At least three persons are required to move the enclosure while it is in the rack (if you are moving the enclosure off the rails). Even after the drives, power supply units, secondary expander modules, canisters, fans, and top cover are removed, the enclosure weighs approximately 43 kg (95 lbs).
- To maximize rack stability, always install the expansion enclosure in the lowest possible position in the rack.

### Weight of expansion enclosure parts

Table 25 on page 42 summarizes the weight and quantity of the parts (FRUs) that are shipped with the 5U expansion enclosure.

FRU description	Weight per unit		Quantity shipped	Total weight	
	kg	lbs		kg	lb
Enclosure FRU	42.5	93.696	1	42.500	93.696
Rail kit	9.231	20.351	1	9.231	20.351
Front fascia (4U front cover)	0.303	0.668	1	0.303	0.668
Display panel assembly	0.020	0.044	1	0.020	0.044
PSU fascia (1U cover)	0.010	0.022	1	0.010	0.022
Power supply unit (PSU)	3.335	7.352	2	6.670	14.705
Secondary expansion module	0.826	1.821	2	1.652	3.642
Fan module	0.890	1.962	4	3.560	7.848
Expansion canister	1.588	3.501	2	3.176	7.002
Cable management arm (lower and upper arms)	1.373	3.027	1	1.373	3.027
Top cover	3.720	8.201	1	3.720	8.201
Fan interface board	0.118	0.260	1	0.236	0.260

### Weight of expansion enclosure SAS drives

The SAS drives are shipped in a separate package from the 5U expansion enclosure. The enclosure can support up to 92 SAS drives; however, the quantity varies depending on the number of drives ordered.

Table 26 on page 43 summarizes the weight of the SAS drives in a 5U expansion enclosure. All Storwize V5000E systems can support the 5U expansion enclosure.

For information about the part numbers of each drive, see [“ 5U expansion enclosure parts ”](#) on page 84.

Table 26. Weight of expansion enclosure drives

FRU description	Approximate weight per unit	
	kg	lb
1.2 TB 10 K 2.5-inch hard disk drive	0.304	0.670
1.8 TB 10 K 2.5-inch hard disk drive	0.304	0.670
2.4TB 10K 2.5-inch hard disk drive	0.304	0.670
6 TB 7.2 K 3.5-inch Near-Line SAS hard disk drive	0.876	1.931
8 TB 7.2 K 3.5-inch Near-Line SAS hard disk drive	0.876	1.931
10 TB 7.2 K 3.5-inch Near-Line SAS hard disk drive	0.876	1.931
12 TB 7.2K 3.5-inch NL HDD in HD Carrier	0.876	1.931
14 TB 7.2K 3.5-inch Near-Line SAS hard disk drive	0.876	1.931
1.92 TB Flash Drive 3.5-inch	0.876	1.931
3.84 TB Flash Drive 3.5-inch	0.876	1.931
7.68 TB Flash Drive 3.5-inch	0.876	1.931
15.36 TB Flash Drive 3.5-inch	0.876	1.931
30 TB Flash Drive 3.5-inch	0.876	1.931

**Weight increases as FRUs are installed**

The 5U expansion enclosure supports up to 92 SAS drives. As Table 27 on page 43 shows, substantial weight is added to the enclosure when all drives are installed.

Table 27. Weight of an enclosure with 92 SAS drives

FRU description	Approximate weigh per unit		Maximum supported	Approximate extra weight	
	kg	lb		kg	lb
2.5-inch tier 0 flash drive	0.224	0.494	92	20.608	45.433
2.5-inch tier 1 flash drive					
2.5-inch hard disk drive	0.304	0.670	92	27.968	61.659
3.5-inch Near-Line SAS hard disk drive	0.876	1.931	92	80.592	177.675

As you install or replace FRUs, the overall weight of the expansion enclosure increases. For example, Table 28 on page 44 shows the weight progression as different combinations of FRUs are installed.

Table 28. Enclosure weight as FRUs are installed

Enclosure assembly		Approximate weight	
FRUs installed	FRUs not installed	kg	lb
<ul style="list-style-type: none"> <li>• Enclosure (01LJ607 or 01LJ112)</li> </ul>	<ul style="list-style-type: none"> <li>• Secondary expansion modules</li> <li>• Fascia (1U and 4U)</li> <li>• PSUs</li> <li>• Expansion canisters</li> <li>• Fan modules</li> <li>• Fan interface board</li> <li>• Display assembly</li> <li>• Drives</li> <li>• Cover</li> </ul>	42.5	93.7
<ul style="list-style-type: none"> <li>• Enclosure (01LJ607 or 01LJ112)</li> <li>• Secondary expansion modules</li> </ul>	<ul style="list-style-type: none"> <li>• Fascia (1U and 4U)</li> <li>• PSUs</li> <li>• Expansion canisters</li> <li>• Fan modules</li> <li>• Fan interface board</li> <li>• Display assembly</li> <li>• Drives</li> <li>• Cover</li> </ul>	44.3	97.7
<ul style="list-style-type: none"> <li>• Enclosure (01LJ607 or 01LJ112)</li> <li>• Secondary expansion modules</li> <li>• Fascia (1U and 4U)</li> <li>• PSUs</li> <li>• Expansion canisters</li> <li>• Fan modules</li> <li>• Fan interface board</li> <li>• Display assembly</li> </ul>	<ul style="list-style-type: none"> <li>• Drives</li> <li>• Cover</li> </ul>	58	127.9

Table 28. Enclosure weight as FRUs are installed (continued)

Enclosure assembly		Approximate weight	
FRUs installed	FRUs not installed	kg	lb
<p><b>Note:</b> The following FRUs are installed when the enclosure is initially shipped.</p> <ul style="list-style-type: none"> <li>• Enclosure (01LJ607 or 01LJ112)</li> <li>• Secondary expansion modules</li> <li>• PSUs</li> <li>• Expansion canisters</li> <li>• Fan modules</li> <li>• Fan interface board</li> <li>• Display assembly</li> <li>• Cover</li> </ul>	<ul style="list-style-type: none"> <li>• Fascia (1U and 4U)</li> <li>• Drives</li> </ul>	61.5	135.4
<ul style="list-style-type: none"> <li>• Enclosure (01LJ607 or 01LJ112)</li> <li>• Secondary expansion modules</li> <li>• Fascia (1U and 4U)</li> <li>• PSUs</li> <li>• Expansion canisters</li> <li>• Fan modules</li> <li>• Fan interface boards</li> <li>• 92 2.5-inch tier 1 flash drives</li> </ul>	<ul style="list-style-type: none"> <li>• Cover</li> </ul>	78.6	173.3
<ul style="list-style-type: none"> <li>• Enclosure (01LJ607 or 01LJ112)</li> <li>• Secondary expansion modules</li> <li>• Fascia</li> <li>• PSUs</li> <li>• Expansion canisters</li> <li>• Fan modules</li> <li>• Fan interface board</li> <li>• 92 2.5-inch hard disk drives</li> </ul>	<ul style="list-style-type: none"> <li>• Cover</li> </ul>	86	189.6

Table 28. Enclosure weight as FRUs are installed (continued)

Enclosure assembly		Approximate weight	
FRUs installed	FRUs not installed	kg	lb
<ul style="list-style-type: none"> <li>• Enclosure (01LJ607 or 01LJ112)</li> <li>• Secondary expansion modules</li> <li>• Fascia</li> <li>• PSUs</li> <li>• Expansion canisters</li> <li>• Fan modules</li> <li>• Fan interface board</li> <li>• 92 3.5-inch Near-Line SAS hard disk drives</li> </ul>	<ul style="list-style-type: none"> <li>• Cover</li> </ul>	138.6	305.6

Conversely, the overall weight of the expansion enclosure is reduced as you remove parts. However, even with parts removed, the 5U expansion enclosure is heavy. Depending on the number of parts that remain, you might need four persons or a mechanical lift to support the weight of the expansion enclosure.

### Identify the hardware components: 2072-92F

You should become familiar with the external components of the 2072-92F expansion enclosure.

#### Components on the front of the enclosure

Figure 23 on page 46 shows the front of the 2072-92F expansion enclosure. In the figure, all parts are installed in the enclosure.

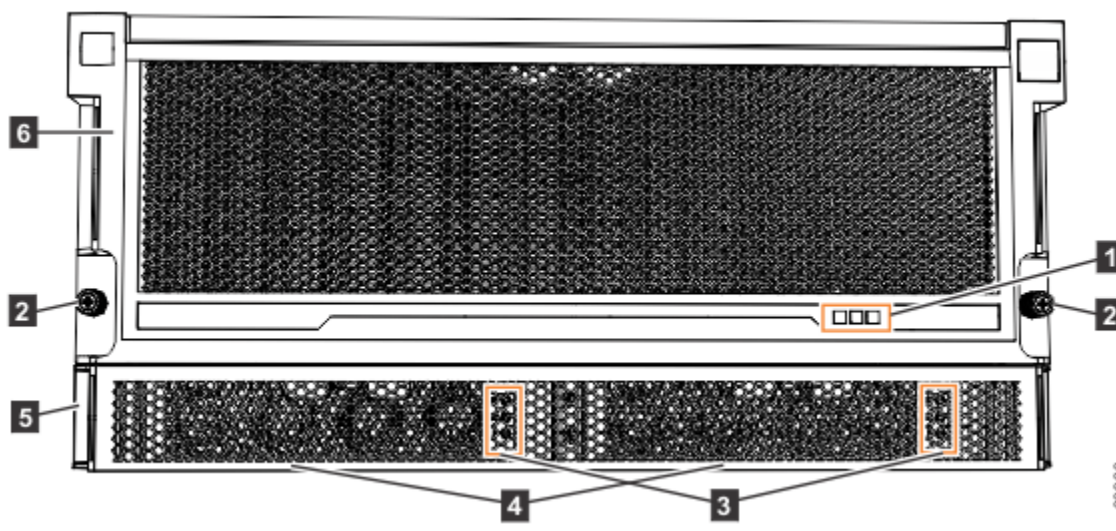


Figure 23. Features on the front of the 2072-92F expansion enclosure

- 1** Display panel indicators
- 2** Rack retention thumb screws
- 3** Power supply unit indicators
- 4** Power supply units (PSUs)
- 5** PSU fascia (1U)

## 6 Front fascia (4U)

However, as Figure 24 on page 47 shows, the 4U and 1U fascias are packaged separately. You must attach them to the front of the 2072-92F expansion enclosure as part of the initial installation process.

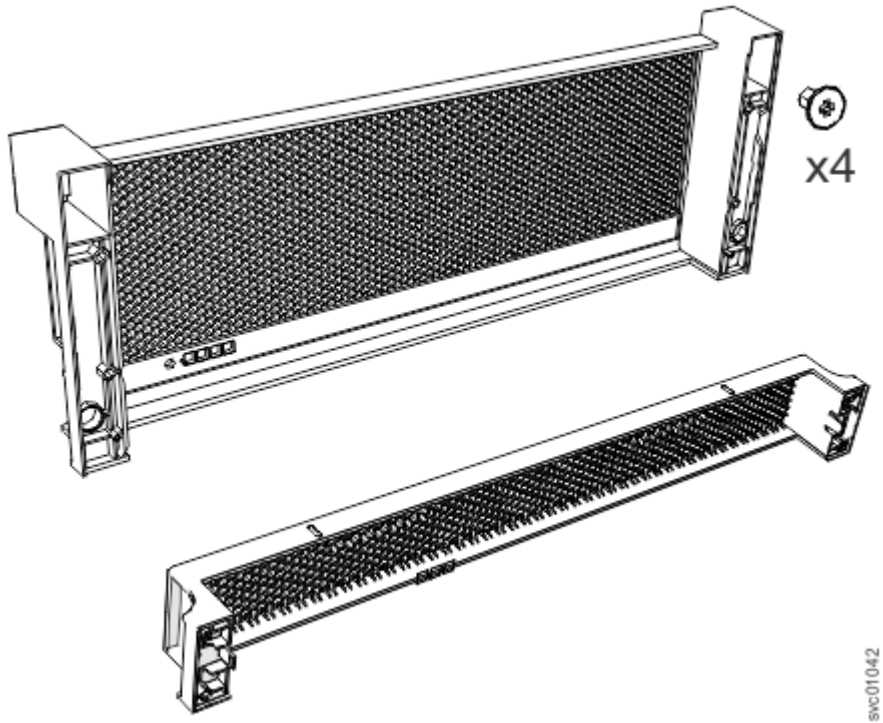


Figure 24. Front fascia of the 2072-92F expansion enclosure

## Components on the rear of the enclosure

Figure 25 on page 47 shows the components on the rear of the 2072-92F expansion enclosure. Four fan modules and two expansion enclosures are accessible from the back of the enclosure.

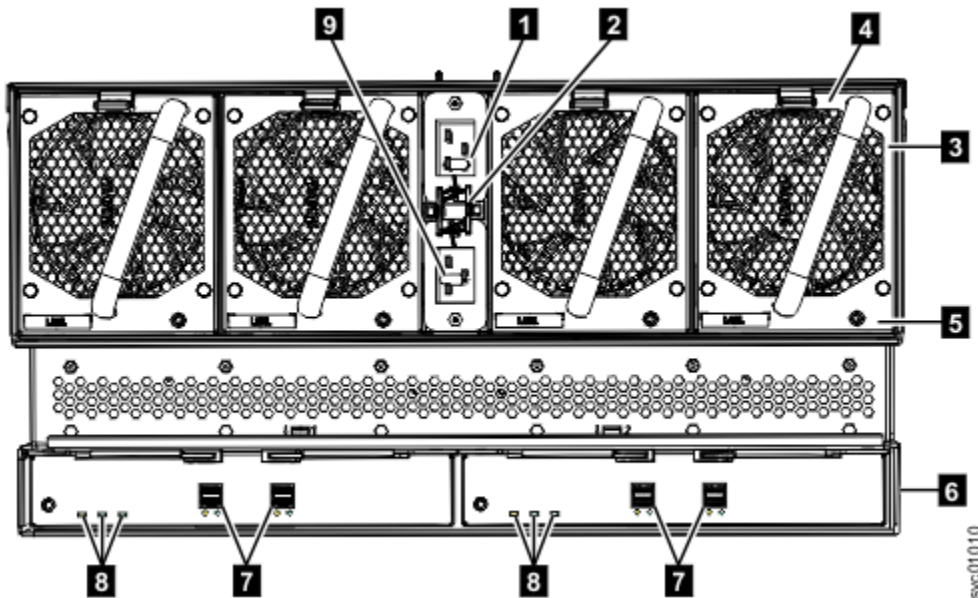


Figure 25. Features on the rear of the 2072-92F expansion enclosure

## 1 Power cable connector for PSU 2

- 2 Power cable retention clamps
- 3 Fan module
- 4 Fan release latch
- 5 Fan fault indicator
- 6 Expansion canister
- 7 SAS ports and indicators
- 8 Expansion canister indicators
- 9 Power cable connector for PSU 1

### Support rails

Figure 26 on page 48 shows the support rails for the expansion enclosure. The support rails are packaged separately from the expansion enclosure.

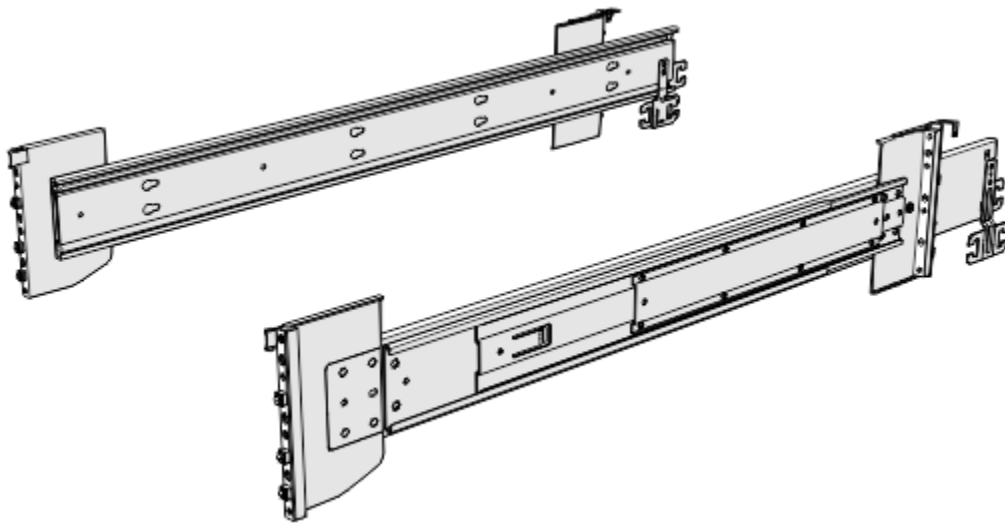


Figure 26. 2072-92F support rails

### Cable management arm

The cable management arm (CMA), which consists of an upper and lower assembly, are packaged separately from the expansion enclosure. As Figure 27 on page 49 shows, each CMA assembly is attached to the rear end of the support rails.



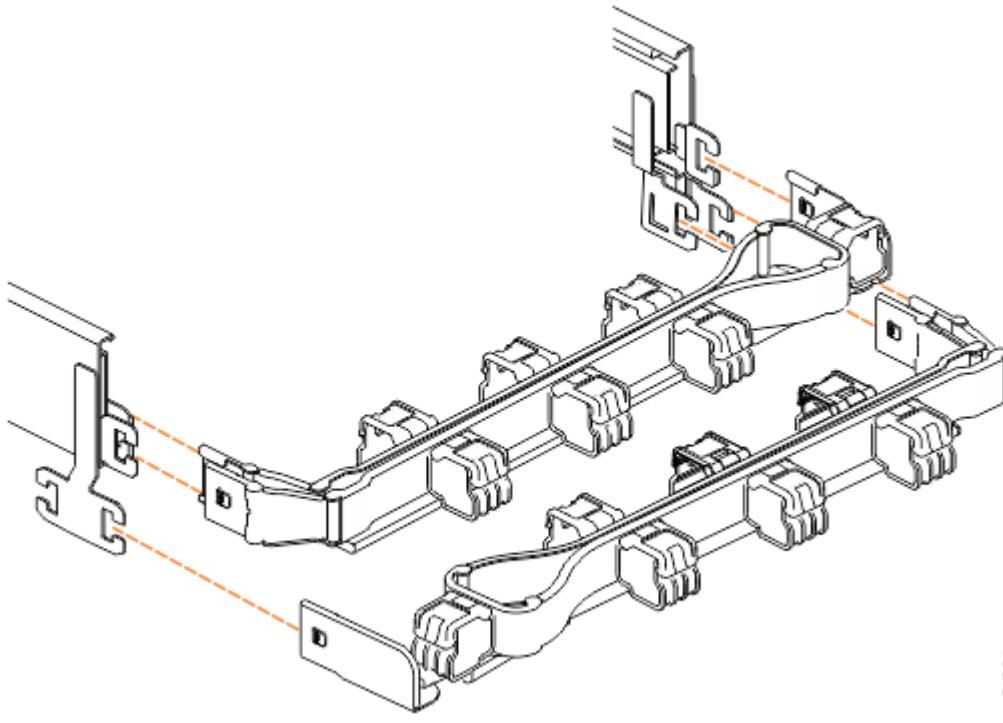


Figure 27. 2072-92F CMA assemblies

## Unpacking and installing the enclosure: 2072-92F

Before you unpack and install the 2072-92F expansion enclosure, ensure that you review and follow the installation checklist and safety notices.

### Before you begin



#### CAUTION:

		
33.6-46.3 kg (74-102 lbs)	46.3-61.7 kg (102-136 lbs)	≥61.7-100 kg (136-220 lbs)

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The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)



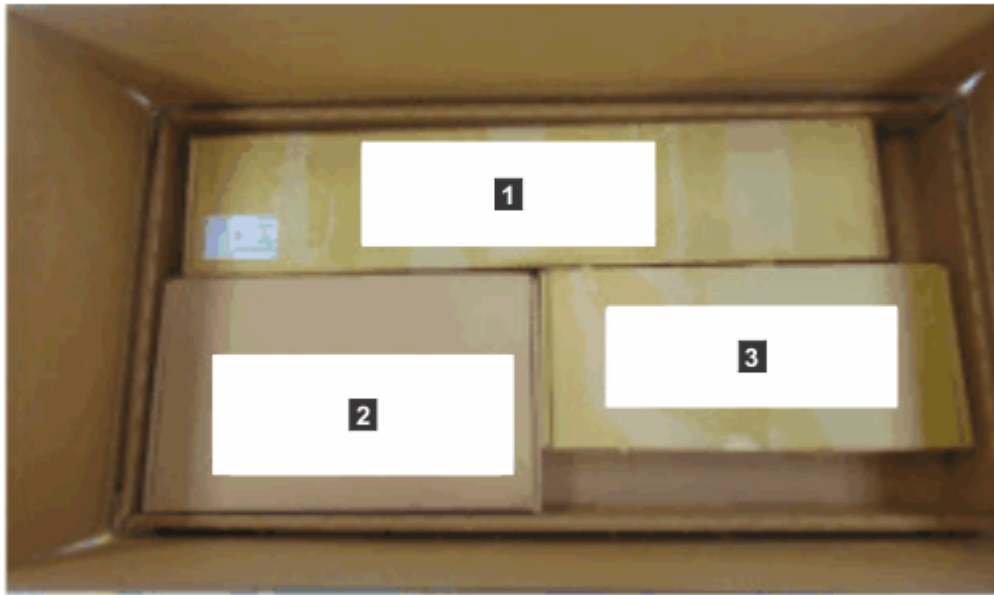
**CAUTION:** To avoid personal injury, before lifting this unit, remove all appropriate subassemblies per instructions to reduce the system weight. (C012)

**Important:** Before you unpack, move, install, or service the 2072-92F expansion enclosure and its parts, always complete the following tasks:

- Read and follow the safety notices and instructions, as described in [“Safety notices and considerations: 2072-92F”](#) on page 37.
- Read and follow the guidelines that are described in [“Weight considerations: 5U SAS expansion enclosure”](#) on page 41.
- Ensure that a suitably rated mechanical lift is available to support the weight of the expansion enclosure as it is inserted into the rack for installation.

