IBM Storwize V5000 Gen2
Storwize V5010, Storwize V5020, Storwize V5030, and
Models 2077-92F and 2078-92F

Quick Installation Guide

GC27-8581-03

Note

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

- The general information in "Notices" on page 155
- The information in the "Safety and environmental notices" on page ix
- The information in the *IBM Environmental Notices and User Guide* (provided on a DVD)

This edition applies to IBM Storwize V5000 and is valid until replaced by new editions.

This edition replaces GC27-8581-02.

Contents

Figures

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Safety and environmental notices

Review the safety notices, environmental notices, and electronic emission notices for IBM® Storwize® V5000 Gen2 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.

Here are examples of a caution and a danger notice:

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)

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

1. Look for the identification number at the end of each caution notice or each danger notice. In the preceding examples, the numbers (C001) and (D002) are the identification numbers.
2. Locate the *IBM Systems Safety Notices* with the user publications that were provided with the Storwize V5000 Gen2 hardware.
3. Find the matching identification number in the *IBM System Storage Storwize V5000 Gen2 Safety Notices* . Then, review the topics concerning the safety notices to ensure that you are in compliance.
4. Optionally, read the multilingual safety instructions on the Storwize V5000 Gen2 website. Go to www.ibm.com/storage/support/storwize/v5000, search for Storwize V5000 Gen2, and click the documentation link.

Safety notices and labels

Review the safety notices and safety information labels before using 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

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.

Note: 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.

Note: 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.

Note: This product was designed, tested, and manufactured to comply with IEC 60950-1, and where required, to relevant national standards that are based on IEC 60950-1.

Caution notices for the Storwize V5000 Gen2

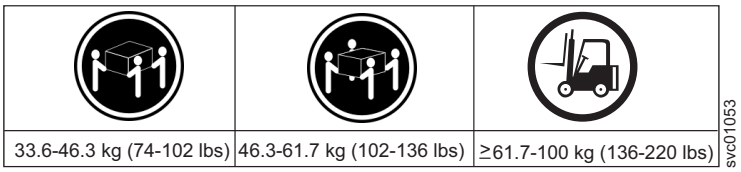
Ensure that you understand the caution notices for Storwize V5000 Gen2 .

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:
The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.

Do not: Throw or immerse into water, heat to more than 100°C (212°F), repair or disassemble. (C003)

CAUTION:



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 Storwize V5000 Gen2

Ensure that you are familiar with the danger notices for Storwize V5000 Gen2 .

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 Storwize V5000. These notices are in addition to the standard safety notices supplied and address specific issues relevant to the equipment provided.

General safety

When you service the Storwize V5000, follow 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 two 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 Storwize V5000 Gen2, 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 Storwize V5000 Gen2 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

The *IBM Systems Environmental Notices* contains all of the required environmental notices for IBM Systems products in English and other languages.

The *IBM Systems Environmental Notices* (`http://ibm.co/1fBgWFI`) 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

This publication provides information that helps you install and initialize IBM Storwize V5000 Gen2 systems.

Unless otherwise stated, references to 2077–324 are assumed to include 2077–AF3. References to 2078–324 are assumed to include 2078–AF3. References to 2077–24F are assumed to include 2077–AFF. References to 2078–24F are assumed to include 2078–AFF.

Who should use this guide

This guide is intended for installers of Storwize V5000 Gen2 systems.

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.

Storwize V5000 Gen2 library and related publications

Product manuals, other publications, and websites contain information that relates to Storwize V5000 Gen2.

IBM Knowledge Center for Storwize V5000 Gen2

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:

http://www.ibm.com/support/knowledgecenter/STPVGU

Storwize V5000 Gen2 library

Unless otherwise noted, the publications in the library are available in Adobe portable document format (PDF) from a website.

www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss

Click **Search for publications** to find the online publications you are interested in, and then view or download the publication by clicking the appropriate item.

Table 1 lists websites where you can find help, services, and more information.

Table 1. IBM websites for help, services, and information

Website	Address
Directory of worldwide contacts	http://www.ibm.com/planetwide
Support for Storwize V5000 (2077 or 2078)	www.ibm.com/storage/support/storwize/v5000
Support for IBM System Storage® and IBM TotalStorage products	www.ibm.com/storage/support/

Each PDF publication in the Table 2 library is also available in the IBM Knowledge Center by clicking the number in the "Order number" column:

Table 2. Storwize V5000 Gen2 library

Title	Description	Order number
IBM Storwize V5000 Gen2 Quick Installation Guide	The guide provides instructions for unpacking your order and installing your system. The first chapter describes how to verify your order, identify hardware components, and meet environmental requirements. The second chapter describes how to install the hardware and attach data cables and power cords. The last chapter describes how to access the management GUI to initially configure your system.	GC27-8581

IBM documentation and related websites

Table 3 lists websites that provide publications and other information about the Storwize V5000 Gen2 or related products or technologies. The IBM Redbooks® publications provide positioning and value guidance, installation and implementation experiences, solution scenarios, and step-by-step procedures for various products.

Table 3. IBM documentation and related websites

Website	Address
IBM Publications Center	www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss
IBM Redbooks publications	www.redbooks.ibm.com/

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

How to order IBM publications

The IBM Publications Center is a worldwide central repository for IBM product publications and marketing material.

The IBM Publications Center offers customized search functions to help you find the publications that you need. Some publications are available for you to view or download at no charge. You can also order publications. The publications center displays prices in your local currency. You can access the IBM Publications Center through the following website:

www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss

Related websites

The following websites provide information about Storwize V5000 Gen2 or related products or technologies:

Type of information	Website

Storwize V5000 Gen2 support	www.ibm.com/storage/support/storwize/v5000
Technical support for IBM storage products	www.ibm.com/storage/support/
IBM Electronic Support registration	www-01.ibm.com/support/electronicsupport/

Sending your comments

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

To submit any comments about this book or any other Storwize V5000 Gen2 documentation, send your comments by email to starpubs@us.ibm.com. Include the following information in your email:

- Publication title
- Publication form number
- Page, table, or illustration numbers that you are commenting on
- A detailed description of any information that should be changed

How to get information, help, and technical assistance

If you need help, service, technical assistance, or just want more information about IBM products, you will 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 4.

Table 4. IBM websites for help, services, and information

Website	**Address**
Directory of worldwide contacts	http://www.ibm.com/planetwide
Support for Storwize V5000 (2077 or 2078)	www.ibm.com/storage/support/storwize/v5000
Support for IBM System Storage and IBM TotalStorage products	www.ibm.com/storage/support/

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

Help and service

Before calling 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 calling 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 calling for assistance. When calling IBM for service regarding the product, follow these guidelines for the **hardware** :

Software option
Identify the Storwize V5000 Gen2 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 should 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 V5000, the machine type is 2077 or 2078.

In the US and Canada, hardware service and support can be extended to 24x7 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/storage/support/storwize/v5000.

Before you call

Make sure that you have taken steps to try to solve the problem yourself before you call.

Some suggestions for resolving the problem before calling 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 the knowledge center contains procedures to help you diagnose problems.
- Go to the IBM Support website at www.ibm.com/storage/support/storwize/v5000 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 these pages, go to www.ibm.com/storage/support/storwize/v5000 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 while deploying your system, and in the future.

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

Chapter 1. Before you begin the installation

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

The *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 1, "Before you begin the installation" (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 2, "Installing the Storwize V5000 Gen2 hardware," on page 19 involve installing the hardware and attaching the data cables and power cords.
3. Chapter 3, "Configuring the system," on page 143 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 from the IBM Knowledge Center for Storwize V5000 Gen2.
- Ensure that any cables that you are supplying are available for installation.

Table 5 lists the steps for each scenario.

Table 5. Steps for different installation scenarios for Storwize V5000 Gen2 systems