## About this task

The 2072-92F expansion enclosure and most parts are shipped together in one large box. A tray on the top of the enclosure contains the front fascia (1U and 4U pieces), the cable management arm (CMA), and the slide rail kit; you must install these parts. [Figure 28 on page 50](#) shows how the enclosure is packaged for shipment.



*Figure 28. Tray containing expansion enclosure parts*

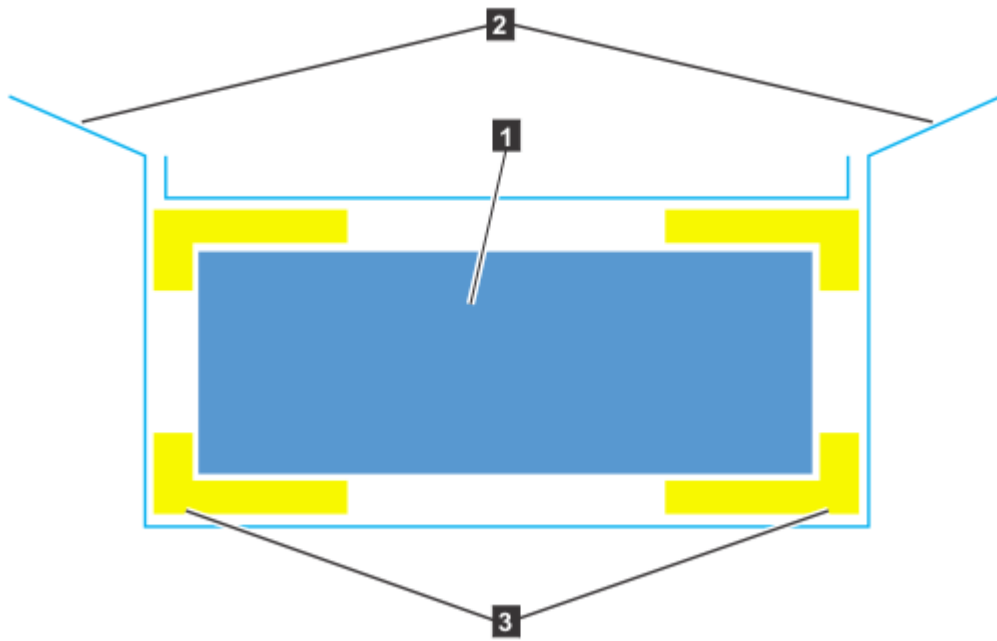
- 1** Slide rail kit
- 2** Cable management arm
- 3** Fascia

Other parts, such as the cover, secondary expander modules, and fans, are installed in the enclosure. However, due to weight considerations, you must remove some parts and then reinstall them as part of the initial installation process.

**Note:** Drives are not included in installation package for the enclosure; they are provided in a separate package.

## Procedure

1. Remove the cardboard tray that contains the slide rails, cable management arm, and fascia from cardboard box in which the expansion enclosure was shipped.
2. Remove the foam end pieces from the top of the 2072-92F expansion enclosure.
3. Cut the corners of the shipping box and fold them down to uncover the sides and faces of the expansion enclosure, as shown in [Figure 29 on page 51](#).



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Figure 29. Packaging materials

- 1** Enclosure
  - 2** Top of shipping box, folded back.
  - 3** Foam protectors
4. Remove the top cover, as described in [“Removing the top cover: 2072-92F”](#) on page 52.
  5. With two or more persons, push the expansion enclosure sideways onto an adjacent flat bed lift. Keep the remaining foam block protectors attached to the enclosure.
  6. Remove the support rail kit from the box in which it was shipped (**1**), as shown in [Figure 28](#) on page 50).
  7. Separate the inner section of the support rails and attach them to each side of the expansion enclosure, as described in steps “3” on page 54 through “5” on page 55 in [“Installing or replacing the support rails: 2072-92F”](#) on page 53.
  8. Attach the remaining sections of the support rails to the rack, as described in step “6” on page 55 in [“Installing or replacing the support rails: 2072-92F”](#) on page 53.
  9. Move the mechanical lift to the front of the rack. Align the inner section of the rails with the mid section of the rails that are extending from the rack.
  10. On each side, push the inner section and middle section of the rails together until they click and will no longer separate, as described in step “1” on page 64 in [“Installing or replacing an expansion enclosure in a rack: 2072-92F”](#) on page 63.
  11. Remove the 4U and 1U fascia from the boxes in which they were shipped, as shown in [Figure 30](#) on page 52.



Figure 30. Packaging for fascia

- 1 4U fascia (front)
- 2 1U fascia (power supply units)

12. Attach the 4U and 1U fascia to the front of the enclosure, as described in [“Installing or replacing the fascia: 2072-92F”](#) on page 57.
13. Install the drives, as described in [“Installing or replacing a drive: 2072-92F”](#) on page 58.
14. Replace the top cover, as described in [“Installing or replacing the top cover: 2072-92F”](#) on page 62.
15. Lower the mechanical lift so that you can remove the remaining foam blocks away from the expansion enclosure.
16. Slide the latch on the side of each rail and push the expansion enclosure securely into the rack, as described in steps [“3”](#) on page 64 through [“5”](#) on page 65 in [“Installing or replacing an expansion enclosure in a rack: 2072-92F”](#) on page 63.
17. Remove the cable management arm assembly from its packaging (**2** in [Figure 28](#) on page 50).
18. Attach the cable management arm, as described in [“Installing or replacing the cable-management arm: 2072-92F”](#) on page 65.
19. Connect the SAS cables, as described in [“Removing and installing a SAS cable: 2072-92F”](#) on page 69.
20. Connect the power cables.

## Removing the top cover: 2072-92F

To complete some service tasks, you might need to remove the top cover from a 2072-92F expansion enclosure.

### Before you begin

**Important:** You can remove the cover without powering off the expansion enclosure. However, to maintain operating temperature, replace the cover within 15 minutes of its removal. When the cover is removed, the reduction in airflow through the enclosure might cause the enclosure or its components to shut down to protect from overheating.

## Procedure

1. Slide the release latch (1) in the direction that is shown in [Figure 31](#) on page 53.

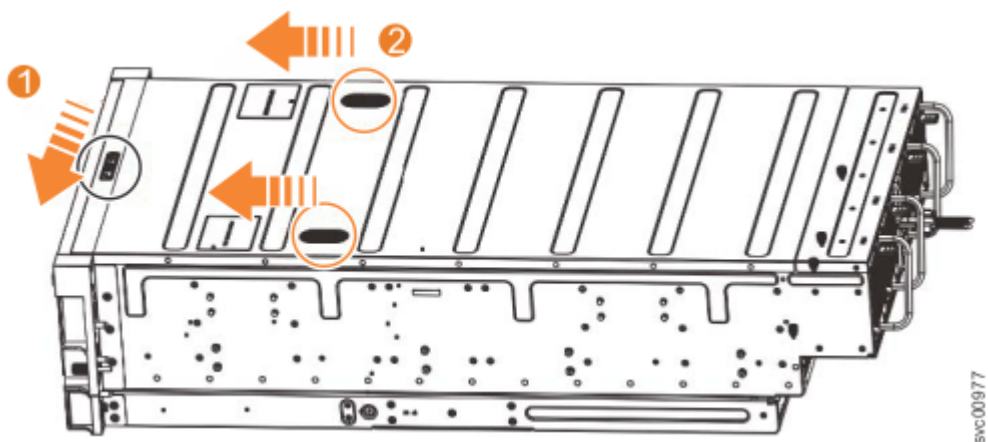


Figure 31. Releasing the 2072-92F cover

2. Slide the cover toward the front of the expansion enclosure (2), as shown in [Figure 31](#) on page 53.
3. Carefully lift the cover up, as shown in [Figure 32](#) on page 53.

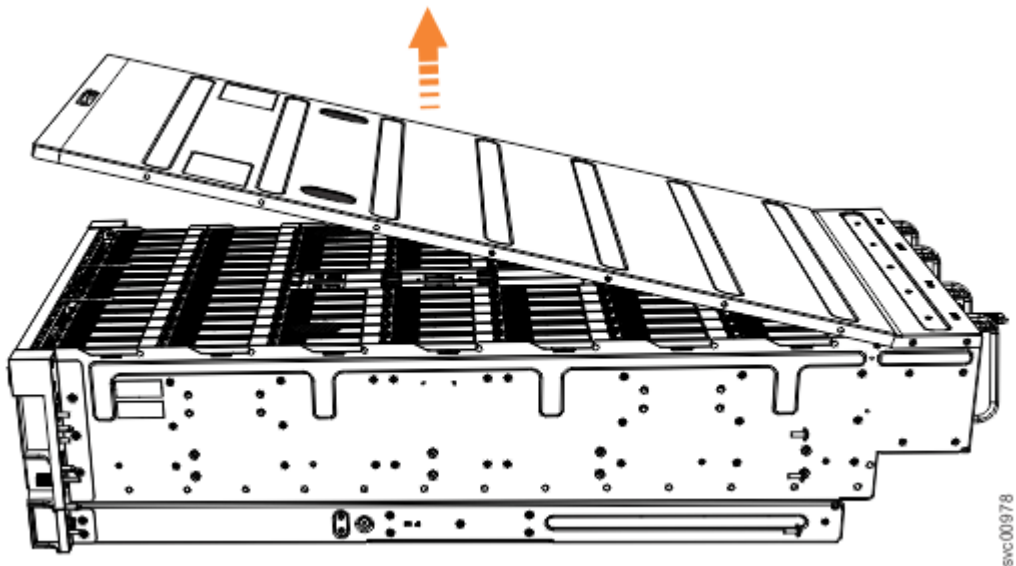


Figure 32. Removing the 2072-92F cover

4. Place the cover in a safe location.

## Replace the cover

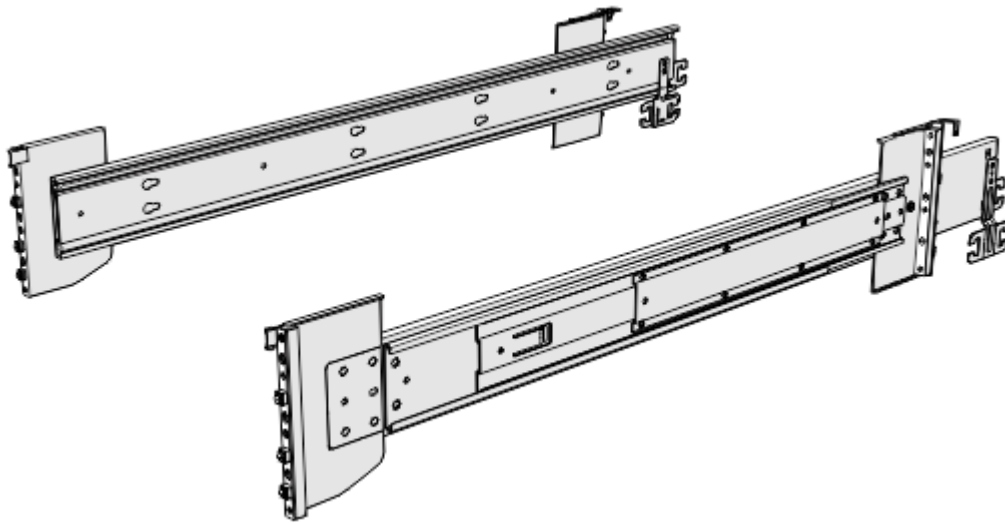
5. To reinstall the cover, or replace it with one from FRU stock, follow the procedure in “[Installing or replacing the top cover: 2072-92F](#)” on page 62.

## Installing or replacing the support rails: 2072-92F

You must install the support rails before you can install a 2072-92F expansion enclosure in a rack.

## Procedure

1. Locate the hardware that is used to install the rails, including the M4xL6 and M5xL13 screws.  
Set the hardware, which is shown in [Figure 33](#) on page 54, aside for use later in the installation process.



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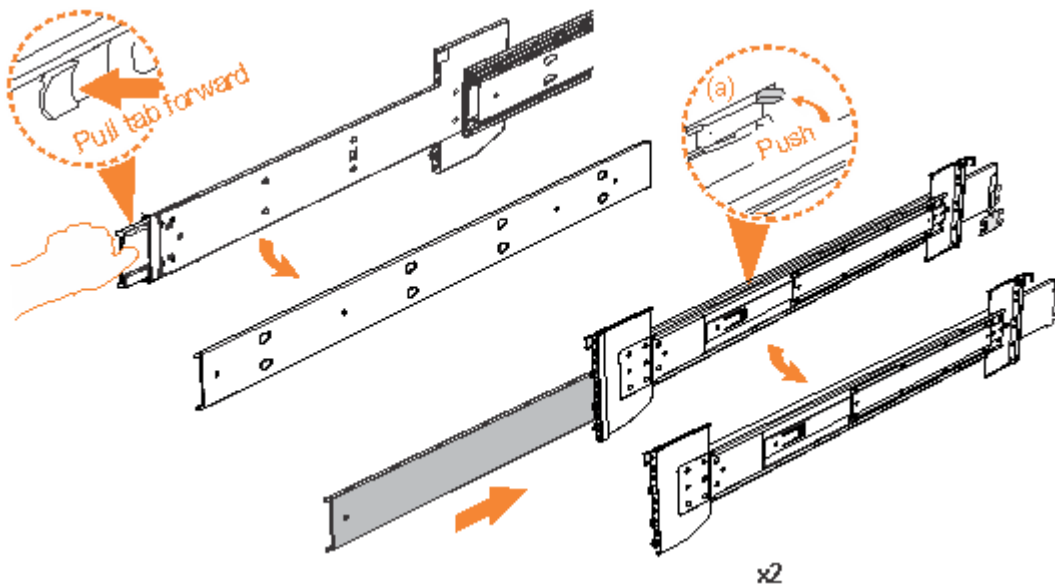
Figure 33. Support rails

2. Select an available 5U space in your rack to install the expansion enclosure.

**Important notes:**

- When you select a rack location, ensure that the enclosure and its parts are easily accessible. Allow enough space for the lid to be easily removed and for internal components, such as drives and secondary expansion modules, to be serviced.
- When all components and drives are installed, the expansion enclosure is heavy. Install the support rails and enclosure at the lowest available position. Do not install the rails and enclosure above position U25 in the rack.

3. Remove the inner member of the rail. Push the tab (a) and slide the middle rail member back, as shown in Figure 34 on page 54.



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Figure 34. Detaching the inner rail section

4. Use four M4 screws to attach the inner rail to the side of the enclosure. Figure 35 on page 55 shows the screw locations.

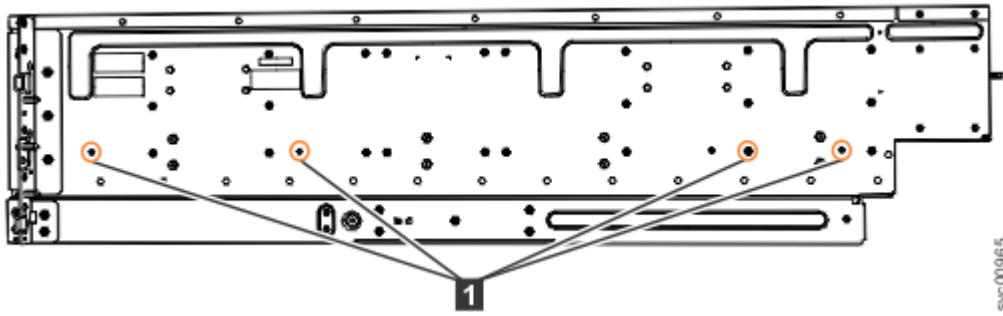


Figure 35. Screw locations to attach the inner rail to the enclosure

5. Install the inner section of the rail onto each side of the expansion enclosure, as shown in [Figure 36](#) on [page 55](#).

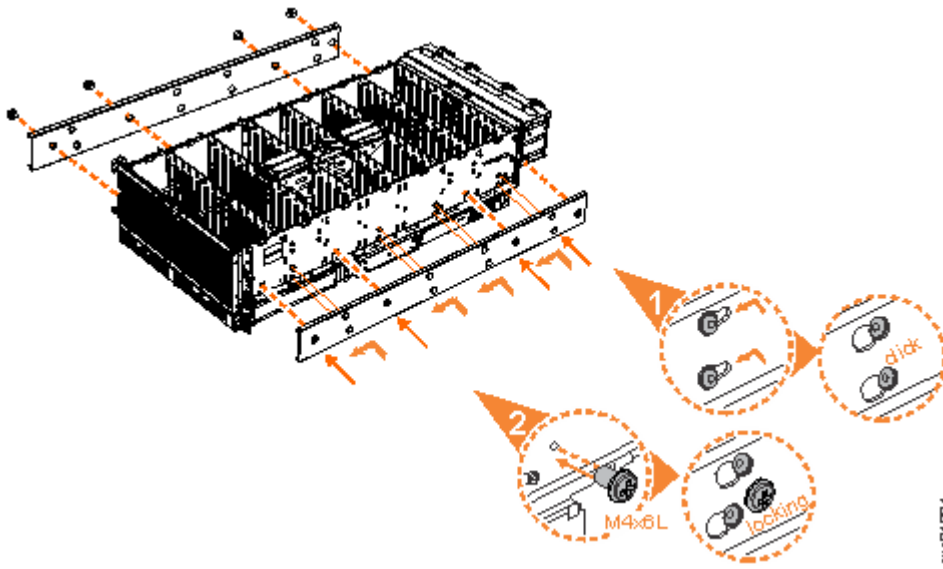


Figure 36. Attaching the inner rail section to the enclosure

6. Use the M5 screws to install the outer rail member and bracket assembly to the rack, as shown in [Figure 37](#) on [page 56](#).

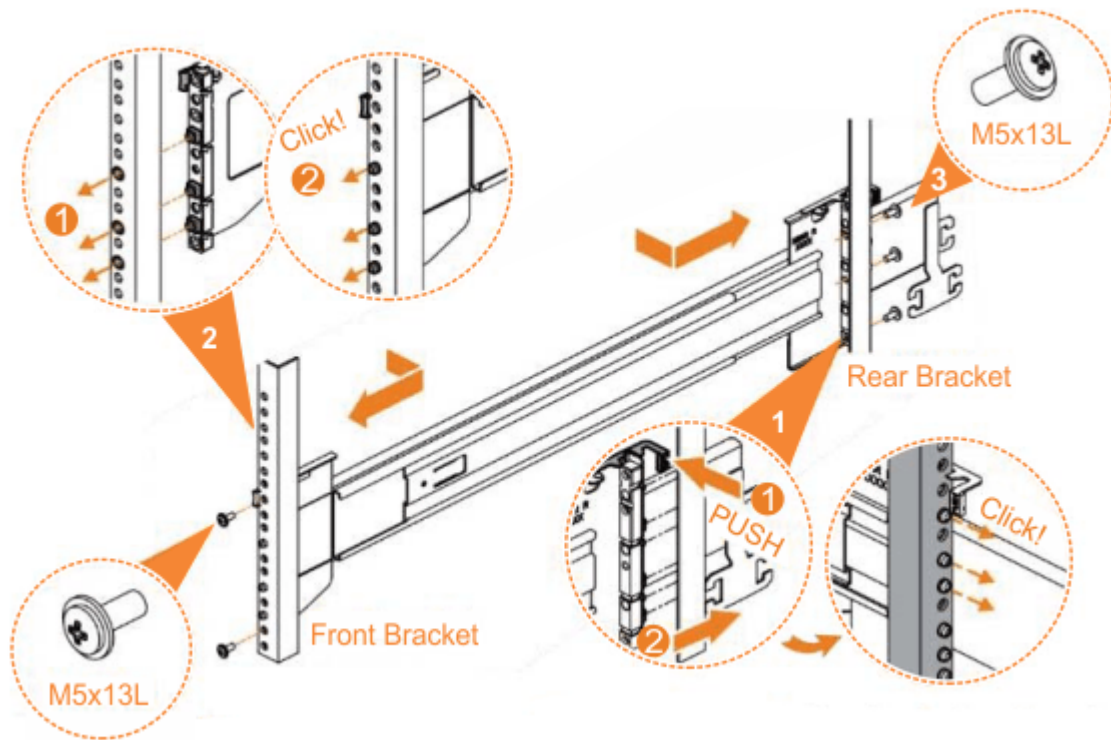


Figure 37. Installing the rail assembly to the rack frame

For example, [Figure 38 on page 56](#) shows the front of the rail that is attached to the frame.

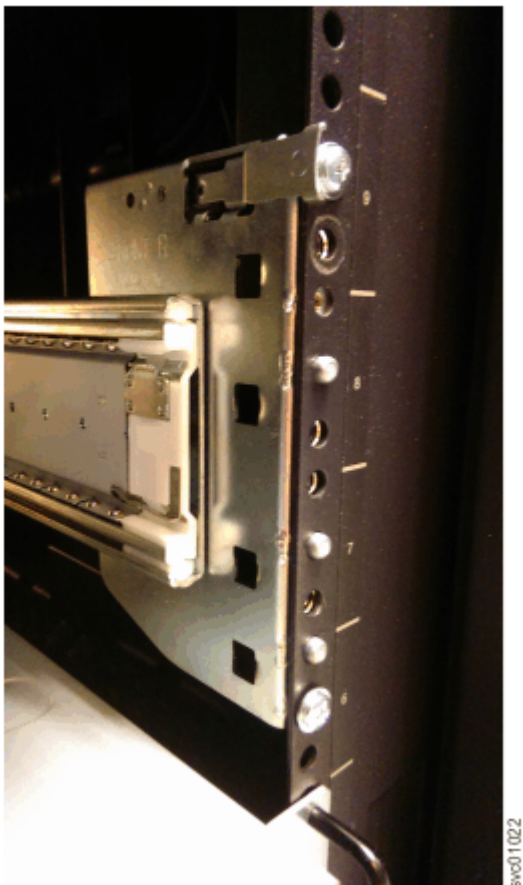


Figure 38. Example of the required rack space



7. Repeat steps “5” on page 55 through “6” on page 55 to install the opposite rail.
8. Install the expansion enclosure in the rack, as described in “Installing or replacing an expansion enclosure in a rack: 2072-92F ” on page 63.

## Installing or replacing the fascia: 2072-92F

During the initial installation process or after you perform service, you can install the fascia components on the front of a 2072-92F expansion enclosure.

### About this task

The 4U fascia covers the display panel of the expansion enclosure. It is attached to the enclosure by four screws. The bottom 1U fascia covers both of the power supply units (PSUs) on the enclosure. As [Figure 39 on page 57](#) shows, the fascias are independent; you can remove or replace one without having to remove or replace the other.

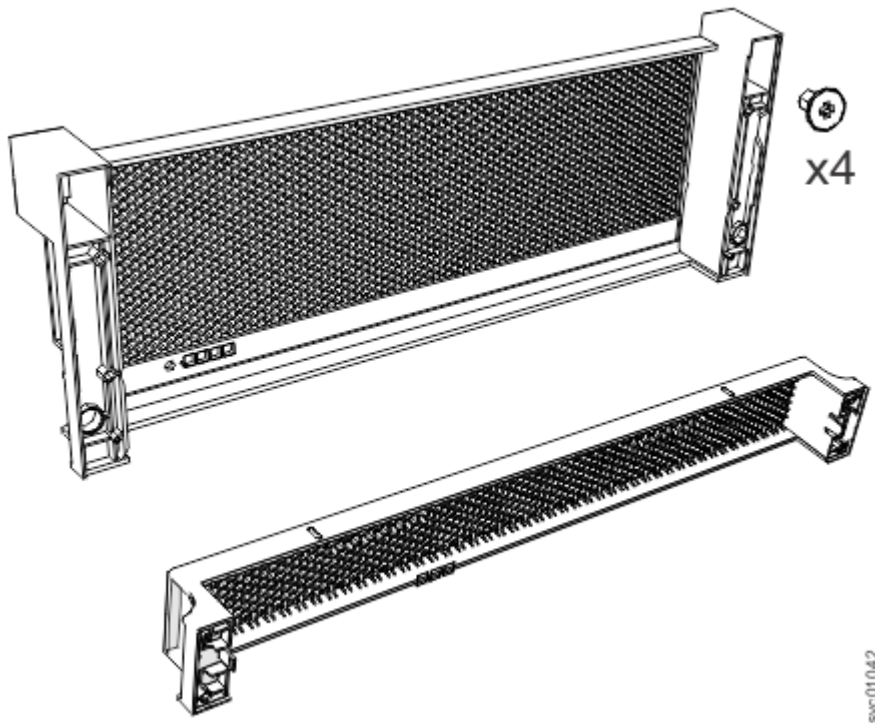


Figure 39. Fascia components on the expansion enclosure

**Note:** When the expansion enclosure is shipped, the 4U and 1U fascia are not installed. You must install them as part of the initial installation process.

### Procedure

#### Attach the front (4U) fascia

1. Align the front 4U fascia with the enclosure so that the thumbscrews go through the holes on each side. As [Figure 40 on page 58](#) shows, this action aligns the screw holes on the back of the fascia with the screw holes on the front flange of the enclosure.
2. Replace the four screws to reattach the 4U fascia. Secure the screws from the back of the flange and into the rear of the fascia. Each side of the 4U fascia contains two screws.

#### Attach the bottom (1U) fascia

3. Reattach the bottom 1U fascia that covers the power supply units (PSUs). Align the fascia with the enclosure and gently push it until it clicks into place on the chassis, as shown in [Figure 40 on page 58](#).

Align the tab on each side of the 1U fascia with the corresponding slots on the enclosure flange. Pins on each flange must also align with a hole in each side of the 1U fascia.

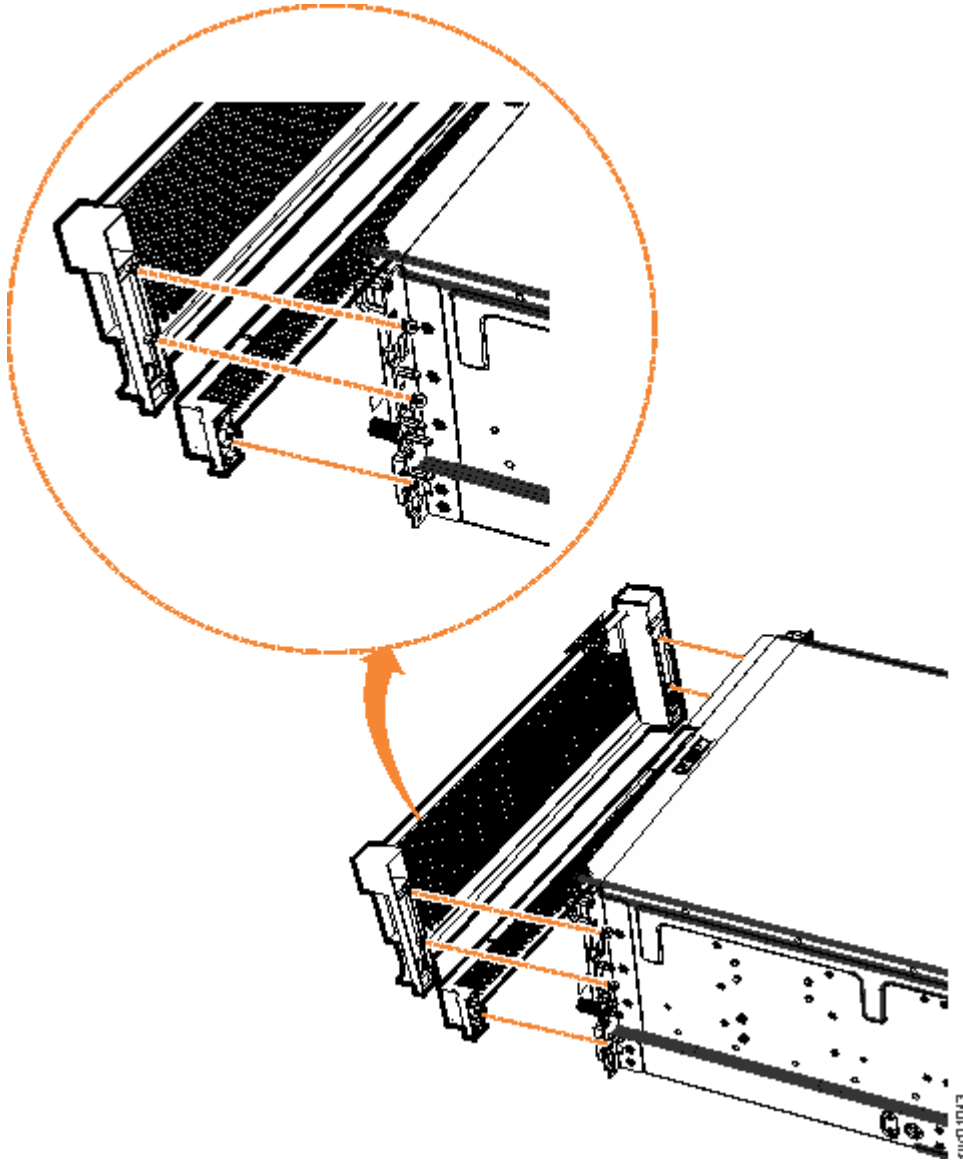


Figure 40. Replace fascia components on the expansion enclosure

### Installing or replacing a drive: 2072-92F

Use the following procedure to install a drive for the first time or to replace a faulty drive in a 2072-92F expansion enclosure with a new one received from FRU stock.

#### Before you begin

#### Important:

- You can replace a drive assembly without powering off the expansion enclosure. However, to maintain operating temperature, do not keep the cover off an operational enclosure for more than 15 minutes. The reduction in airflow through the enclosure might cause the enclosure or its components to shut down to protect from overheating.
- Ensure that the drive that you are replacing is not a spare or a member of an array. The drive status is shown in **Pools > Internal Storage** in the management GUI. If the drive is a member of an array, follow the fix procedures in the management GUI. The fix procedures minimize the risk of losing data or access to data; the procedures also manage the system's use of the drive.

## About this task

The 2072-92F expansion enclosure supports 92 drives. [Figure 41 on page 59](#) shows an example of a drive assembly.

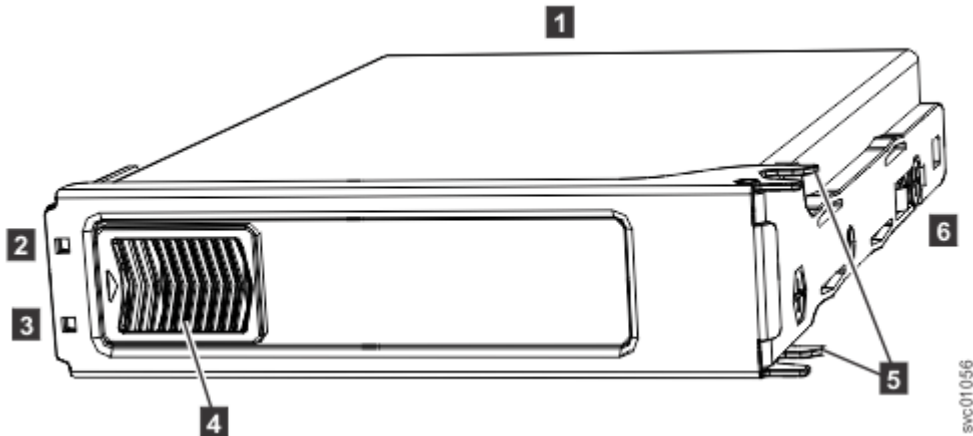


Figure 41. Drive assembly

- 1 Disk drive
- 2 Online indicator
- 3 Fault indicator
- 4 Release latch
- 5 Drive latch toes
- 6 Drive carrier

## Procedure

1. Read all the available safety information.
2. Remove the cover, as described in [“Removing the top cover: 2072-92F” on page 52](#).
3. Locate the empty drive slot to receive the new drive or that contains the faulty drive that you want to replace.

**Note:** When a drive is faulty, the amber fault indicator is lit (3 in Figure 41 on page 59). Do not replace a drive unless the drive fault indicator is on or you are instructed to do so by a fix procedure.

A label on the enclosure cover (Figure 42 on page 59) shows the drive locations in the enclosure. The drive slots are numbered 1-14 from left to right and A-G from the back to the front of the enclosure.

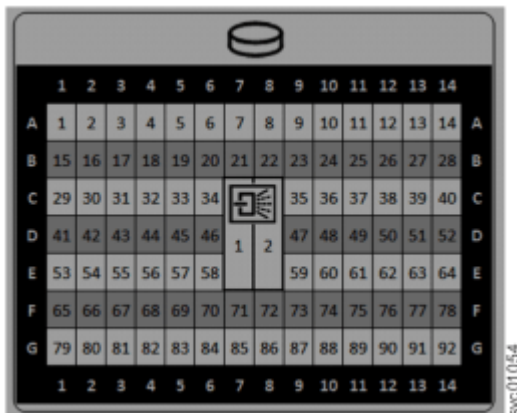
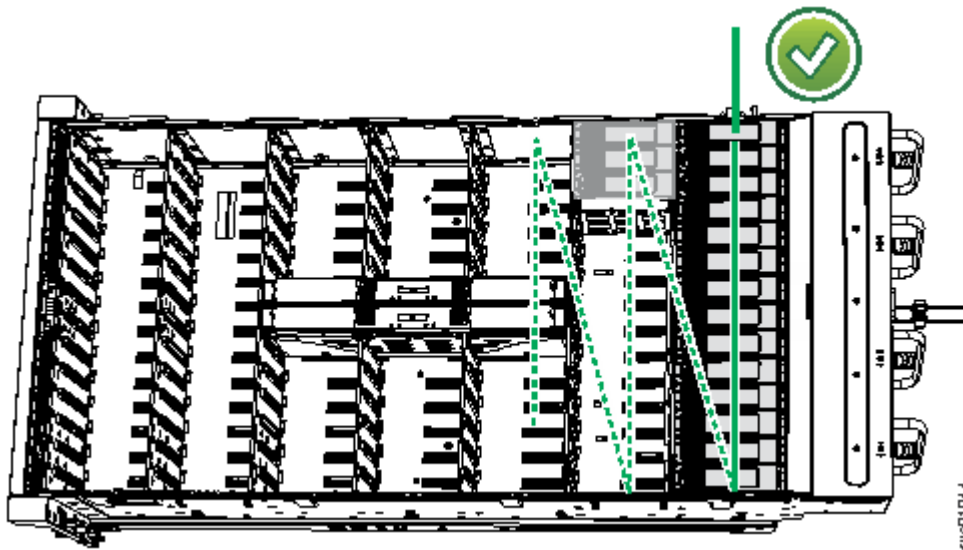


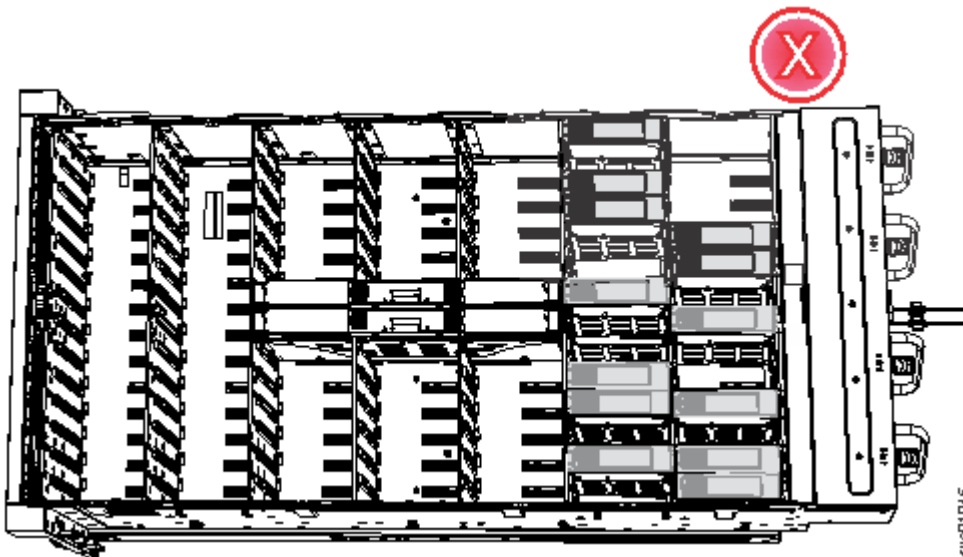
Figure 42. Drive locations in a 5U expansion enclosure

The drive slots must be populated sequentially, starting from the back-left corner position (slot 1, grid A1). Sequentially install the drive in the slots from left to right and back row to front. Always complete a full row before you install drives in the next row. For example, in [Figure 43 on page 60](#), the drives are installed correctly. Drives are installed in slots 1 -14 of row A and the installation continues in slot 15 in row B.



*Figure 43. Correct drive installation*

In [Figure 44 on page 60](#), the drives are not installed correctly. Slot 1 (A1) does not contain a drive. In addition, drives are installed in row B even though row A contains empty drive slots.



*Figure 44. Incorrect drive installation*

4. Touch the static-protective package that contains the drive to any unpainted metal surface on the enclosure. Wear an anti-static wrist strap to remove the drive from the package.
5. Ensure that the drive handle (❶ in [Figure 45 on page 61](#)) of the drive assembly is in the open (unlocked) position.
6. Align the drive carrier into the appropriate drive slot.
7. Gently push the drive down until it stops and the bottom of the latch is aligned with the top of the partition. Ensure that the handle is not open more than 45 degrees from the drive carrier. (❷ in [Figure 45 on page 61](#)).

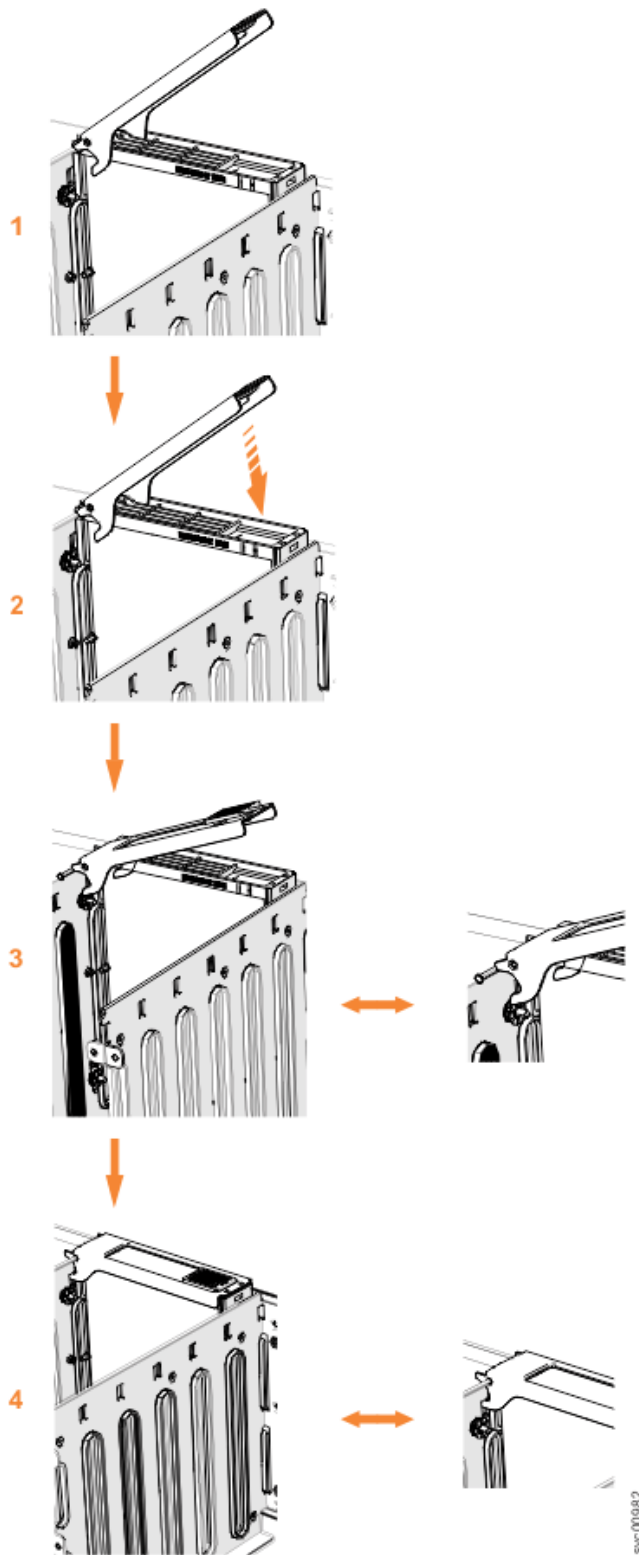


Figure 45. Replace the drive

8. Rotate the handle down to lock the drive assembly into the chassis (**3** in Figure 45 on page 61).
9. Ensure the toe on the bottom of the latch is fully engaged with the partition in the chassis.
10. Ensure that the top toe of the latch is also fully engaged (**4** in Figure 45 on page 61).
11. Repeat steps “4” on page 60 through “10” on page 61 for each drive you are replacing.

12. Replace the cover, as described in [“Installing or replacing the top cover: 2072-92F”](#) on page 62.
13. Slide the expansion enclosure back into the rack, as described in [“Installing or replacing an expansion enclosure in a rack: 2072-92F”](#) on page 63.

## Installing or replacing the top cover: 2072-92F

You can replace the top cover on a 2072-92F expansion enclosure during the installation process or after you complete a service task.

### Before you begin

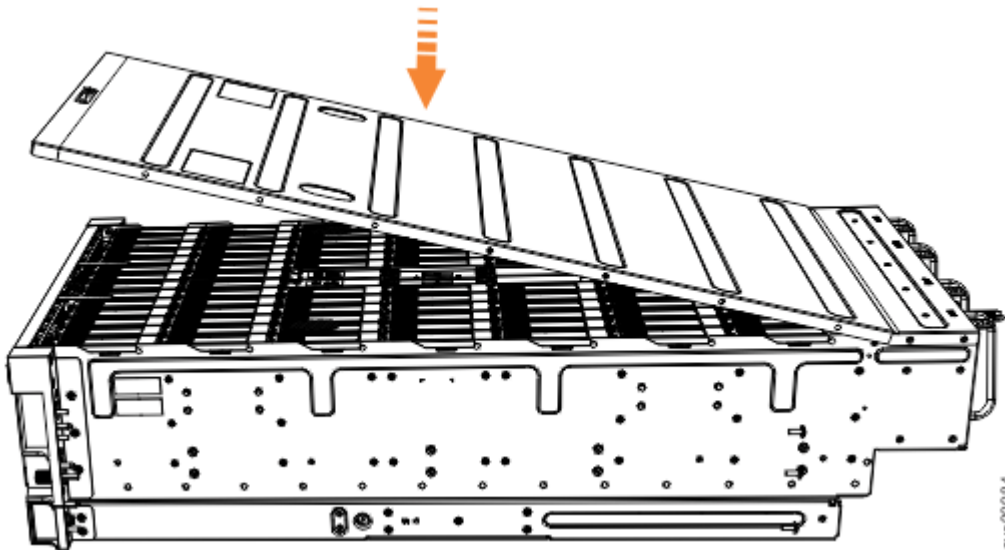
**Important:** You can install the cover while the expansion enclosure is powered on. To maintain operating temperature, replace the cover within 15 minutes of completing other service tasks. When the cover is removed, the reduction in airflow through the enclosure might cause the enclosure or its components to shut down to protect from overheating.

### About this task

To install or replace the top cover on the 2072-92F expansion enclosure, complete the following steps.

### Procedure

1. Carefully lower the cover and ensure that it is aligned correctly with the back of the enclosure, as shown in [Figure 46](#) on page 62.