New system		Existing system	
Control enclosure only	**Control enclosure and one or more expansion enclosures**	**Adding expansion enclosures**	**Adding a control enclosure and expansion enclosures (Storwize V5030 only)**
"Reviewing your packing slip" on page 5	"Reviewing your packing slip" on page 5	"Reviewing your packing slip" on page 5	"Reviewing your packing slip" on page 5
"Identify the hardware components" on page 7	"Identify the hardware components" on page 7	"Identify the hardware components" on page 7	"Identify the hardware components" on page 7
"Verify environmental requirements" on page 16	"Verify environmental requirements" on page 16	"Verify environmental requirements" on page 16	"Verify environmental requirements" on page 16
"Review enclosure location guidelines" on page 16	"Review enclosure location guidelines" on page 16	"Review enclosure location guidelines" on page 16	"Review enclosure location guidelines" on page 16
"Installing support rails for Storwize V5000 Gen2 systems" on page 19	"Installing support rails for Storwize V5000 Gen2 systems" on page 19	"Installing support rails for Storwize V5000 Gen2 systems" on page 19[1]	"Installing support rails for Storwize V5000 Gen2 systems" on page 19[2]
"Installing enclosures for Storwize V5000 Gen2 systems" on page 24	"Installing enclosures for Storwize V5000 Gen2 systems" on page 24	"Installing enclosures for Storwize V5000 Gen2 systems" on page 24[1]	"Installing enclosures for Storwize V5000 Gen2 systems" on page 24[2]
"Connecting Ethernet cables to node canisters" on page 131	"Connecting SAS cables to expansion enclosures" on page 25	"Connecting SAS cables to expansion enclosures" on page 25[1]	"Connecting SAS cables to expansion enclosures" on page 25[1]

Table 5. Steps for different installation scenarios for Storwize V5000 Gen2 systems (continued)

New system		Existing system	
Control enclosure only	**Control enclosure and one or more expansion enclosures**	**Adding expansion enclosures**	**Adding a control enclosure and expansion enclosures (Storwize V5030 only)**
"Connecting Fibre Channel cables to a Fibre Channel host interface adapter" on page 136 "Connecting Fibre Channel cables to a 10 Gbps iSCSI-FCoE 4-port host interface adapter" on page 134	"Connecting Ethernet cables to node canisters" on page 131	"Powering on the system" on page 140[1]	"Connecting Ethernet cables to node canisters" on page 131[2]
"Powering on the system" on page 140	"Connecting Ethernet cables to node canisters" on page 131	"Adding an expansion enclosure to an existing system" on page 148	"Connecting Fibre Channel cables to a Fibre Channel host interface adapter" on page 136
Chapter 3, "Configuring the system," on page 143	"Powering on the system" on page 140		"Powering on the system" on page 140
	Chapter 3, "Configuring the system," on page 143		"Adding a control enclosure to an existing Storwize V5030 system" on page 149

[1]Complete these steps for each expansion enclosure that you add.

[2]Complete these steps for each control enclosure and expansion enclosure that you add.

Be familiar with the following information

- See "Caution notices for the Storwize V5000 Gen2" on page x and "Danger notices for Storwize V5000 Gen2" on page xiv 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 26 kg (57 lbs). At least two people are required to lift and install the enclosure into the rack or to remove an enclosure from the rack.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.

  (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 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.

__ • Table 6 summarizes the machine types and models of the Storwize V5000 Gen2 control enclosures.

Table 6. Storwize V5000 Gen2 control enclosures

IBM Storwize V5000 Gen2 Model	Machine type / model	Warranty	Description
IBM Storwize V5010	2077–112	1 year	12-slot Control enclosure for 3.5-inch drives
	2077–124	1 year	24-slot Control enclosure for 3.5-inch drives
	2078–112	3 years	12-slot Control enclosure for 2.5-inch drives
	2078–124	3 years	24-slot Control enclosure for 2.5-inch drives
IBM Storwize V5020	2077–212	1 year	12-slot Control enclosure for 3.5-inch drives
	2077–224	1 year	24-slot Control enclosure for 3.5-inch drives
	2078 –212	3 years	12-slot Control enclosure for 2.5-inch drives
	2078 –224	3 years	24-slot Control enclosure for 2.5-inch drives
IBM Storwize V5030	2077–312	1 year	12-slot Control enclosure for 3.5-inch drives
	2077–324	1 year	24-slot Control enclosure for 3.5-inch drives
	2077–AF3	1 year	24-slot Control enclosure for 3.5-inch drives
	2078–312	3 years	12-slot Control enclosure for 2.5-inch drives
	2078–324	3 years	24-slot Control enclosure for 2.5-inch drives
	2078–AF3	3 years	24-slot All Flash Control enclosure for 2.5-inch drives

__ • All Storwize V5000 Gen2 systems support the expansion enclosures that are listed in Table 7 on page 6.

Table 7. Storwize V5000 Gen2 expansion enclosures

IBM Storwize V5000 Gen2 Model	Machine type / model	Warranty	Description
Storwize V5010 Storwize V5020 Storwize V5030	2077–12F	1 year	12-slot Expansion enclosure for 3.5-inch drives
	2077–24F	1 year	24-slot Expansion enclosure for 2.5-inch drives
	2077–AFF	1 year	24-slot Expansion enclosure for 2.5-inch Flash Drives
	2078–12F	3 years	12-slot Expansion enclosure for 2.5-inch drives
	2078–24F	3 years	24-slot Expansion enclosure for 2.5-inch drives
	2078–AFF	3 years	24-slot Expansion enclosure for 2.5-inch Flash Drives
	2077–92F	1 year	92-slot Expansion enclosure for 3.5-inch drives
	2078–92F	3 years	92-slot Expansion enclosure for 3.5-inch drives

__ • Rack-mounting hardware kit:
  __ – Two rails (right and left assembly)
  __ – Two rail springs
  __ – Two sets of rail-mount screws and alternative rail-mount pins (large and small) for non-IBM racks
__ • Two power cords for connection to rack-mounted power distribution units
__ • Drive bay blanking plates (installed in the enclosure)

Options applicable to control enclosures

__ • Cache memory upgrade (16 GB for Storwize V5020 and 32 GB for Storwize V5030)
__ • Fibre Channel cables
__ • SAS cables
__ • Drives
__ • Power cords for connection to wall sockets
__ • Four-port 16 Gbps Fibre Channel HBA
__ • Four-port 10 Gbps Ethernet Adapter (iSCSI, FCoE)
__ • Four-port 12 Gbps SAS HBA
__ • Four-port 1 Gbps Ethernet Adapter (iSCSI)
__ • 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 Storwize V5000 Gen2 systems.

Control enclosure components

The following figures show the rear view of the control enclosures on Storwize V5000 Gen2 systems. The location of the power supply units and node canisters are also shown.

Figure 1 shows the Storwize V5010 control enclosure.

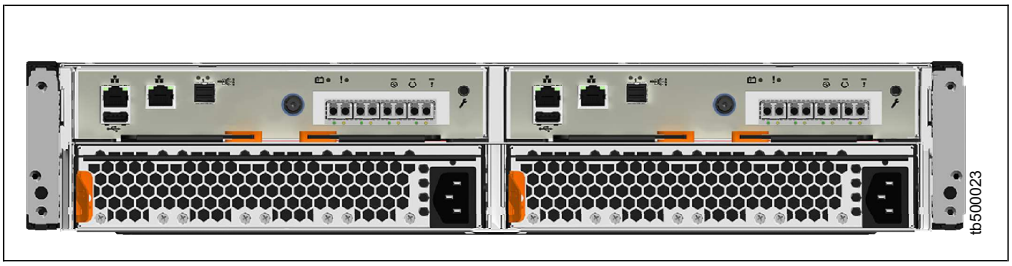


Figure 1. Storwize V5010 control enclosure

Figure 2 shows a rear view of the Storwize V5020 node.

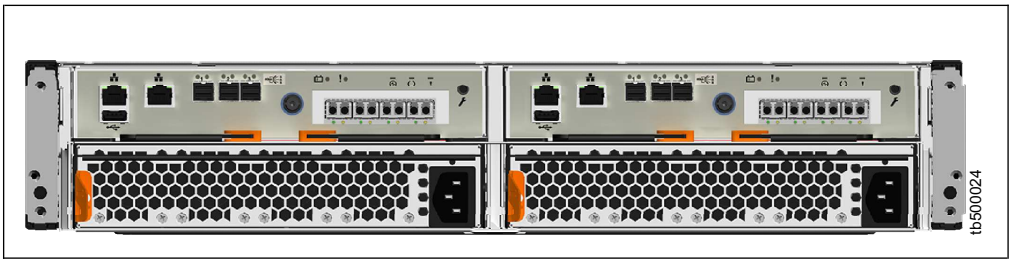


Figure 2. Storwize V5020 control enclosure

Figure 3 shows a rear view of the Storwize V5030 node.