*Figure 46. Aligning the 2072-92F top cover*

2. Push the cover release lever to the side (2) as shown in [Figure 47](#) on page 63.
3. Slide the cover towards the back of the enclosure (3) back until it stops, as shown in [Figure 47](#) on page 63.

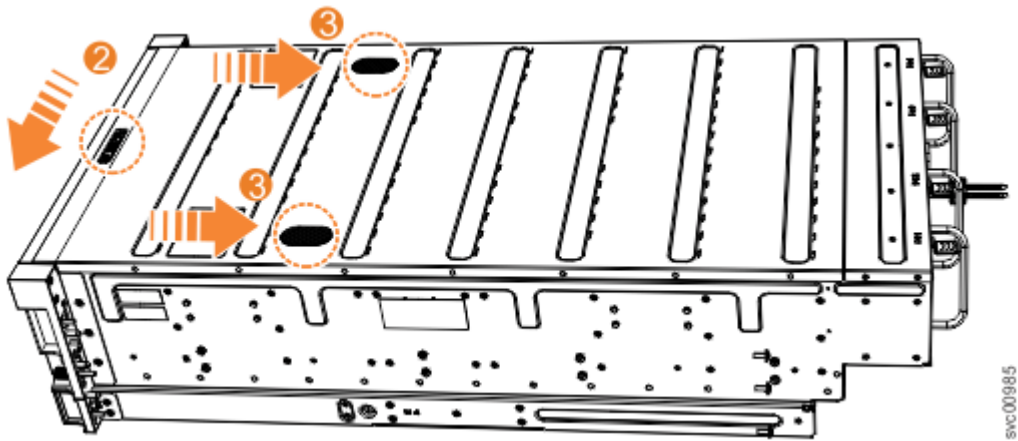


Figure 47. Replacing the 2072-92F top cover

4. Verify that the cover correctly engages the cover release latch and all of the inset tabs on the expansion enclosure.
5. Lock the cover into position by sliding the release lever **4**, as shown in [Figure 48 on page 63](#)

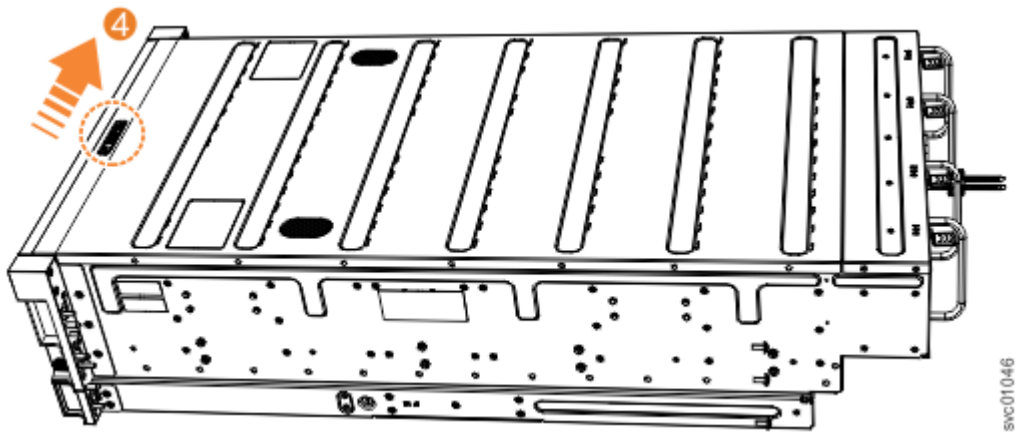


Figure 48. Locking the top cover

## Installing or replacing an expansion enclosure in a rack: 2072-92F

Use the following procedure to place the 2072-92F expansion enclosure in a rack during the installation process. To complete some service tasks, you might also need to slide the enclosure back in to the rack.

### About this task

**Important:** The 2072-92F expansion enclosure is heavy. Before you install the expansion enclosure in the rack for the first time or replace it in the rack to complete a service task, review and implement the following tasks:

- Always use a suitably rated mechanical lift or four persons to raise the enclosure to install it in the rack. Even after the drives, power supply units, secondary expander modules, canisters, fans, and top cover are removed, the enclosure weighs 43 kg (95 lbs).
- Install the expansion enclosure in the lowest position in the rack. [Figure 49 on page 64](#) shows an example.

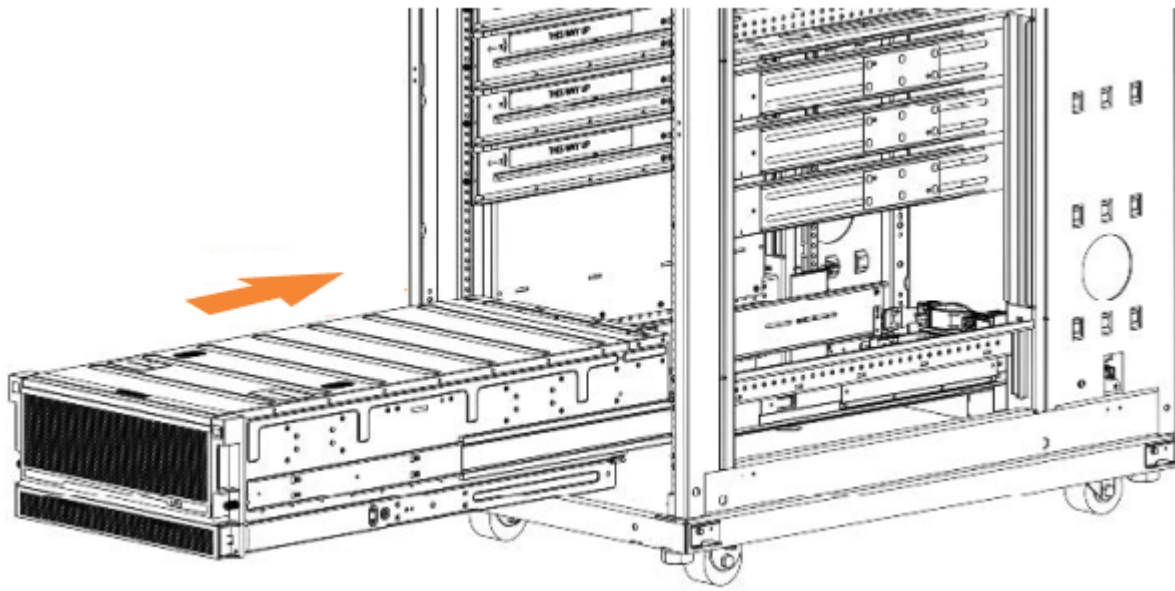


Figure 49. Example installation of the enclosure in the rack

- Ensure that the drives are easily accessible. Avoid installing the 2072-92F expansion enclosure above position 22U in the rack.

#### Procedure

1. Fully extend the left and right drawer sections from the rack to lock the rails in the extended position (1 in Figure 50 on page 64).

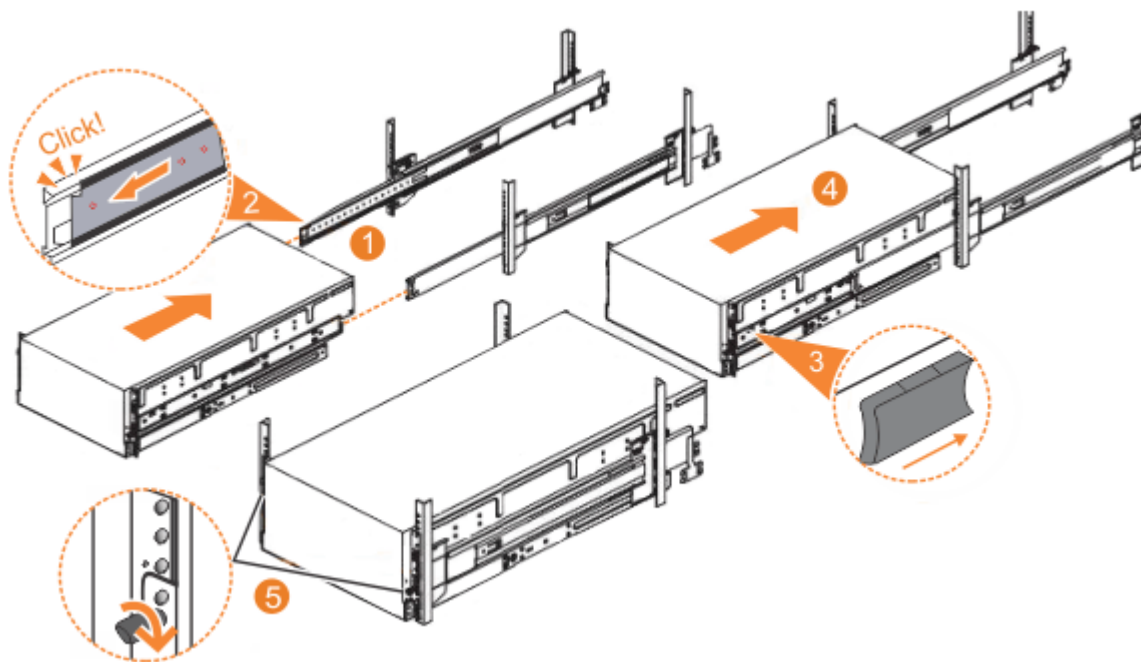


Figure 50. Replacing the 2072-92F enclosure in the rack

2. Ensure that the ball bearing retainer clicks into place inside the front of the left and right drawer sections (2 in Figure 50 on page 64).

#### Sliding the enclosure into the rack

3. Locate the left and right blue release tabs near the front of the enclosure. Press both release tabs forward to unlock the drawer mechanism (3 in Figure 50 on page 64).



4. Push the enclosure firmly into the rack (4 in Figure 50 on page 64).
5. Tighten the locking thumb screws (5 in Figure 50 on page 64) to secure the enclosure in the rack.
6. Reconnect power to the expansion enclosure.

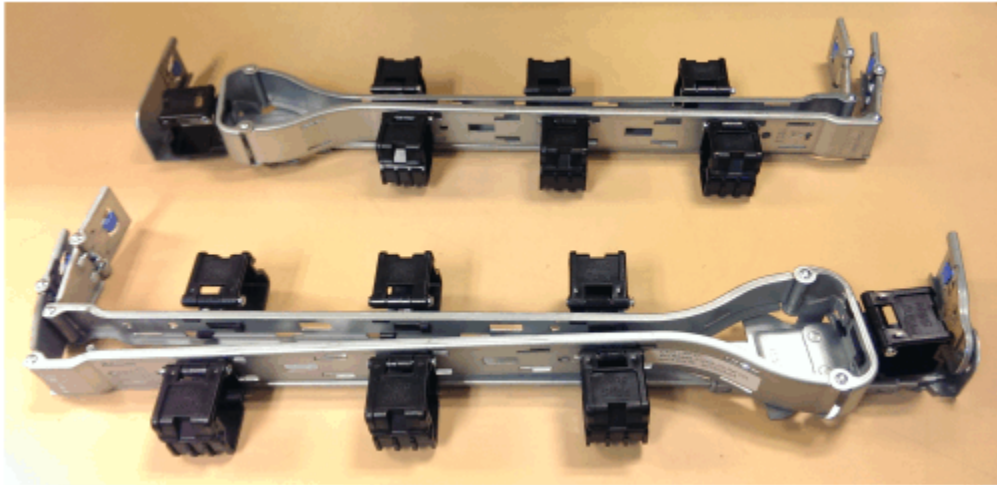
### **Installing or replacing the cable-management arm: 2072-92F**

Use these procedures to install the cable-management arm (CMA) for the 2072-92F expansion enclosure. You can also use these procedures to replace a faulty CMA assembly.

#### **About this task**

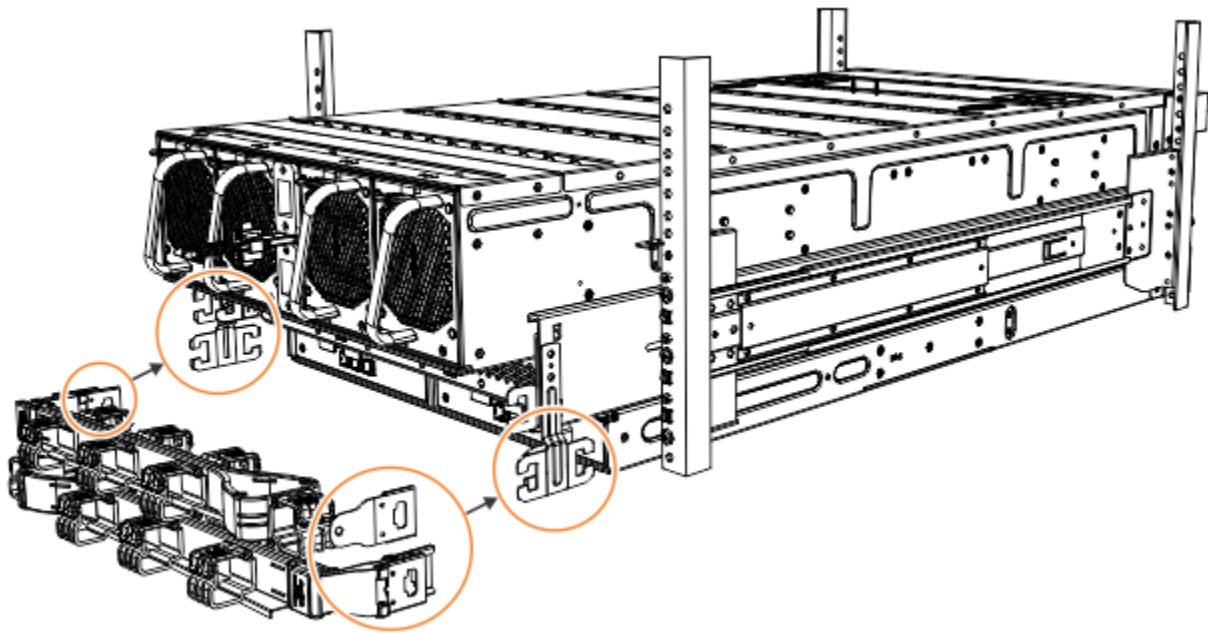
As part of the initial installation of the 2072-92F expansion enclosure, you must attach the CMA. You might also need to replace a faulty CMA with a new one from FRU stock.

The cable management arm (CMA) consists of an upper arm and a lower arm assembly, as [Figure 51](#) on page 65 shows.



*Figure 51. Upper and lower cable-management arms*

As [Figure 52](#) on page 66 shows, the support rail connectors of each CMA assembly are installed on the rail hooks at the end of the support rails.



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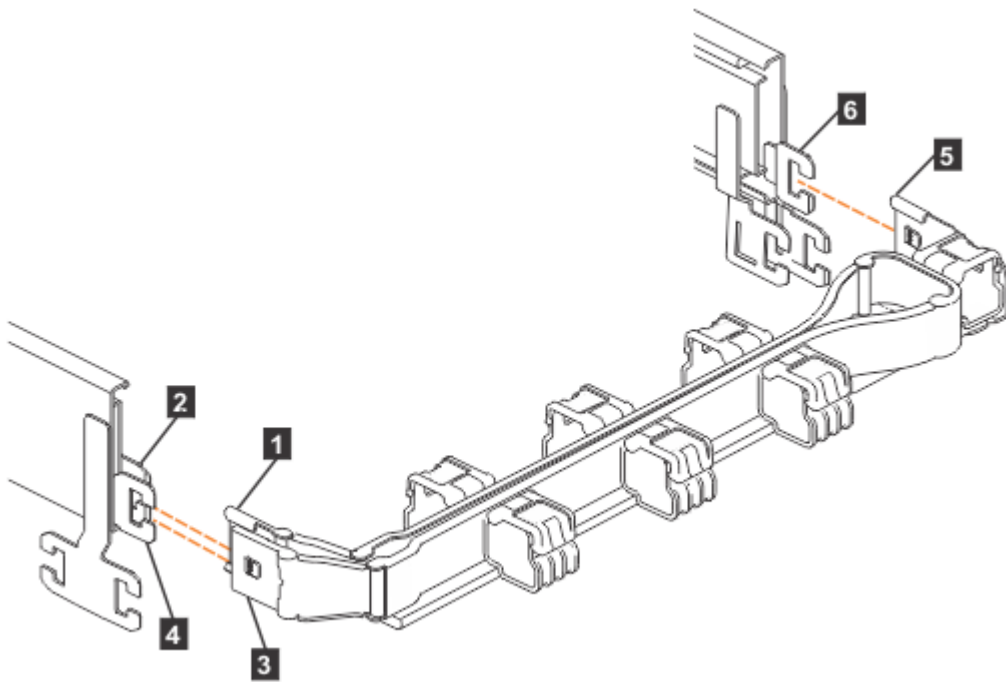
Figure 52. Upper and lower cable-management arms

### Procedure

1. Remove the loop straps from the upper and lower CMA assemblies. The straps are used only for shipping.

### Installing the upper CMA assembly

Figure 53 on page 66 shows the connectors on the upper CMA assembly.

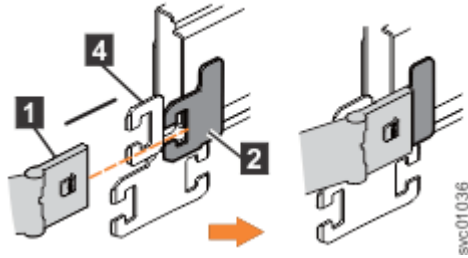


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Figure 53. Connectors for the cable management arm

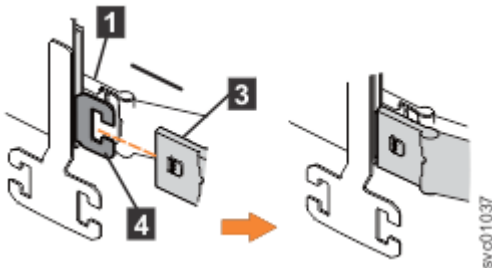
- 1 Inner connector on upper CMA
- 2 Connector base on inner rail member

- 3 Outer connector on upper CMA
  - 4 Connector base on outer rail member
  - 5 Support rail connector on upper CMA
  - 6 Connector base on outer rail member
2. Install the inner connector of the upper CMA assembly (1) to the inner member of the left support rail (2), as shown in [Figure 54](#) on page 67.



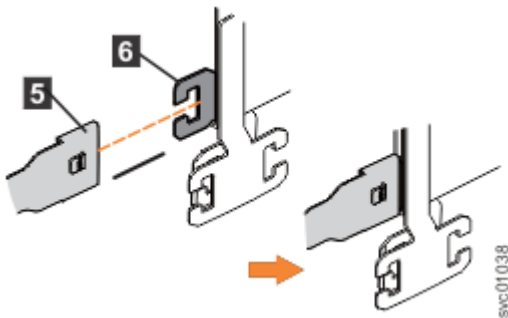
*Figure 54. Install the inner connector of the upper CMA to the inner member of the support rail*

3. Install the outer connector of the upper CMA assembly (3) to the outer member of the left support rail (4), as shown in [Figure 55](#) on page 67.



*Figure 55. Install the outer connector of the upper CMA to the outer member of the support rail*

4. Attach the support rail connector on the upper CMA assembly (5) to the connector base on the right support rail (6), as shown in [Figure 56](#) on page 67.

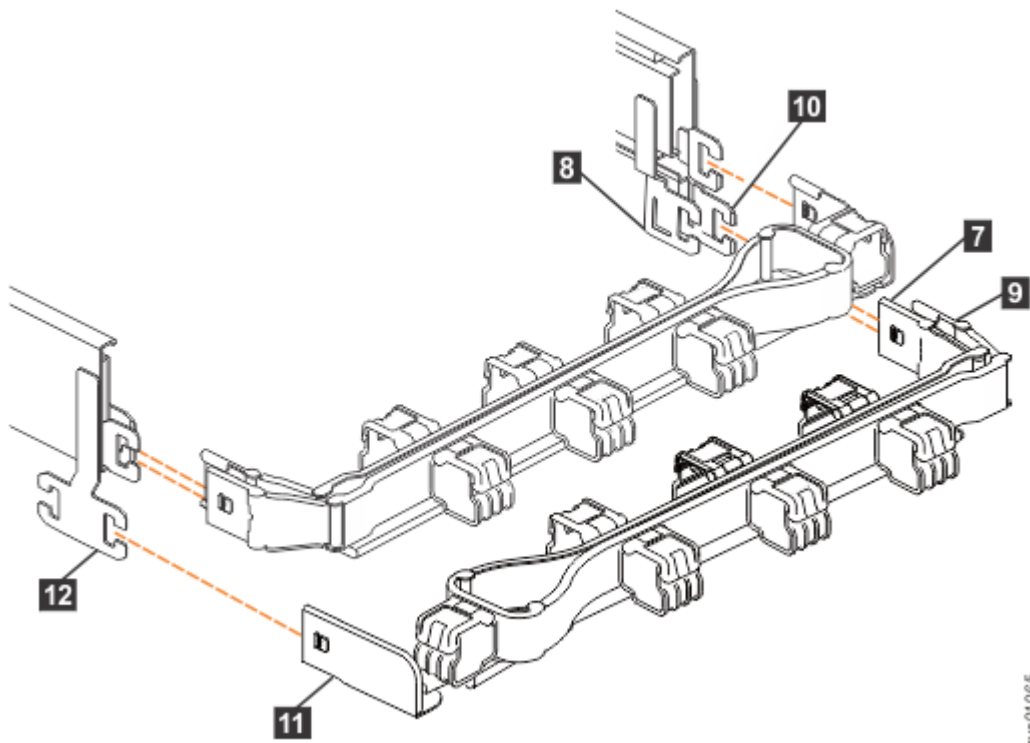


*Figure 56. Attach the support rail connector of the upper CMA to the right support rail*

Ensure the cable-management arm connector attaches securely to the hooks on the rails.