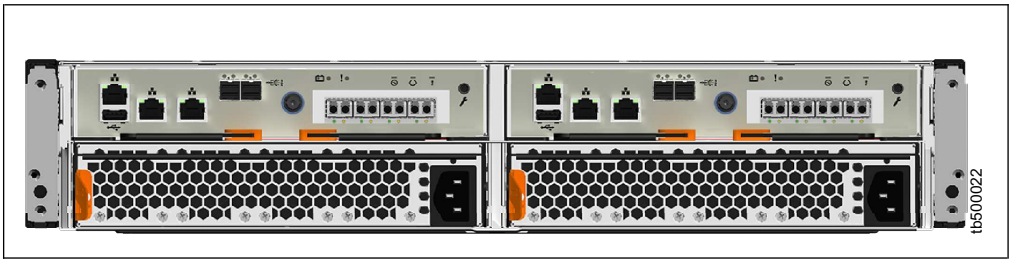


Figure 3. Storwize V5030 control enclosure

Data ports

The following figures show the rear view of the control enclosures on Storwize V5000 Gen2 systems. The location of the ports are shown.

- T Technician port
- 1 Ethernet port 1
- 2 Ethernet port 2

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

Figure 4 shows the Storwize V5010 control enclosure.

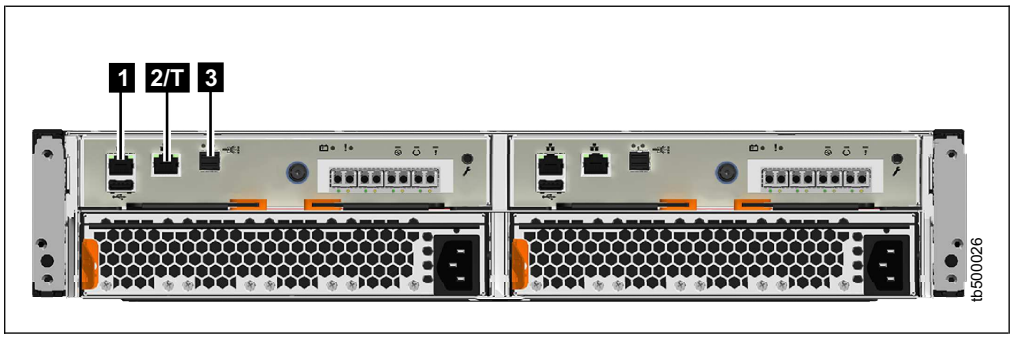


Figure 4. Data ports on the rear of the Storwize V5010 control enclosure

Figure 5 shows the data ports on the back of the Storwize V5020 node.

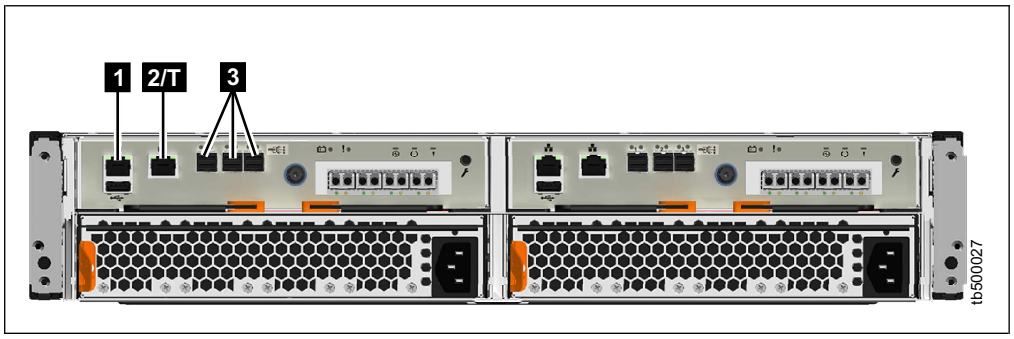


Figure 5. Data ports on the rear of the Storwize V5020 control enclosure

Figure 6 shows the data ports on the back of a Storwize V5030 node.

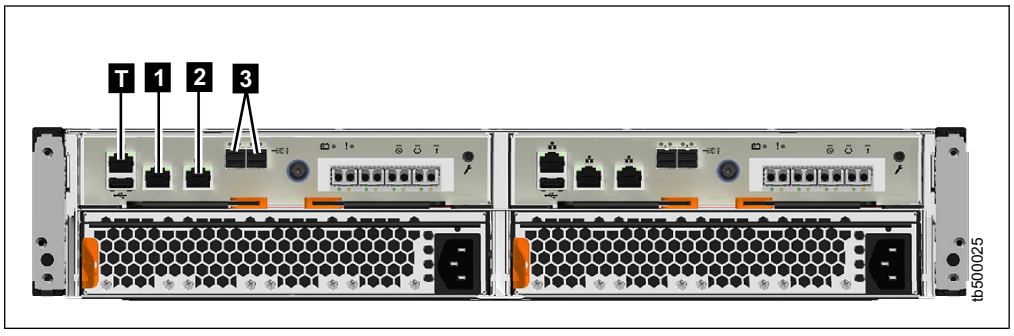


Figure 6. Data ports on the rear of the Storwize V5030 control enclosure

Expansion enclosure components

Figure 7 shows the location of the power supply units and expansion canisters.

- 1 Expansion canisters
- 2 Power supply units

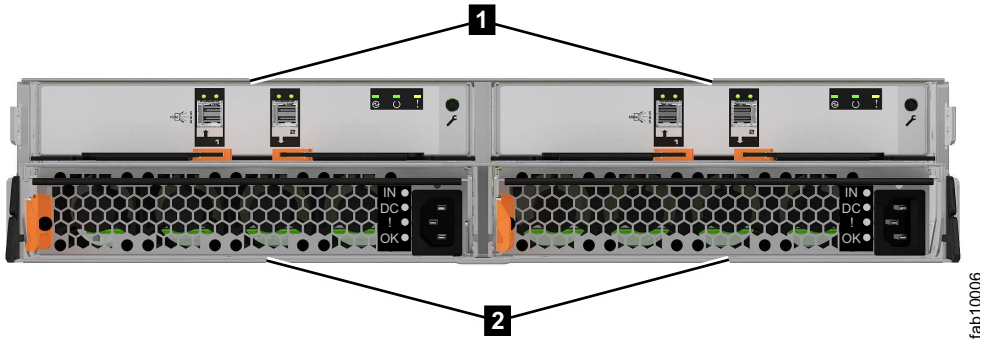


Figure 7. Rear view of a Storwize V5000 Gen2 expansion enclosure

Figure 8 shows the LEDs and SAS port locations from the rear view of an expansion canister.

- 1 LEDs
- 2 SAS ports

Each canister has two SAS ports that are numbered 1 on the left and 2 on the right. Port 1 is used to connect to a SAS expansion port on a node canister or port 2 of another expansion canister.

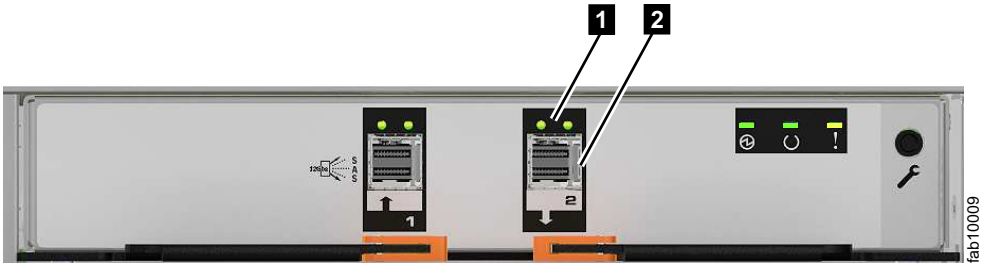


Figure 8. SAS ports and LEDs in rear view of a Storwize V5000 Gen2 expansion canister

Support rails and enclosures

Storwize V5000 Gen2 systems use the same rails and enclosures for both control and expansion enclosures. All Storwize V5000 Gen2 models use the same expansion enclosure.

- The ledge on the inside of each rail supports the entire length of an enclosure.
- The enclosure support rails capture the left and right rear edges of an inserted enclosure. This prevents the installed enclosure bouncing when the rack is subjected to quake or vibration.
- The enclosure support rails adjust to fit racks from 595 mm to 755 mm deep, measured between the front and rear rack rails.