### **Installing the lower CMA assembly**

**Note:** The procedure for attaching the lower CMA assembly is the same as the procedure to attach the upper CMA assembly. However, the connector locations are reversed. For comparison, [Figure 57](#) on page 68 shows the upper and lower CMA assemblies as they are aligned to the support rails. The support rail connector of the upper CMA attaches to the right rail. The support rail connector of the lower CMA (11) attaches to the left rail.



svc01065

Figure 57. Comparing the location of the components of the CMA assemblies

- 7** Inner connector on lower CMA
- 8** Connector base on inner rail member
- 9** Outer connector on lower CMA
- 10** Connector base on outer rail member
- 11** Support rail connector the lower CMA
- 12** Connector base on outer rail member

5. Install the inner connector of the lower CMA assembly (**7**) to the inner member of the right support rail (**8**), as shown in [Figure 57 on page 68](#).
6. Install the outer connector of the lower CMA assembly (**9**) to the outer member of the right support rail **10**, as shown in [Figure 57 on page 68](#).
7. Attach the support rail connector on the lower CMA assembly (**11**) to the connector on the left support rail (**12**), as shown in [Figure 57 on page 68](#).  
Ensure that the lower CMA assembly is securely attached to the hooks on the end of the support rails.
8. Route the cables and power cords on the CMA. If needed, secure them with cable ties or hook-and-loop fasteners.

**Notes:**

- Use the cable straps that are provided on the rear of the system to retain the cables and prevent them from sagging.
  - Allow slack in all of the cables to avoid tension in the cables as the CMA moves.
9. Reconnect the power cords and other cables, as needed.

## Removing and installing a SAS cable: 2072-92F

Use the following procedures to attach SAS cables to the 2072-92F enclosure during the initial installation process. You can also use this procedure to remove a faulty SAS cable and replace it with a new one received from FRU stock.

### About this task

Be careful when you are replacing the hardware components that are located in the back of the system. Do not inadvertently disturb or remove any cables that you are not instructed to remove.

If you replace more than one cable, record which two ports, canisters, and enclosures each cable connects, so you can match the connections with the replacement cables. The system cannot operate if the SAS cabling to the expansion enclosure is incorrect.

When the 2072-92F expansion enclosure is installed in the rack, the expansion canisters are upside down. The input cable connects to the right port (port 1) on the expansion canister. The output cable connects to the left port (port 2) on the canister.

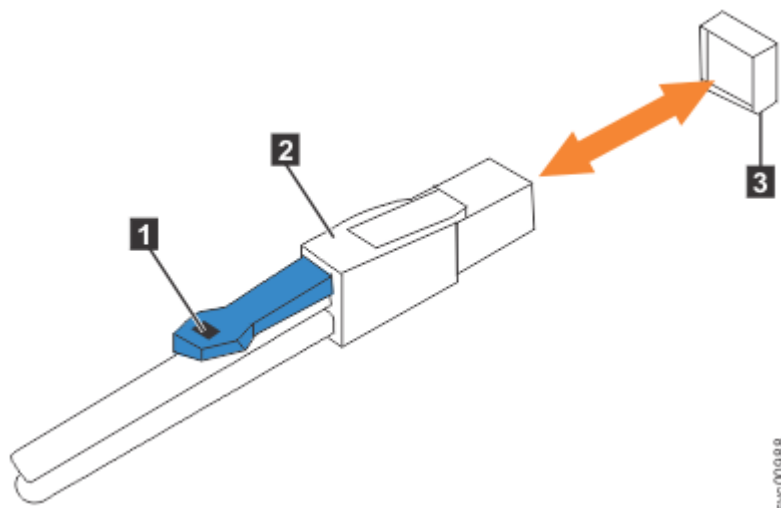
### Procedure

#### Removing a SAS cable

1. Locate the connector at the end of the SAS cable that is to be removed from the expansion enclosure.
2. Grasp the connector by its blue tag. Pull the tag.
3. Release the connector and slide it out of the SAS port.
4. Repeat steps “2” on page 69 and “3” on page 69 on the other end of the SAS cable.

#### Replacing a SAS cable

5. Ensure that the SAS connector is oriented correctly, as shown in [Figure 58 on page 69](#). The blue tab must face towards the top of the enclosure canister.



- 1 Blue pull tab
- 2 SAS cable
- 3 SAS port

Figure 58. Correct orientation for SAS cable connectors

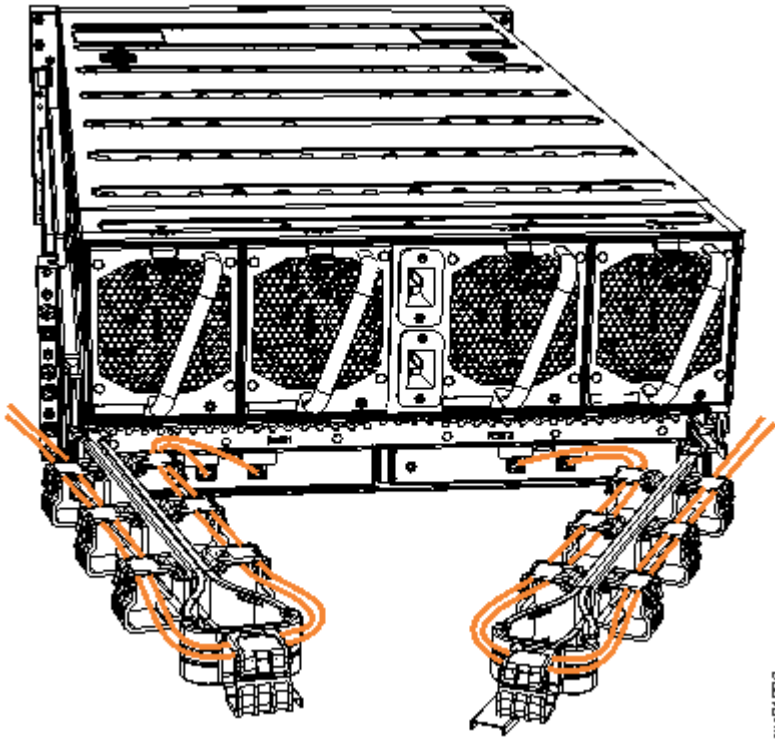
6. Insert the SAS cable into the SAS port until you hear or feel a click. When the cable is successfully inserted, you cannot disconnect the cable without pulling on the blue tag.

#### Connecting to a Storwize V5000E node

7. Connect the SAS cable to the SAS port with blue tab **above** the connector (that is, facing towards the top of the node).

You hear or feel a click when the cable is successfully inserted. You cannot disconnect the cable without pulling on the blue tag.

8. Route the SAS cables through the cable management arms, as shown in [Figure 59](#) on page 70.



*Figure 59. Example of SAS cables routed through the cable management arms*

9. When both ends of a SAS cable are correctly connected, the green link-LED next to the connected SAS ports are lit.

For example, [Figure 60](#) on page 71 shows the LEDs of expansion canister 1 on a 2072-92F expansion enclosure. The SAS cable is successfully inserted in to port 1 (input); port 2 (output) does not contain a SAS cable.

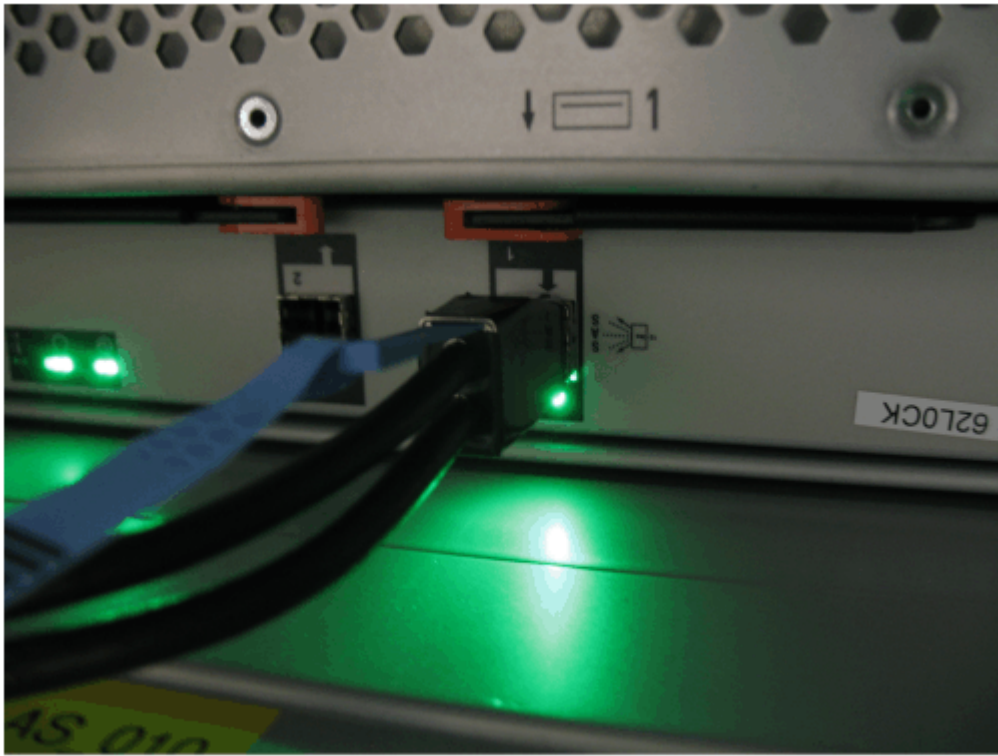


Figure 60. SAS cable correctly inserted into the SAS port

## Connecting the optional 5U expansion enclosure: 2072-92F

After you install a 2072-92F expansion enclosure into the rack, you must connect it to each Storwize V5000E system that will use it.

### About this task

When you insert SAS cables, ensure that the connector is oriented correctly to the node and expansion enclosure.

- For Storwize V5000E control enclosures (and 2072-24F or 2072-12F expansion enclosures), the blue pull tab must be below the cable (1 in Figure 61 on page 71).

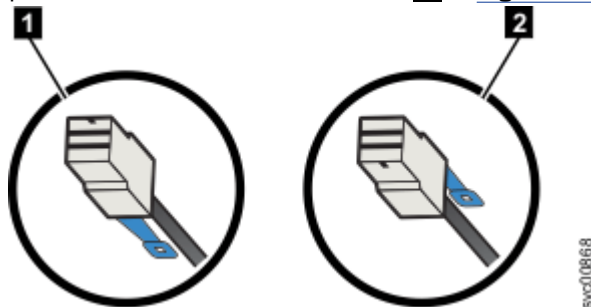


Figure 61. SAS cable connector orientation

- For 2072-92F expansion enclosures, the blue pull tab must be above the connector (2 in Figure 61 on page 71).
- Insert the connector gently until it clicks into place. If you feel resistance, the connector is probably oriented the wrong way. Do not force it.
- When inserted correctly, the connector can be removed only by pulling the tab.

Be aware of the following guidelines when you attach the cables to the SAS ports.

- No cable can be connected between a port on a left canister and a port on a right canister of the expansion enclosures.
- Ensure that cables are installed in an orderly way to reduce the risk of cable damage when replaceable units are removed or inserted.
- SAS cables must be routed through the cable management arms to reduce the risk of disconnecting the nodes from their storage arrays. This step also helps to protect the SAS cables from getting damaged if you slide the node or enclosure out of the rack while they are attached. Arrange your cables to provide access to the following components:
  - Ethernet ports, including the technician port. The technician port is used for initial setup of the system by directly attaching to a personal computer. It can also be used to complete service actions for the system.
  - USB ports. USB ports can be used to initialize the system or to perform service-related tasks by using a USB flash drive that contains executable files for initializing the system.
  - Fibre Channel ports. If your system has an optionally installed Fibre Channel adapter for host and external storage attachment, ensure that these ports are accessible.
  - The nodes and the enclosures themselves. Access is required to the hardware for servicing and for safely removing and replacing components by using two or more people.

### Procedure

1. Install the cables, as shown in [Figure 62 on page 73](#).

**Note:** [Figure 62 on page 73](#) shows the cable connections between the SAS enclosures and the Storwize V5030E control enclosure. It does not imply or represent the precise racking order for the enclosures in a rack. However, due to its size and weight, always place the 2072-92F enclosure near the bottom of the rack.



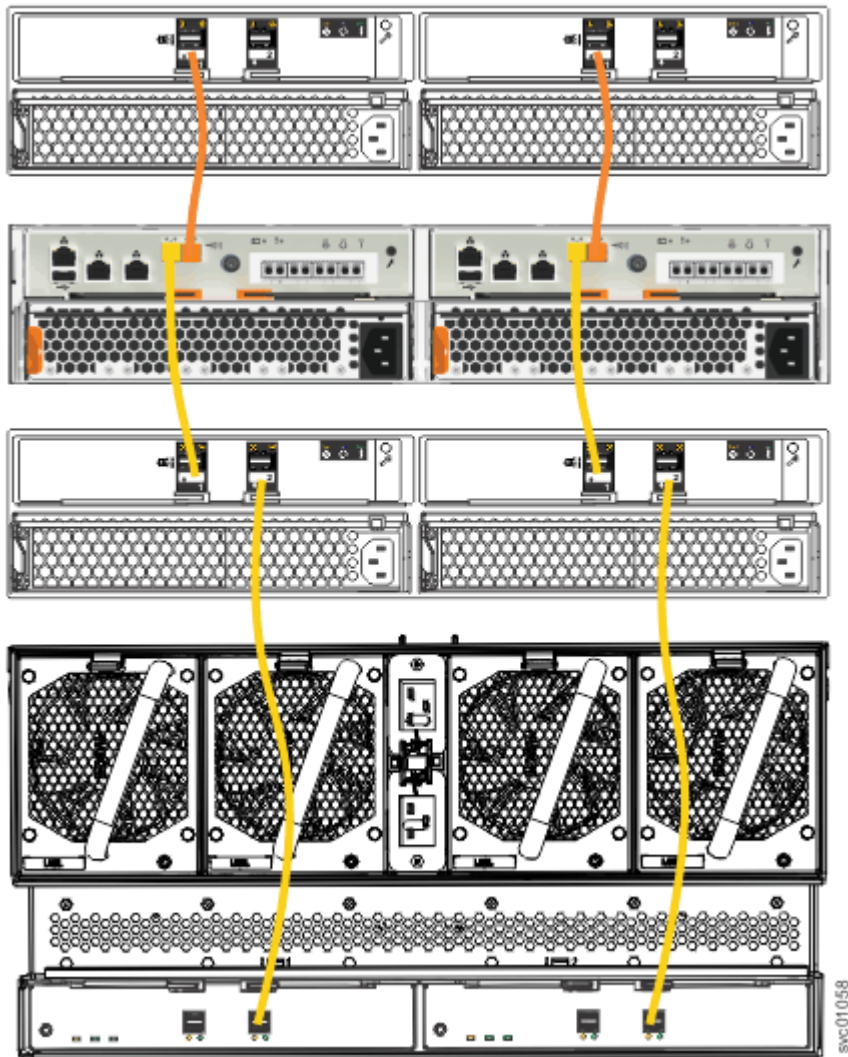


Figure 62. Connecting the SAS cables

2. If more I/O groups are configured, repeat the cabling procedure for the other I/O groups. The maximum number of I/O groups that is supported depends on the model of your system. Two chains of expansion enclosures can be attached to each I/O group. On each SAS chain, the systems can support up to a SAS chain weight of 10.

### Combining 2U and 5U expansion enclosures

#### About this task

As Figure 62 on page 73 shows, you can combine 2U and 5U expansion enclosures in a SAS chain. The limiting factor is the combined *chain weight* of the various components. The maximum SAS chain weight that can be attached to a node SAS port is 10:

- 2072-92F expansion enclosures (5U) have a chain weight of 2.5
- 2072-24F or 2072-12F expansion enclosures (2U) each have a chain weight of 1.

#### Example

Table 29 on page 74 shows example of different combinations of SAS weights.

2072-12F Enclosures	2072-24F Enclosures	2072-92F Enclosures	Combined chain weight
2	0	3	9.5
2	3	2	10
0	7	1	9.5
1	1	1	4.5 (as shown in Figure 62 on page 73)

In addition, the orientation of the Input and Output SAS ports on the 2U and 5U SAS expansion enclosures differs. Figure 63 on page 74 shows the SAS ports on the 2072-92F, 2072-12F, and 2072-24F expansion enclosures.

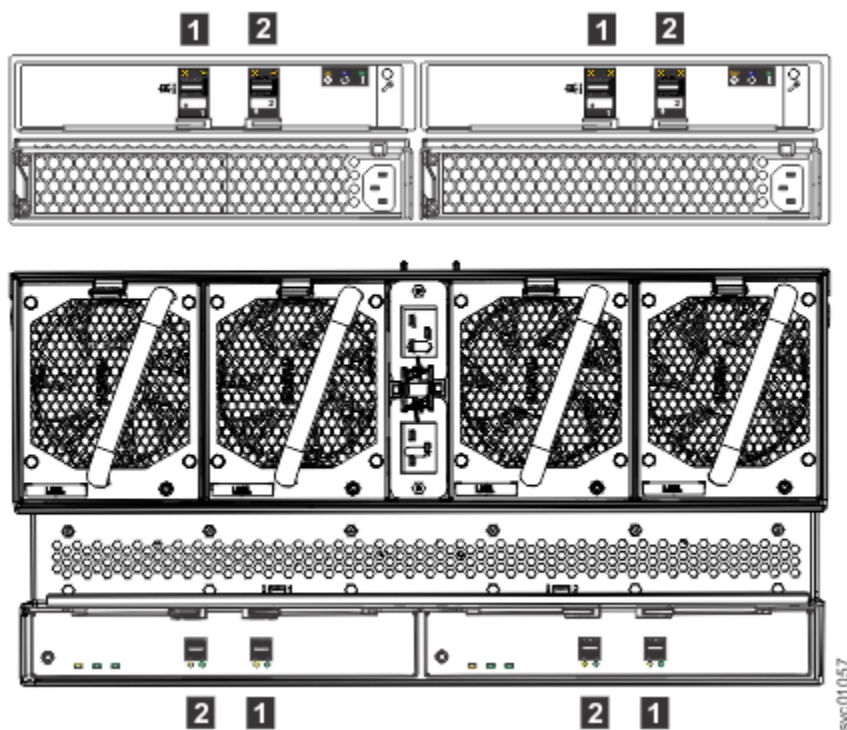


Figure 63. SAS port orientation on expansion enclosures

- 1 Input SAS port
- 2 Output SAS port

### Powering on the 5U expansion enclosure: 2072-92F

Use the following procedure to provide power to the 2072-92F expansion enclosure as part of the initial installation process or after a service procedure.

#### Before you begin

#### Important:

- Before you connect the power cables to the rear of the enclosure, always check that the expansion enclosure is secured in the rack. If needed, tighten the thumbscrews on the front of the enclosure (2 in Figure 64 on page 75) to ensure that the enclosure drawer does not roll open.

## About this task

The 2072-92F expansion enclosure has two power supply units (PSUs) that are accessible from the front of the enclosure (4 in Figure 64 on page 75). As the figure also shows, the PSUs are covered by the 1U fascia (5).

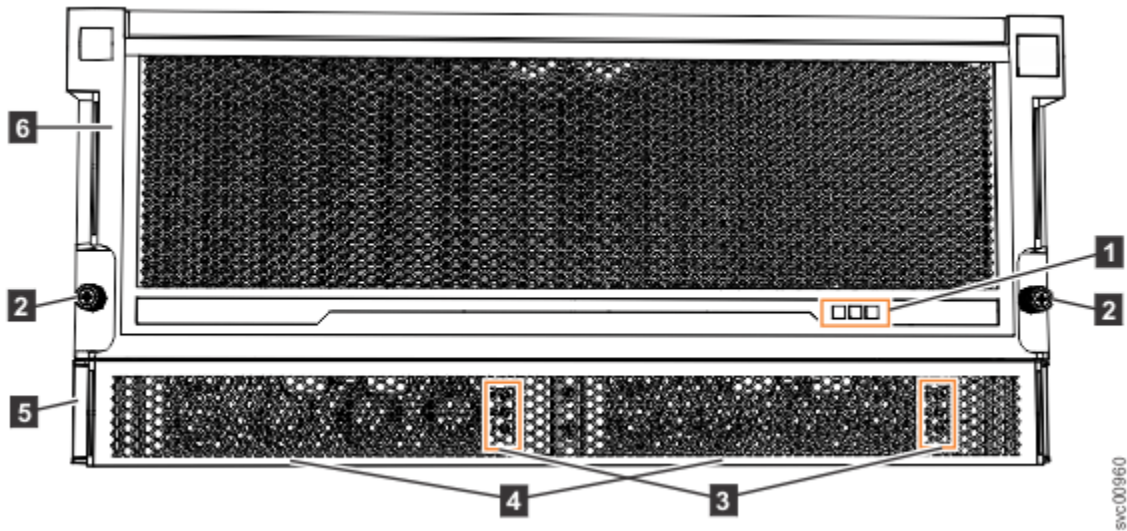


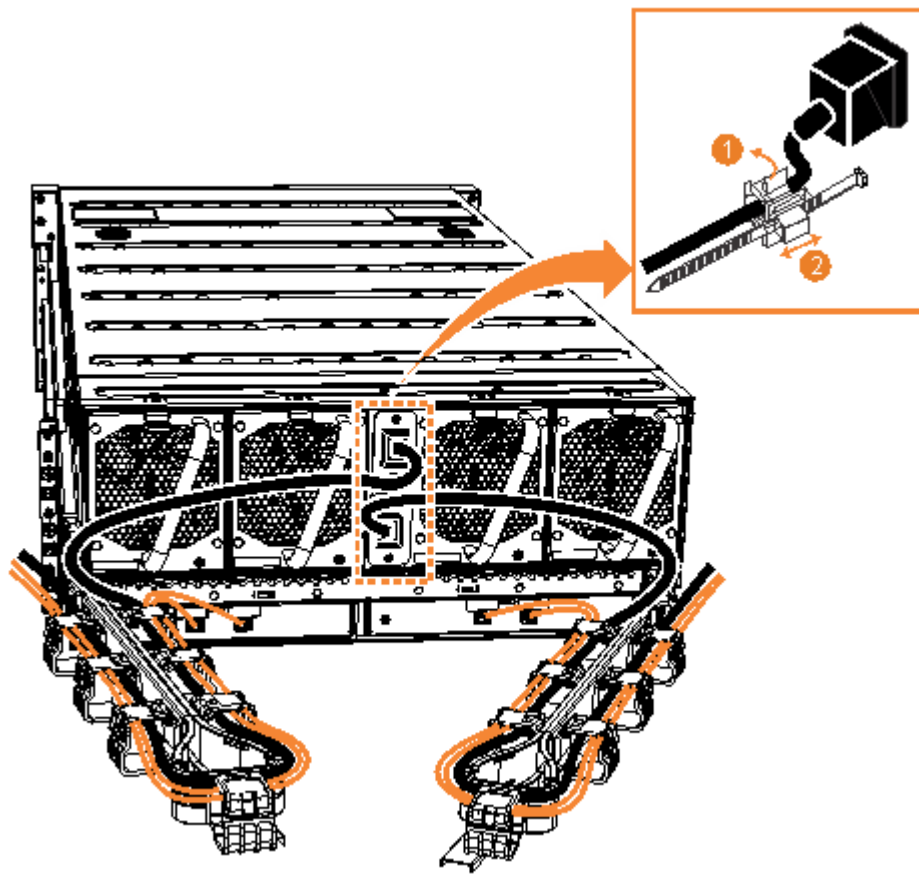
Figure 64. Features on the front of the 2072-92F expansion enclosure

- 1 Display panel LEDs
- 2 Rack retention thumb screws
- 3 Power supply unit LEDs
- 4 Power supply units (PSUs)
- 5 PSU fascia (1U)
- 6 Front fascia (4U)

Each PSU has a power supply connector and power cable, which are accessible from the back of the enclosure. Power is provided by plugging a C19-C20 power cable into each power supply unit and, if necessary, turning on the power source. The expansion enclosure does not have a power button.

## Procedure

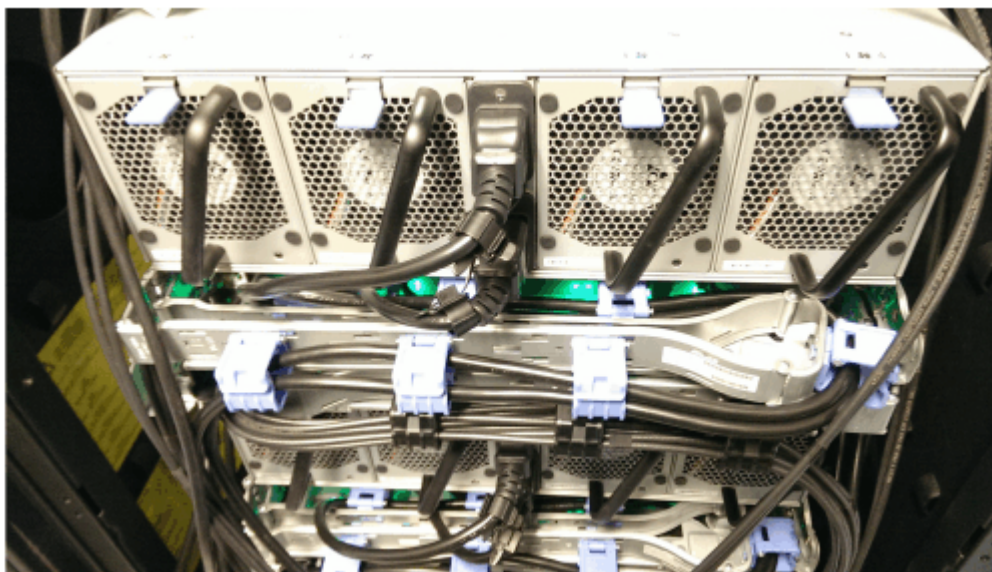
1. Connect the C19-C20 power cables to the power connectors on the rear of the expansion enclosure. The enclosure automatically powers on and begins its Power On Self-Tests (POST).
2. Secure the power cables in the cable retainer at each power connector on the rear of the enclosure, as shown in Figure 65 on page 76. Also, ensure that each cable is installed along one of the cable management arms. The cable management arms also support the SAS cables.



svu01083

Figure 65. Secure power cables

**Important:** Always secure each power cable with a cable retainer and ensure that the cable is installed along one of the cable management arms. When secured, the power and SAS cables stay connected when you slide the expansion enclosure out of the rack to perform service tasks.



svu01098

Figure 66. Power and SAS cable connections on the back of the enclosure

3. Verify that the expansion enclosure and its components are operating as expected.

On the back of the expansion enclosure, all four fans and the expansion canister indicators (3 and 8 in Figure 67 on page 77) become active when the power is connected.

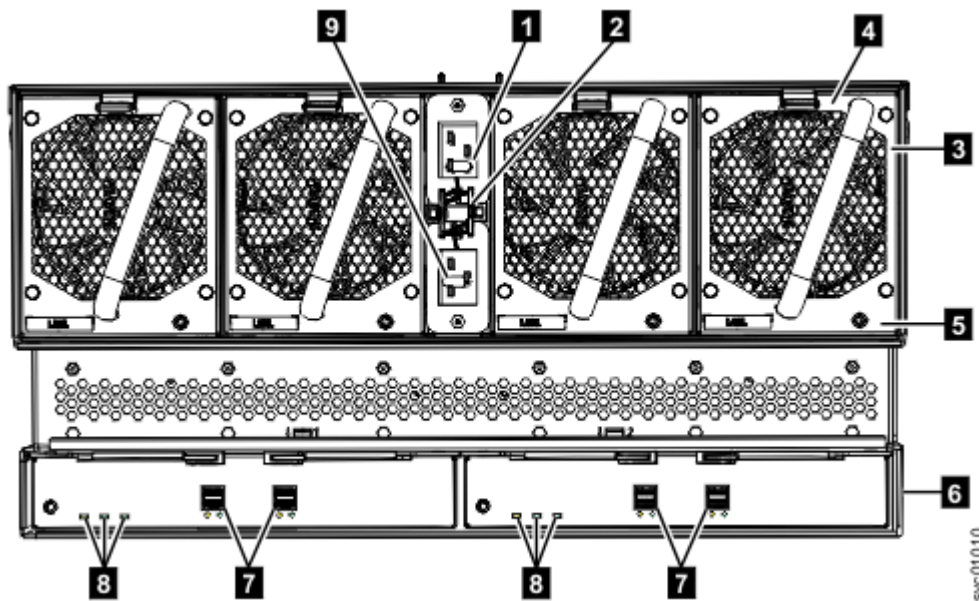


Figure 67. Features on the rear of the 2072-92F expansion enclosure

- 1 Power cable connector for PSU 2
- 2 Power cable retention clamps
- 3 Fan module
- 4 Fan release latch
- 5 Fan fault indicator
- 6 Expansion canister
- 7 SAS ports and indicators
- 8 Expansion canister indicators
- 9 Power cable connector for PSU 1

4. Verify that the system recognizes the expansion enclosure.

In the management GUI, view information about the system status and the expansion enclosure.

- If a new expansion enclosure was installed, make sure that the enclosure was discovered by the system. A newly recognized expansion enclosure is visible in the management GUI.
- If the expansion enclosure was powered off as part of a service procedure, view the information in the management GUI to confirm that the enclosure is operating as expected. You can also access the Event Log to view enclosure and component events and complete any remaining fix procedures.

### Powering off the expansion enclosure: 2072-92F

Before you power down a 2072-92F expansion enclosure, review the following procedure.

#### Before you begin

When you power off an expansion enclosure, the drives in that enclosure are no longer available to the control enclosure. The SAS chain also breaks. Any expansion enclosures that are beyond the enclosure that is powered down are also disconnected from the control enclosure.

Before you power off an enclosure, use the management GUI to show the volumes that depend on that enclosure. In the system view, select the expansion enclosure to be powered off. Then, select **Dependent Volumes**. If no configuration changes are made, other volumes remain available to the system.

#### Procedure

1. Stop all I/O to the system from hosts that access the expansion enclosure.
2. Unmount any associated file systems.

3. Wait 5 minutes for all write data to be flushed to the drives.
4. Unplug both of the power cords from the rear of the expansion enclosure to remove all power from the enclosure.

### Storwize V5000E 2072-92F expansion enclosure LEDs and indicators

The 2072-92F (5U) expansion enclosure has several sets of LEDs that provide information about the overall status of the enclosure, power, drives, fans, canisters, and SAS connections.

The 2072-92F (5U) expansion enclosure has sets of LEDs on the front and rear of the enclosure. Inside of the expansion enclosure, LEDs also indicate the status of the drives and each secondary expander module.

#### LEDs on the front of the expansion enclosure

As [Figure 68 on page 78](#) shows, the front of the 2072-92F expansion enclosure contains LEDs for the display panel (1) and for each of the power supply units (3).

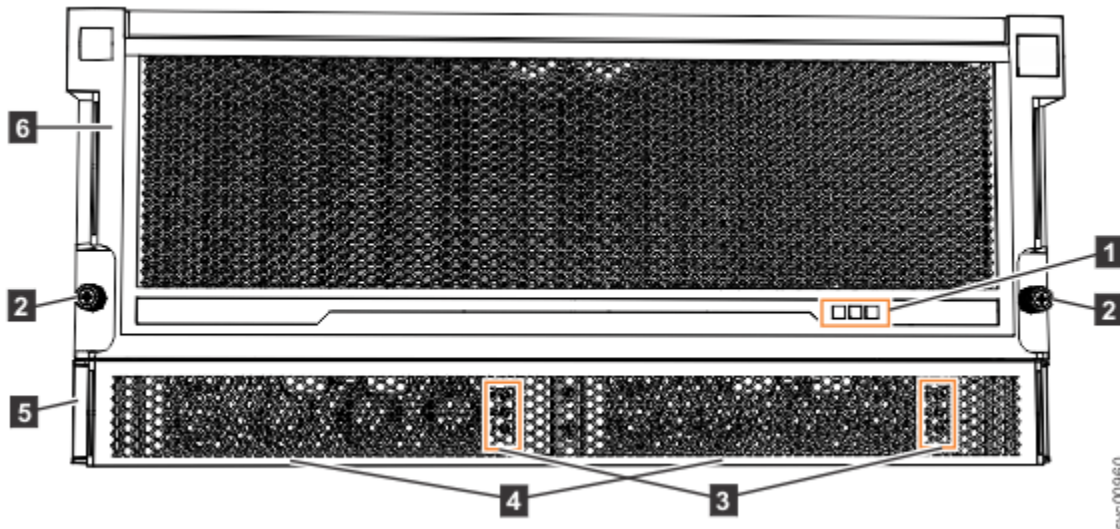


Figure 68. LEDs on the front of the expansion enclosure

- 1 Display panel LEDs
- 2 Rack retention thumb screws
- 3 Power supply unit LEDs
- 4 Power supply units (PSUs)
- 5 PSU fascia (1U)
- 6 Front fascia (4U)

The display panel (1) contains three LEDs that describe the operational status of the expansion enclosure. [Table 30 on page 78](#) describes the function and meaning of the LEDs on the front display panel.

Function	Color	Status	Description
Power	Green	On	The expansion enclosure power is on; this LED is controlled by the expansion enclosure.
		Off	The expansion enclosure power is off.

Function	Color	Status	Description
Identify	Blue	On	Identifies the expansion enclosure; this LED is controlled by the system. Use the management GUI or service interface to identify an enclosure.
		Off	The expansion enclosure is operating normally.
Enclosure fault	Amber	On	The expansion enclosure is coming up or a fault is detected against a component within the enclosure.
		Off	No faults are detected.

The 2072-92F expansion enclosure contains two PSUs (4 in Figure 68 on page 78) that are accessible from the front of the enclosure. Each PSU has its own set of LEDs, as shown in Figure 69 on page 79.

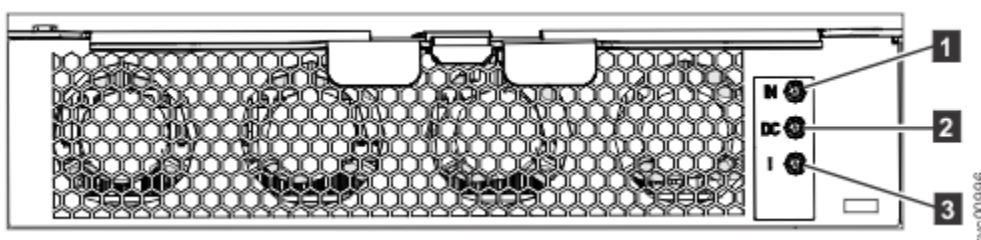


Figure 69. LEDs on the front of a power supply unit

- 1 Input power
- 2 DC power
- 3 Fault indicator

Table 31 on page 79 explains the function and status that is indicated by each of the LEDs. The power cords for each PSU are accessible from the rear of the expansion enclosure (1), as shown in Figure 72 on page 82.

Function	Color	Status	Description
1 Input power	Green	On	The input voltage is within specification.
		Off	No power input detected.
2 DC power	Green	On	DC power outputs are within specification.
		Off	DC power is not available.

Table 31. Power supply unit LEDs (continued)

Function	Color	Status	Description
3 Fault	Amber	On	A fault is detected in the PSU.
		Off	No faults are detected.

### LEDs inside of the expansion enclosure

Each of the drives and secondary expansion modules within the 2072-92F expansion enclosure has two LED indicators. To view the drives and secondary expansion modules, you must remove the cover of the enclosure, as described in “Removing the top cover: 2072-92F ” on page 52.

Figure 70 on page 80 shows the components of a drive assembly. Each drive has an online indicator (2) and fault indicator (3).

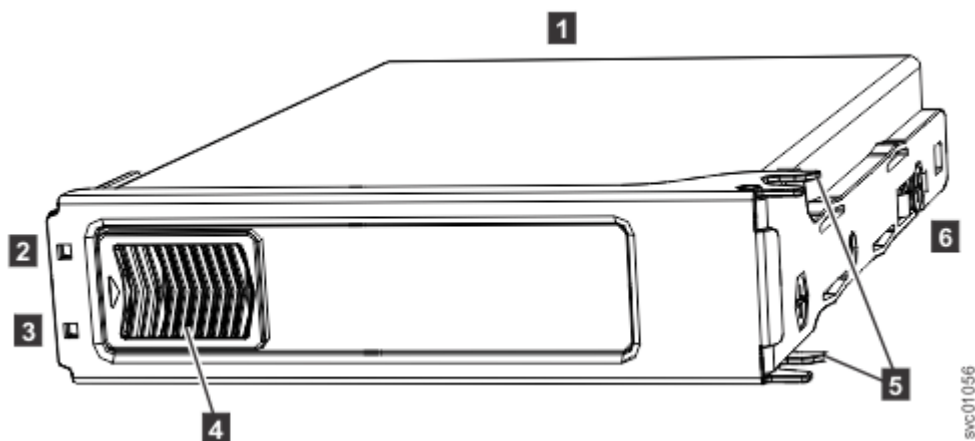


Figure 70. LEDs on a drive assembly

Table 32 on page 80 describes the meaning of the LEDs on each drive.

Table 32. LED indicators on drives

Function	Color	Status	Description
2 Activity	Green	On	The drive is ready to be used.
		Flashing	The drive is operating and I/O is occurring.
		Off	The drive is not installed or an installed drive is not ready to be used.
3 Fault	Amber	On	A fault occurred on the drive. The LED is turned off when the drive is removed and replaced.
		Flash	The drive is being identified, a fault might or might not be detected.
		Off	The installed drive is operating normally.



Figure 71 on page 81 shows the LEDs on a secondary expansion module.

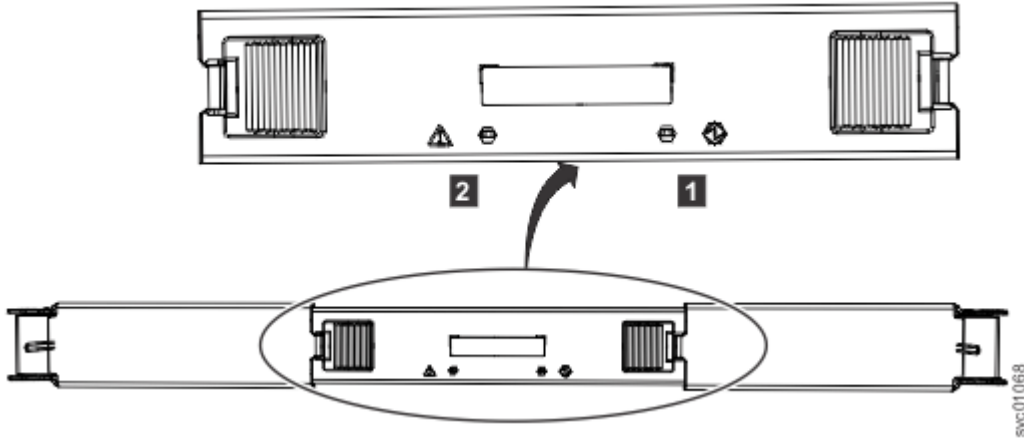


Figure 71. LEDs on a secondary expansion module

- 1 Online indicator
- 2 Fault indicator

Table 33 on page 81 describes the meaning of the LEDs on each secondary expansion module.

*Table 33. LED indicators on secondary expansion modules*

Function	Color	Status	Description
1 Power	Green	On	The secondary expansion module is receiving power.
		Flashing	Not used.
		Off	The secondary expansion module is not receiving power.
2 Fault	Amber	On	Not used.
		Flash	The secondary expansion module is being identified.
		Off	The secondary expansion module is operating normally.

#### LEDs on the rear of the expansion enclosure

Figure 72 on page 82 shows the rear view of a 2072-92F expansion enclosure. LEDs on the rear of the enclosure provide information about each fan module, each expansion canister, and SAS links.

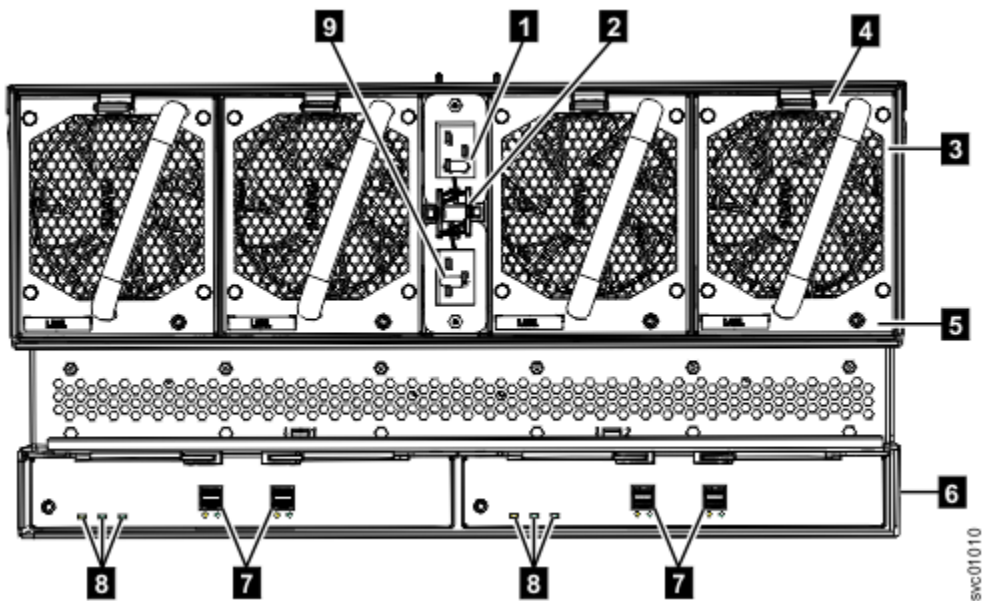


Figure 72. LEDs on the back of the expansion enclosure

The expansion enclosure has four fans. Each fan has one LED; for example, [Figure 72 on page 82](#) shows the location of the LED (5) for fan number four. When a fan is operating normally, the LED is not lit. If a fault is detected, the amber LED is lit.

As [Figure 72 on page 82](#) also shows, the expansion enclosure contains two expansion canisters. Each expansion canister contains its own set of LEDs, as shown in [Figure 73 on page 82](#). The LEDs provide status information about the expansion canister itself and the SAS connections.

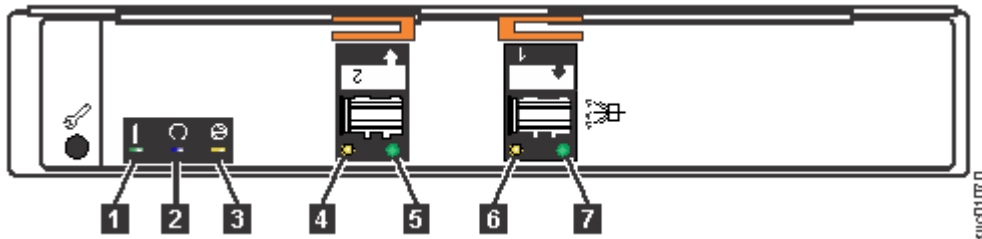


Figure 73. LEDs on the back of the expansion canister

- 1 Canister fault
- 2 Canister status
- 3 Canister power
- 4 and 6 SAS link fault
- 5 and 7 SAS link operational
- 8 Canister release handles

[Table 34 on page 83](#) describes the values and meaning of each LED.

Table 34. Expansion canister and SAS port LEDs

Name	Color	State	Meaning
<b>1</b> Canister fault	Amber	Off	Normal operation.
		On	A fault was detected.
		Flashing	The expansion canister is being identified. A fault might or might not be detected.
<b>2</b> Canister status	Green	Off	Canister is off.
		On	Normal operation.
		Flashing	A vital product data (VPD) error occurred.
<b>3</b> Canister power	Green	Off	Canister is off.
		On	Canister is receiving power.
<b>4</b> and <b>6</b> SAS link fault	Amber	Off	No faults are detected. All four phys have a link connection.
		On	Several error conditions are possible: <ul style="list-style-type: none"> <li>• Only 1, 2, or 3 phys are connected, but not all 4.</li> <li>• The phys are not operating at the same speed.</li> <li>• All phys are not connected to the same remote port. One or more of the connected lanes are attached to a different address.</li> </ul>
<b>5</b> and <b>7</b> SAS link operational	Green	Off	No link connection on any lane. The connection is down.
		On	The SAS link is active. At least one of the four lanes is connected.

## 5U expansion enclosure parts

In the 5U expansion enclosure, all replaceable parts are customer-replaceable units (CRUs).

### Expansion enclosure drives and other parts

Table 35 on page 84 summarizes the part numbers for the drives and other parts of the 2072-92F expansion enclosure.


<i>Table 35. Supported expansion enclosure SAS drives</i>		
<b>FRU Part Number</b>	<b>Description</b>	<b>Comments</b>
00AR317	3m mSASHD	
01EJ190	6m mSASHD	
01LJ112	Enclosure	Includes the drive board, signal interconnect board, and internal power cables, in an otherwise empty enclosure.
01LJ114	Rack rail kit	
01LJ116	4U Fascia / bezel	
01LJ118	Control panel assembly	
01LJ120	Power supply unit (PSU) 1U fascia / bezel	The fascia must be removed to access the power supply units.
01LJ122	PSU	The expansion enclosure contains 2 PSUs. Each PSU requires a C19/C20 power cord.
01LJ124	SAS expander module	<p>The expansion enclosure supports two-secondary expansion modules.</p> <p><b>Note:</b> The secondary expansion modules are Tier 2 CRUs. You can replace them or request that they be replaced by IBM® Service.</p> <p> <b>CAUTION:</b> When removing or replacing a secondary expansion module, do not touch the connectors on the main board.</p>
01LJ126	Fan module	The expansion enclosure contains four fan modules
01LJ128	Expansion canister	
01LJ130	Cable management arms (CMA)	This part contains the upper and lower CMA.
01LJ132	Chassis top lid	
01LJ134	Fan interface board	
02PX476	Drive 30 TB Flash Drive 3.5" in an HD carrier	
02PX526	Drive 1.2 TB 10K 2.5" HDD in an HD carrier	
02PX527	Drive 1.8 TB 10K 2.5" HDD in an HD carrier	
02PX528	Drive 2.4 TB 10K 2.5" HDD in an HD carrier	

Table 35. Supported expansion enclosure SAS drives (continued)

FRU Part Number	Description	Comments
02PX529	Drive 6 TB 7.2K 3.5" NL HDD in an HD carrier	
02PX530	Drive 8 TB 7.2K 3.5" NL HDD in an HD carrier	
02PX531	Drive 10 TB 7.2K 3.5" NL HDD in an HD carrier	
02PX532	Drive 12 TB 7.2K 3.5" NL HDD in an HD carrier	
02PX533	Drive 14 TB 7.2K 3.5" NL HDD in an HD carrier	
02PX534	Drive 1.92 TB Flash Drive 3.5" in an HD carrier	
02PX535	Drive 3.84 TB Flash Drive 3.5" in an HD carrier	
02PX536	Drive 7.68 TB Flash Drive 3.5" in an HD carrier	
02PX537	Drive 15.36 TB Flash Drive 3.5" in an HD carrier	
39M5388	Power Cord - HD Expansion PDU	This is a C19-C20 cable.

## Connecting expansion enclosures to the control enclosure

If you have installed expansion enclosures in the rack, you must connect them to the control enclosure.

### About this task

This task applies if you are installing one or more expansion enclosures. Each control enclosure in the system can manage two sets of expansion enclosures.

The number of SAS chains and enclosures varies per each type of system, as shown in [Table 36 on page 85](#).

System	Expansion ports	Number of SAS chains supported	Control enclosures per system	Expansion enclosures per chain	Maximum Number of Enclosures
Storwize V5010E	Port 1 only	1	1	10	11
Storwize V5030E	Port 1 and Port 2	2	1	10	21

Each set of expansion enclosures is connected together sequentially through the IN and OUT SAS ports, forming a chain with a control enclosure at the end of the chain.

**Note:** When connecting SAS cables between enclosures, you must follow a list of guidelines to ensure that your configuration is valid. Do not begin connecting the cables until you have read [“SAS cabling guidelines”](#) on page 88.

## Procedure

To install the cables, complete the following steps.

1. Using the supplied SAS cables, connect the control enclosure to the expansion enclosure at rack position 1, as shown in the following figures.
  - a) Connect SAS port 1 of the left node canister in the control enclosure to SAS port 1 of the left expansion canister in the first expansion enclosure.
  - b) Connect SAS port 1 of the right node canister in the control enclosure to SAS port 1 of the right expansion canister in the first expansion enclosure.

Figure 74 on page 86 shows how to connect SAS cables on a Storwize V5010E system.

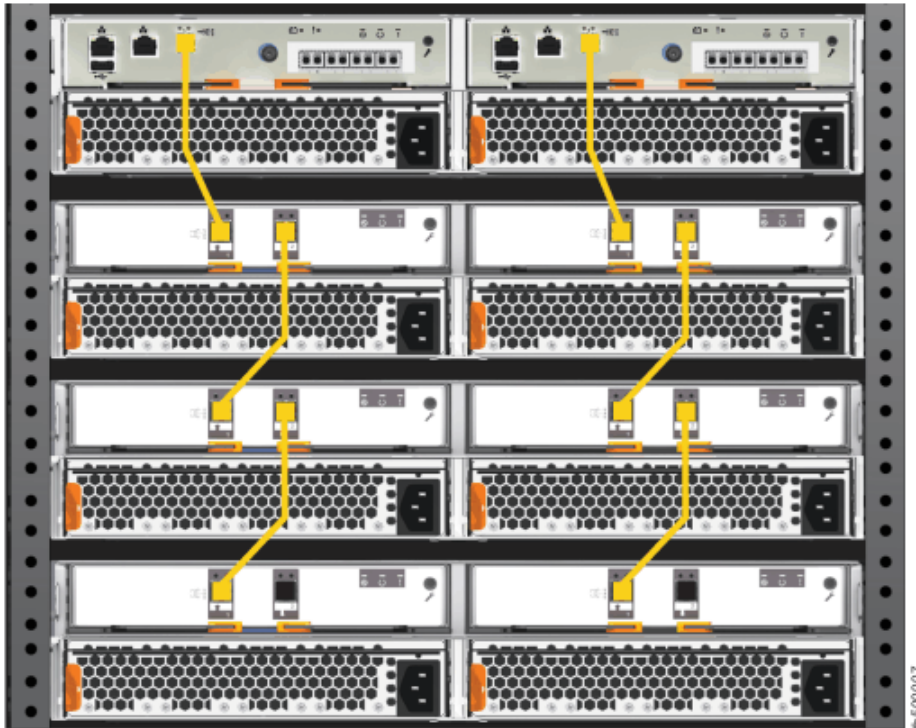


Figure 74. Connecting the SAS cables to a Storwize V5010E system

Figure 75 on page 87 shows how to connect SAS cables on a Storwize V5030E system. In this figure, two expansion chains are connected to the Storwize V5030E system.

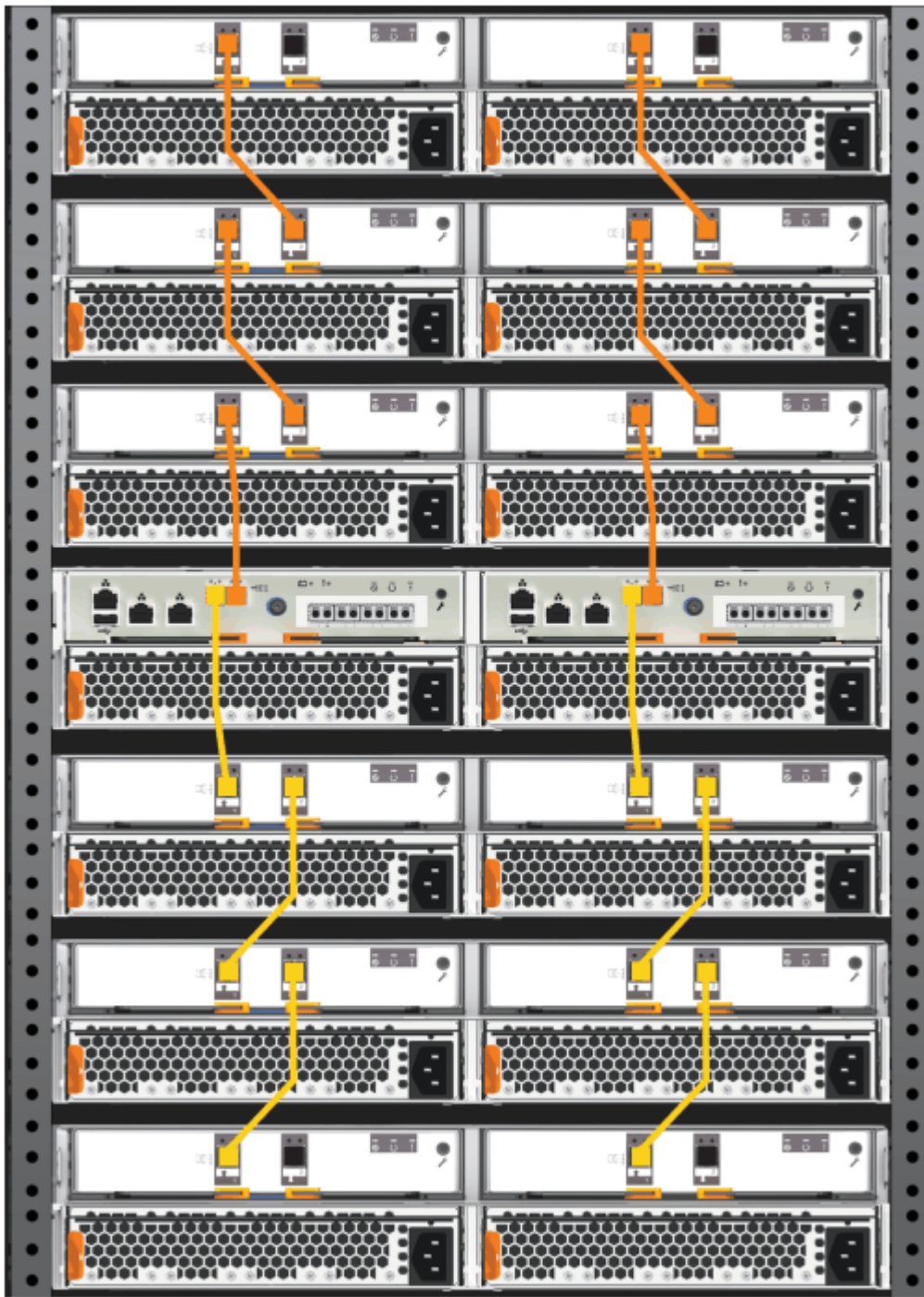


Figure 75. Connecting the SAS cables to a Storwize V5030E system

2. To add a second expansion chain to the Storwize V5030E control enclosure, use the supplied SAS cables to connect the control enclosure to the expansion enclosure at rack position 2, as shown in [Figure 75 on page 87](#).

**Note:** Storwize V5010E systems support only one expansion chain.

- a) Connect SAS port 2 of the left node canister in the control enclosure to SAS port 1 of the left expansion canister in the second expansion enclosure.
  - b) Connect SAS port 2 of the right node canister in the control enclosure to SAS port 1 of the right expansion canister in the second expansion enclosure.
3. If more expansion enclosures are installed, connect each one to the previous expansion enclosure in a chain; use two Mini SAS HD to Mini SAS HD cables, as shown in [Figure 75 on page 87](#).

**Note:** Storwize V5010E control enclosures can support up to 10 additional expansion enclosures on one chain. Storwize V5030E systems can support two chains. Each chain can contain up to 10 additional expansion enclosures.

4. If two Storwize V5030E control enclosures are installed, repeat this cabling procedure on the second control enclosure and its expansion enclosures.

## SAS cabling guidelines

When connecting SAS cables between 2U expansion enclosures, you must follow a list of guidelines to ensure that your configuration is valid.

### Orienting the connector

When inserting SAS cables, make sure the connector ([Figure 76 on page 88](#)) is oriented correctly.

- The orientation of the connector must match the orientation of the port before you push the connector into the port. The cable connector and socket are keyed, and it is important that you have proper alignment of the keys when the cable is inserted.
- The blue pull tab must be **below** the connector.
- Insert the connector **gently** until it clicks into place. If you feel resistance, the connector is probably oriented the wrong way. Do **not** force it.
- When inserted correctly, the connector can only be removed by pulling the tab.
- When both ends of a SAS cable are inserted correctly, the green link LEDs next to the connected SAS ports are lit.

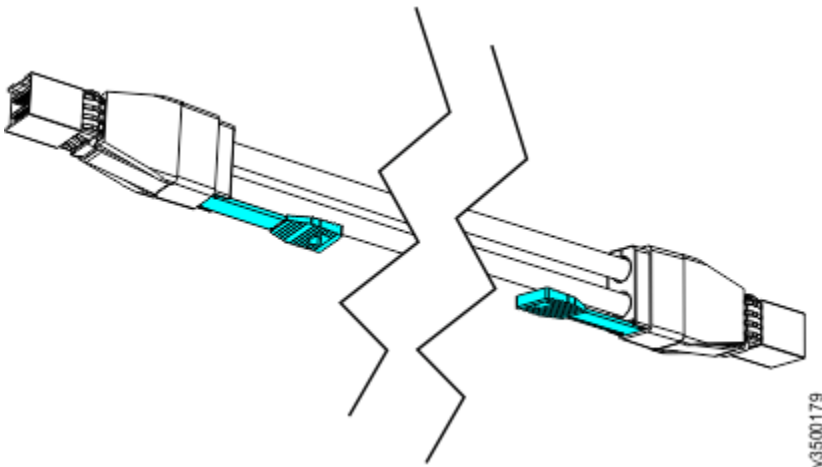


Figure 76. SAS cable connectors

### Connecting SAS cables

Be aware of the following guidelines when you attach the cables to the SAS ports in 2U expansion enclosures.

- No more than 10 expansion enclosures can be chained to SAS port 1 of a node canister. The expansion enclosures in this chain should be installed below the control enclosure.
- For Storwize V5030E systems only:
  - No more than 10 expansion enclosures can be chained to SAS port 2 of a node canister. The expansion enclosures in this chain should be installed above the control enclosure.
  - When an odd number of expansions is attached to a control enclosure, ensure the SAS expansion chain attached to SAS port 1 of the canisters contains one more expansion enclosure than the SAS expansion chain attached to SAS port 2 of the canister
- No cable can be connected between a port on a left canister and a port on a right canister.
- A cable must not be connected between ports in the same enclosure.



- A connected port on the node canister must connect to a single port on an expansion canister. Cables that split the connector out into separate physical connections are not supported.
- Attach cables serially between enclosures; do not skip an enclosure.
- The last enclosure in a chain must not have cables in port 2 of canister 1 and port 2 of canister 2.
- Ensure that cables are installed in an orderly way to reduce the risk of cable damage when replaceable units are removed or inserted.

See [“Connecting expansion enclosures to the control enclosure”](#) on page 85 for examples of SAS cable connections on each system.

For information about the SAS cabling requirements for 5U expansion enclosures, see [“Connecting the optional 5U expansion enclosure: 2072-92F”](#) on page 71.

## Connecting Ethernet cables to the node canisters

The control enclosures have several Ethernet ports on the rear of each node canister. The ports provide access to system management facilities and can also provide iSCSI connectivity. The number of ports and their initial function differ across each system model.

### Procedure

To install the Ethernet cables, complete the following steps.

1. If you have a Storwize V5010E system, complete the following steps.

a) Identify the location and function of the Ethernet ports on your system, as shown in [Figure 77](#) on page 90 .

- Port 1 can be used to provide Ethernet connections; in the figure, port 1 is identified by the green cable **(1)**.
- Port 2 serves as the technician port when the system is initially set up or when service is needed. In the figure, port 2 is identified by the blue cable **(2/T)**. After the system initializes, the technician port on port 2 is disabled. Port 2 can then be connected to the Ethernet switch for iSCSI connectivity, IP replication, or to act as a second management port.

**Note:** Do not connect port 2 to an Ethernet switch until the system initialization or service is complete. After the system initializes, the technician port is automatically disabled and port 2 can then be connected to the Ethernet switch. To use the technician port again, port 2 must be disconnected from the Ethernet switch and the technician port enabled using the **satask chserviceip -techport enable** CLI command. After use, the technician port must be disabled again using the **satask chserviceip -techport disable** command before port 2 is reconnected to the Ethernet switch.

b) Connect Ethernet port 1 of each node canister in the system to the IP network that will provide a connection to the system management interfaces.

[Figure 77](#) on page 90 shows the Ethernet cabling and the ports on the back of a Storwize V5010E system.



Figure 77. Connecting the Ethernet cables to a Storwize V5010E system

- c) Optional: Connect Ethernet port 2 of each node canister in the system to a second IP network, as shown by the blue cable connection in [Figure 77 on page 90](#). This second port can be used to provide a redundant connection to the system management interfaces; it can also be used for iSCSI connectivity to the system by hosts on the network.

**Note:** On Storwize V5010E systems, the second Ethernet port is also used as the technician port. Do not connect Ethernet port 2 to the SAN until the management GUI setup wizard completes on each system and the cluster is created. If you have to service your system, disconnect port 2 from the SAN before you enable port 2 to be the technician port again.

2. If you have a Storwize V5030E system, complete the following steps.

- a) Identify the location and function of the Ethernet ports on your system; refer to [Figure 78 on page 90](#).

- The technician port should only be used to initialize or service the system. In [Figure 78 on page 90](#), the technician port is identified by the green cable (T).

**Note:** Never use the technician port to provide an Ethernet connection to the system. Do not connect the Ethernet technician port to a network switch. The technician port must only be directly connected to a personal computer when initializing a system or servicing a node.

- Ethernet port 1 can be used to provide Ethernet connections. In the figure, port 1 is identified by the blue cable (1).
- Ethernet port 2 can optionally be used to provide additional Ethernet connections. In the figure, port 2 is identified by the red cable (2). Port 2 can also be used for iSCSI connectivity or IP replication.

- b) Connect Ethernet port 1 of each Storwize V5030E node canister in the system to the IP network that will provide a connection to the system management interfaces. [Figure 78 on page 90](#) shows the port locations and Ethernet cabling on a Storwize V5030E node canister.



Figure 78. Connecting the Ethernet cables to a Storwize V5030E system

- c) Optional: Connect Ethernet port 2 of each node canister in the system to a second IP network, as shown by the red cable connection in [Figure 78 on page 90](#). Port 2 can provide a redundant

connection to the system management interfaces. Port 2 can also be used for iSCSI connectivity to the system by hosts on the network. If more than one control enclosure is present in the system, ensure that port 2 of every node canister is connected to the same network to provide access if the configuration node fails.

## Connecting Ethernet cables to 25 Gbps iSCSI 2-port host interface adapters

If you installed an optional 25 Gbps iSCSI 2-port host interface adapter, you can use Ethernet cables to connect the system to your network.

### About this task

Each system has two onboard Ethernet ports, port 1 and port 2. When an optional 2-port 25 Gbps Ethernet host interface adapter (RoCE or iWARP) is installed, two optical Ethernet ports are added to each canister. These ports are numbered 3 and 4.

Figure 79 on page 91 shows the ports (labeled 3 and 4) on a 25 Gbps Ethernet (RoCE) adapter, as seen on the back of a Storwize V5030E node canister.



Figure 79. Example of a Storwize V5030E system with a 2-port Ethernet host interface adapter

**Note:** This port numbering also applies if the 2-port 25 Gbps Ethernet (iWARP) adapter is installed in the node canister.

### Procedure

To install the cables, complete the following steps.

1. Identify the correct pair of Ethernet cables for the Ethernet ports labeled 3 in the left canister and the right canister.
2. Connect the appropriate cable to each port.
3. For each additional pair of Ethernet ports in the right and left canisters, identify the correct pair of cables and connect them.

**Note:** The Ethernet cables are connected in pairs. Both canisters must have the same number of cables connected.

## Connecting Fibre Channel cables to a Fibre Channel adapter in the enclosure

If optional Fibre Channel host interface adapters are installed in your system, use Fibre Channel cables to connect the two node canisters in the enclosure to the switches in the Fibre Channel SAN. The system supports an optional 4-port 16 Gbps Fibre Channel host interface adapter.

### Procedure

To install the cables, complete the following steps.

1. Connect the required number of Fibre Channel cables to the node canisters in the control enclosure. Both canisters must have the same number of cables connected.
2. If you want to connect additional Fibre Channel cables, make sure to connect the same number of cables to each canister.

3. If a control enclosure is already installed, you can optionally add Fibre Channel connections between all the control enclosures.
  - This involves both the physical installation of the cables and configuring the correct zoning on the Fibre Channel switches.
  - Configure the network so that every node canister has at least two connections to every node canister in a different control enclosure.
  - You must configure the network before you attempt to add a control enclosure to an existing system.

## Connecting a control enclosure to a host

When you install a control enclosure, you can connect it to a host with SAS cables. On Storwize V5010E and Storwize V5030E systems, you can use the optional 4-port 12 Gbps SAS host interface adapter.

### About this task

Two types of SAS cables are used for host attachment, depending on the requirements of the host.

- Mini SAS HD to Mini SAS HD (Figure 80 on page 92)

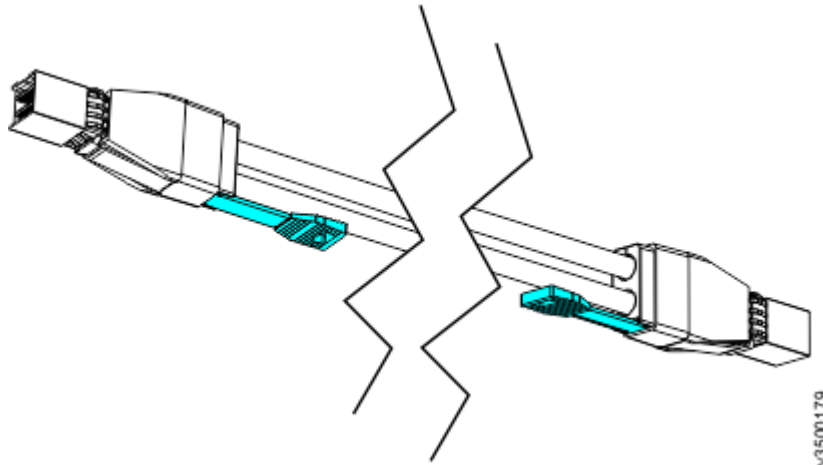


Figure 80. Mini SAS HD to Mini SAS HD cable

- Mini SAS HD to Mini SAS (Figure 81 on page 92)

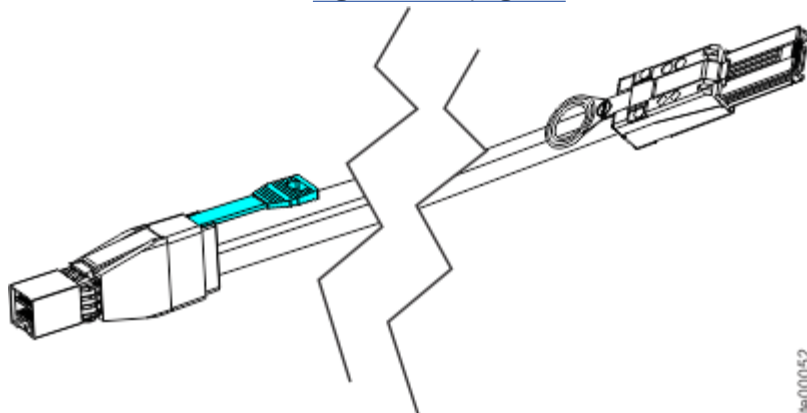


Figure 81. Mini SAS HD to Mini SAS cable

**Note:** When you insert a SAS cable, make sure that the connector is oriented correctly.

- When you connect cables to the SAS ports on the left side of the node canister, the blue pull tab must be **below** the connector.
- When you connect a cable to a SAS 4-port host interface adapter, the blue pull tab must be **above** the connector.

- Insert the connector **gently** until it clicks into place. If you feel resistance, the connector is probably oriented the wrong way. Do **not** force it.
- When inserted correctly, the connector can only be removed by pulling the tab.

### Procedure

To install the cables, complete the following steps.

1. Connect the required number of SAS cables.
 

Refer to the "Planning" section of the IBM Knowledge Center for instructions on determining the number of cables required.
2. Arrange the cables to provide access to the hardware.
  - **USB ports.** USB port access is required when you use a USB flash drive to configure the system.
  - **The enclosures themselves.** Access is required to the hardware for servicing and for safely removing and replacing components by using two or more people.

## Powering on the system

After you install all hardware components, you must power on the system and check its status.

### About this task



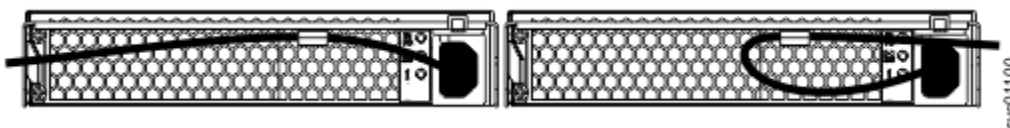
**Attention:** Do not power on the system with any open bays or slots. Open bays or slots disrupt the internal air flow, causing the drives to receive insufficient cooling.

- Every unused drive bay must be occupied by a filler panel.
- Filler panels must be installed in all empty host interface adapter slots.

**Note:** The AC power supply unit, and the DC power supply unit in DC-powered models, features a cable retainer to secure the power cable.

Use the cable retainers to secure the power cables from being accidentally pulled out of the enclosure. The cable retainer, which is on the back of each PSU handle, has a curved opening that faces the rear of the PSU. After you plug the power cables in to the PSU, slip the power cable behind the retainer. Then, pull the cable back into the retainer opening to secure the cable.

Each cable must be routed through the retainer, as shown in [Figure 82 on page 93](#). For PSU 1, hook the power cable underneath the cable retainer so the cable can extend to the left. For PSU 2, make a loop to secure the cable under the retainer and extend the power cable to the right side of the enclosure.



*Figure 82. Routing the power cables through the cable retainer*

To remove the power cable, push the cable forward to unhook it from the cable retainer. Then, unplug the cable from the PSU.

### Procedure

1. Power on all expansion enclosures. Use the supplied power cords to connect both power supply units of the enclosure to their power sources.

If the power sources have circuit breakers or switches, ensure that they are turned on. The enclosure does not have power switches. Repeat this step for each expansion enclosure in the system.

**Note:** Each enclosure has two power supply units. To provide power failure redundancy, connect the two power cords to separate power circuits.

2. From the rear of the expansion enclosure, check the LEDs on each expansion canister (see [Figure 83](#) on page 94).

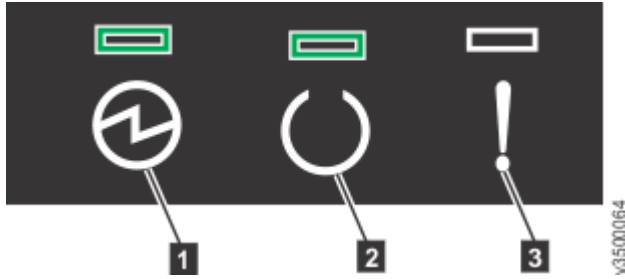


Figure 83. Expansion canister LEDs

- 1 Power
- 2 Status
- 3 Fault

The canister is ready with no critical errors when **Power** is illuminated, **Status** is on, and **Fault** is off. If a canister is *not* ready, refer to the "Procedure: Understanding the system status using the LEDs" topic in "Troubleshooting".

3. Wait for all expansion canisters to finish powering on.
4. Power on the control enclosure. Use the supplied power cords to connect both power supply units of the enclosure to their power sources.

If the power sources have circuit breakers or switches, ensure that they are turned on. The enclosure does not have power switches.

**Notes:**

- Each enclosure has two power supply units. To provide power failure redundancy, connect the two power cords to separate power circuits.
- Review the [information on securing the power cables](#) to ensure that each power cable is secured to each PSU on the back of the enclosure.

5. From the rear of the control enclosure, check the LEDs on each node canister. (See [Figure 84](#) on page 94.)

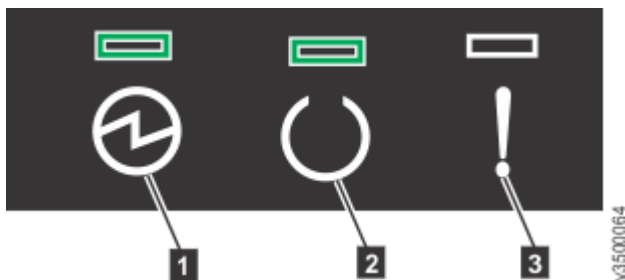


Figure 84. Node canister LEDs

- 1 Power
- 2 Status
- 3 Fault

The canister is ready with no critical errors when **Power** is illuminated, **Status** is flashing, and **Fault** is off. If a canister is *not* ready, refer to the "Procedure: Understanding the system status using the LEDs" topic in "Troubleshooting".

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## Chapter 5. Configuring the system

After initializing the system, you can complete the configuration of the system with the management GUI or command-line interface.

To use the management GUI to complete the configuration procedures after initializing the system, you need a supported browser and you need to log on to the system.

- To use the enclosure hardware, the system software must be configured. Your web browser is used to access the system's initialization and configuration interfaces. [“Checking your web browser settings for the management GUI”](#) on page 95 describes how to ensure that you are using a supported web browser.
- To create a new system of enclosures, for example, when you are creating your first system, refer to the "Knowledge Center topic, "User name and password for system initialization.". Then, follow the procedure that is described in [“Initializing the system by using the technician port”](#) on page 98.
- If a system must operate in a NEBS-compliant environment, refer to the "Configuring a system to be NEBS compliant" topic in the Knowledge Center.
- A Storwize V5030E system can be created with up to two control enclosures. To add a control enclosure to an existing system, follow the procedure in [“Adding a control enclosure to an existing system”](#) on page 100.
- Each control enclosure supports the connection of SAS expansion enclosures. These can be added by following the procedure in [“Adding an expansion enclosure to an existing system”](#) on page 99.

---

### Checking your web browser settings for the management GUI

To access the management GUI, you must ensure that your web browser is supported and that the appropriate settings are enabled.

#### Before you begin

The management GUI supports the following HTML5-compliant browsers:

- Mozilla Firefox 62
- Mozilla Firefox Extended Support Release (ESR) 60
- Microsoft Internet Explorer (IE) 11 and Microsoft Edge 42
- Google Chrome 69

IBM supports higher versions of the browsers if the vendors do not remove or disable function that the product relies upon. For browser levels higher than the versions that are certified with the product, customer support accepts usage-related and defect-related service requests. If the support center cannot re-create the issue, support might request the client to re-create the problem on a certified browser version. Defects are not accepted for cosmetic differences between browsers or browser versions that do not affect the functional behavior of the product. If a problem is identified in the product, defects are accepted. If a problem is identified with the browser, IBM might investigate potential solutions or work-arounds that the client can implement until a permanent solution becomes available.

#### Procedure

To configure your web browser, follow these steps:

1. Enable JavaScript for your web browser.

For Mozilla Firefox, JavaScript is enabled by default and requires no additional configuration.

For Microsoft Internet Explorer (IE) 11 and Microsoft Edge running on Microsoft Windows 10, JavaScript is enabled by default and requires no additional configuration.

For Microsoft Internet Explorer (IE) running on Microsoft Windows 7, complete the following steps:

- a. In Internet Explorer, click **Tools > Internet Options**.
- b. Click **Security Settings**.
- c. Click **Internet** to choose the internet zone.
- d. Click **Custom Level**.
- e. Scroll down to the **Scripting** section, and then in **Active Scripting**, click **Enable**.
- f. Click **OK** to close **Security Settings**.
- g. Click **Yes** to confirm the change for the zone.
- h. Click **OK** to close **Internet Options**.
- i. Refresh your browser.

For Microsoft Internet Explorer (IE) running on Microsoft Windows Server 2008, complete the following steps:

- a. In Internet Explorer, click **Tools > Internet Options**.
- b. Click **Security**.
- c. Click **Trusted sites**.
- d. On the **Trusted sites** window, verify that the web address for the management GUI is correct and click **Add**.
- e. Verify that the correct web address was added to the **Trusted sites** window.
- f. Click **Close** on the **Trusted sites** window.
- g. Click **OK**.
- h. Refresh your browser.

For Google Chrome, complete the following steps:

- a. On the menu bar in the Google Chrome browser window, click **Settings**.
  - b. Click **Show advanced settings**.
  - c. In the **Privacy** section, click **Content settings**.
  - d. In the **JavaScript** section, select **Allow all sites to run JavaScript**.
  - e. Click **OK**.
  - f. Refresh your browser.
2. Enable cookies in your web browser.

For Microsoft Internet Explorer (IE) 11 and Microsoft Edge running on Microsoft Windows 10, cookies are enabled by default and require no additional configuration.

For Mozilla Firefox, complete the following steps:

- a. On the menu bar in the Firefox browser window, click **Tools > Options**.
- b. On the **Options** window, select **Privacy**.
- c. Set "Firefox will" to **Use custom settings for history**.
- d. Select **Accept cookies from sites** to enable cookies.
- e. Click **OK**.
- f. Refresh the browser.

For Microsoft Internet Explorer, complete the following steps:

- a. In Internet Explorer, click **Tools > Internet Options**.
- b. Click **Privacy**. Under **Settings**, move the slider to the bottom to allow all cookies.
- c. Click **OK**.
- d. Refresh your browser.



For Google Chrome, complete the following steps:

- a. On the menu bar in the Google Chrome browser window, click **Settings**.
  - b. Click **Show advanced settings**.
  - c. In the **Privacy** section, click **Content settings**.
  - d. In the **Cookies** section, select **Allow local data to be set**.
  - e. Click **OK**.
  - f. Refresh your browser.
3. Enable file download on IE 11 running on Windows 2012.
- a. In Internet Explorer, click **Tools > Internet Options**.
  - b. On the **Internet Options** window, select the **Security** tab.
  - c. On the **Security** tab, click the **Internet zone**.
  - d. Click **Custom level** to customize the security level for this zone.
  - e. Scroll down to **Downloads** and select **Enable** under File download.
  - f. Click **OK**.
  - g. Click **Yes** to confirm.
  - h. Click **OK** to close the **Internet Options** window.

For Microsoft Internet Explorer (IE) 11 and Microsoft Edge running on Microsoft Windows 10, file download is enabled by default and requires no additional configuration.

4. Enable scripts to disable or replace context menus (Mozilla Firefox only).

For Mozilla Firefox, complete the following steps:

- a. On the menu bar in the Firefox browser window, click **Tools > Options**.
- b. On the **Options** window, select **Content**.
- c. Click **Advanced** by the **Enable JavaScript** setting.
- d. Select **Disable or replace context menus**.
- e. Click **OK** to close the **Advanced** window.
- f. Click **OK** to close the **Options** window.
- g. Refresh your browser.

## User name and password for system initialization

During the initialization procedure, you need to log in to the initialization GUI for the system.

The default user name and password for the initialization GUI are listed in the following table.

User name	Password
superuser	passw0rd

**Note:** The 0 character in the password is the number zero, not the letter "O".

## Initializing the system by using the technician port

To initialize a new system, you must connect a notebook computer to the technician port on the rear of a node canister and run the initialization tool.

### Before you begin

To perform these tasks, you must have the following items:

- A supported browser that is installed on the personal computer
- An Ethernet cable to connect the personal computer to the technician port



**Attention:** Do not connect the technician port to a switch. If a switch is detected, the technician port connection might shut down, causing a 746 node error.

### Procedure

To initialize the system, complete the following steps.

1. Ensure that the system is powered on, as described in “Powering on the system” on page 93.
2. Configure an Ethernet port on the personal computer to enable Dynamic Host Configuration Protocol (DHCP) configuration of its IP address and DNS settings.
  - a) If you do not have DHCP, you must manually configure the personal computer. To do so, specify the static IPv4 address 192.168.0.2, subnet mask 255.255.255.0, gateway 192.168.0.1, and DNS 192.168.0.1.
3. Locate the Ethernet port that is labeled **T** on the rear of each node canister.

On Storwize V5010E systems, the second onboard 1 Gbps Ethernet port is initially used as the technician port. [Figure 85 on page 98](#) shows the location of the technician port (T) on a node canister.



Figure 85. Storwize V5010E technician port

Storwize V5030E systems have a dedicated technician port. [Figure 86 on page 98](#) shows the location of the port (T) on a node canister.



Figure 86. Storwize V5030E technician port

4. Connect an Ethernet cable between the port of the personal computer that is configured in step “2” on [page 98](#) and the technician port.

After the connection is made, the system will automatically configure the IP and DNS settings for the personal computer if DHCP is available. If DHCP is not available, the system uses the values that you provided in step “2.a” on page 98.

5. After the Ethernet port of the personal computer is connected, open a supported browser and go to address `http://install`.

If you do not have DHCP, open a supported browser and go to the following static IP address `192.168.0.1`.

The browser is automatically directed to the initialization tool.

6. Follow the instructions that are presented by the initialization tool to configure the system with a name and management IP address.
7. If you experience a problem during the process due to a change in system states, wait 5 - 10 seconds. Then, either reopen the SSH connection or reload the service assistant.
8. After you complete the initialization process, disconnect the cable between the personal computer and the technician port.

## Configuring a system to be NEBS-compliant

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For operation in Network Equipment-Building System (NEBS) compliant installations, the system can be configured to extend its operational temperature range to meet NEBS operating temperature requirements.

**Note:** The system might not be able to save its cache and state data if the power fails while it is operating within the extended temperature range. This is because the battery capacity decreases as temperature rises. If the save of cache and state data cannot be completed, an extended service action is required to recover the system and data might be lost. Keep the temperature within the normal operating range if possible, and maintain a reliable power supply.

- To extend the operational temperature range of all enclosures in the system to meet NEBS operating temperature requirements, enter the following CLI command:

```
chsystem -hightempmode on
```

After it is set, `high_temp_mode` is applied to all enclosures in the system.

- To configure the default operating temperature ranges, enter the following CLI command:

```
chsystem -hightempmode off
```

- To determine which mode is configured, read the value of the `high_temp_mode` parameter in the **lssystem** output.

### Notes:

1. Configuring the system to be NEBS-compliant only changes the way that the system responds to raised temperature. You must also ensure that the way the system is racked, and the operating environment, conforms to NEBS requirements. See [“NEBS-compliant earth connection” on page 27..](#)

## Adding an expansion enclosure to an existing system

---

When you add an expansion enclosure to an existing system, you must use the management GUI to update the system configuration.

### About this task

The management GUI requires a supported web browser (see [“Checking your web browser settings for the management GUI” on page 95](#)).

## Procedure

To add an expansion enclosure to your system, complete the following steps.

1. Install support rails for the new enclosure.
2. Install the new enclosure in the rack.
3. Connect the expansion enclosure attachment cables.
4. Connect the power cables and wait for the SAS light-emitting diodes (LEDs) to illuminate.
5. Start the management GUI.
6. Go to **Monitoring > System**.
7. In the management GUI, select **Monitoring > System**. On the **System -- Overview** page, select **Add Enclosure**. When a new enclosure is cabled correctly to the system, the **Add Enclosures** action automatically displays on the **System -- Overview** page. If this action does not appear, review the installation instructions to ensure the new enclosure is cabled correctly. You can also add a new enclosure by selecting **Add Enclosure** from the **System Actions** menu.
8. Continue to follow the on-screen instructions.

## Adding a control enclosure to an existing system

---

To add a control enclosure to an existing system, you must first install it in the rack. Then, you must connect it to the system through a zone in the SAN.

### About this task

The management GUI requires a supported web browser (see [“Checking your web browser settings for the management GUI”](#) on page 95).

**Note:** You cannot cluster a second control enclosure with a Storwize V5010E system.

## Procedure

To add a control enclosure to an existing system, complete the following steps.

1. Install support rails for the new enclosure.
2. Install the new enclosure in the rack.
3. Connect the node canisters to the storage area network.
4. Configure the zoning on the SAN switches.  
The correct zoning provides a way for the ports to connect to each other.
5. Run the following command to erase the enclosure vital product data (VPD).

```
satask chvpd -resetclusterid
```

6. Wait until both nodes are online again, and then start the management GUI.  
Typically, it takes a few minutes before both nodes are online again.
7. Go to **Monitoring > System**.
8. In the management GUI, select **Monitoring > System**. On the **System -- Overview** page, select **Add Enclosure**. When a new enclosure is cabled correctly to the system, the **Add Enclosures** action automatically displays on the **System -- Overview** page. If this action does not appear, review the installation instructions to ensure the new enclosure is cabled correctly. You can also add a new enclosure by selecting **Add Enclosure** from the **System Actions** menu.
9. Continue to follow the on-screen instructions.

---

## Appendix A. Accessibility features for the system

Accessibility features help users who have a disability, such as restricted mobility or limited vision, to use information technology products successfully.

### **Accessibility features**

These are the major accessibility features for the system:

- You can use screen-reader software and a digital speech synthesizer to hear what is displayed on the screen. HTML documents are tested by using JAWS version 15.0.
- This product uses standard Windows navigation keys.
- Interfaces are commonly used by screen readers.
- Industry-standard devices, ports, and connectors.

The system online documentation and its related publications are accessibility-enabled. The accessibility features of the online documentation are described in

### **Keyboard navigation**

You can use keys or key combinations for operations and to initiate menu actions that can also be done through mouse actions. You can go to the system online documentation from the keyboard by using the keyboard shortcuts for your browser or screen-reader software. See your browser or screen-reader software Help for a list of keyboard shortcuts that it supports.

### **IBM and accessibility**

See the [IBM Human Ability and Accessibility Center](#) for more information about the commitment that IBM has to accessibility.



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## Appendix B. Where to find the Statement of Limited Warranty

The *Statement of Limited Warranty* is available in both hardcopy format and in the Storwize V5000E Storwize V5000E IBM Knowledge Center.

The *Statement of Limited Warranty* is included (in hardcopy form) with your product. See [“Publications and related libraries”](#) on page xxi for the part number.





## Notices

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CAN ICES-3 (A)/NMB-3(A)

### European Community and Morocco Notice

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This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.

**Warning:** This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.

### Germany Notice

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

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55032 Klasse A ein.

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#### **Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC Richtlinie 2014/30/EU) für Geräte der Klasse A**

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV-Vorschriften ist der Hersteller:

International Business Machines Corp.  
New Orchard Road  
Armonk, New York 10504  
Tel: 914-499-1900

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Generelle Informationen:

**Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55032 Klasse A.**

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This statement applies to products less than or equal to 20 A per phase.

高調波電流規格 JIS C 61000-3-2 適合品

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本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。

- 回路分類 : 6 (単相、PFC回路付)
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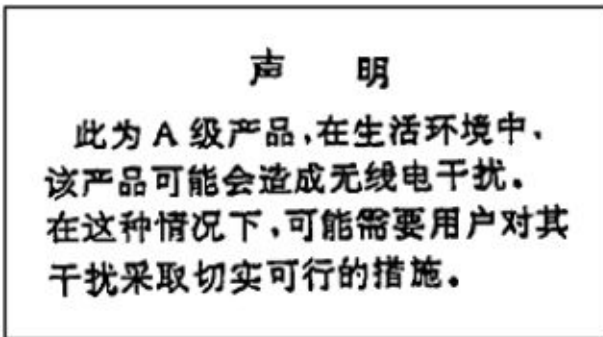
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VCCI-A

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台北市松仁路7號3樓  
電話：0800-016-888

72c00790

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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. IBM 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 might not cause harmful interference, and (2) this device must accept any interference received, including interference that might cause undesired operation.

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