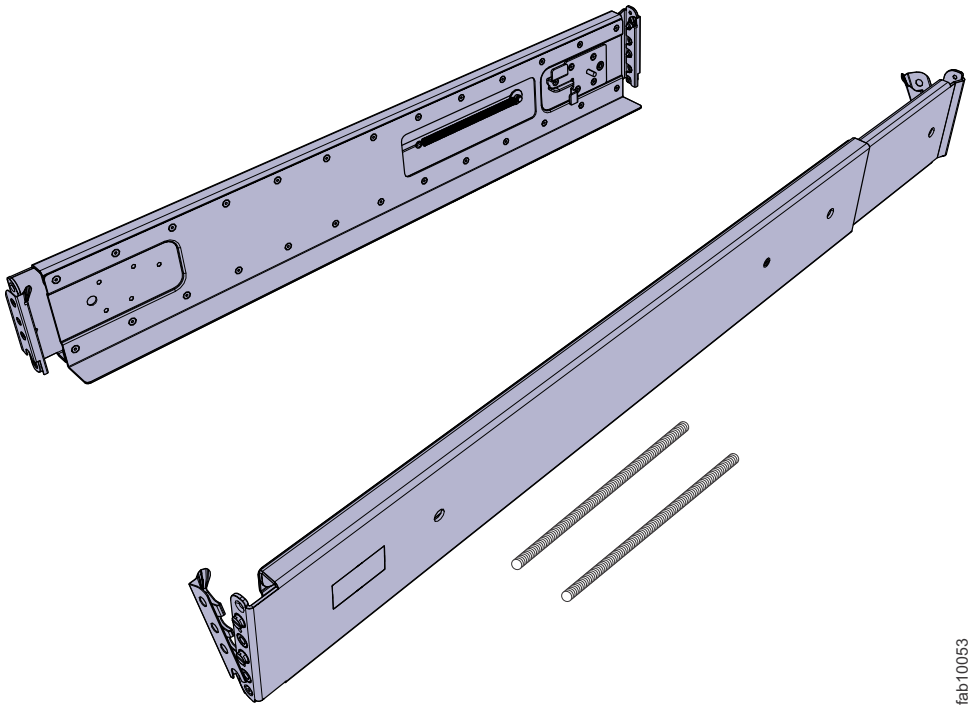


Figure 9. Enclosure support rails on Storwize V5000 Gen2

Direct current power supply units

When feature code AHPB is used, a direct current (DC) power supply can be installed in a Storwize V5000 Gen2 enclosure.

This topic describes the additional information you need to know when using the DC power models.

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:

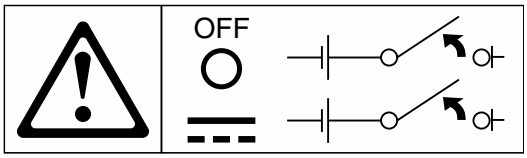
  1. **Turn off everything (unless instructed otherwise).**
  2. **Remove the power cords from the outlets.**
  3. **Remove the signal cables from the connectors.**
  4. **Remove all cables from the devices.**

  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 Storwize V5000 Gen2 enclosure can contain two DC power supply units. Each power supply unit can provide power to the whole enclosure.

The power supply units have the components that are shown in Figure 10 on page 13.

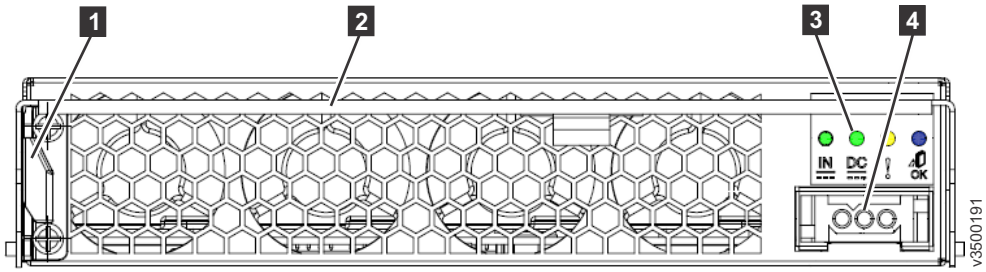


Figure 10. DC power supply unit connectors and indicators

- 1 Release tab
- 2 Handle
- 3 Power supply LED indicators
- 4 DC power cable connector

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 8 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. For details, see "Powering on the system" on page 140.

Table 8. DC power supply LED indicators

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

A Storwize V5000 Gen2 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.

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.

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 9 lists the wire colors.

Table 9. DC cable wire color coding

Color	**Function**
Blue	Return
Green / Yellow	Ground
Brown	-48V

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, so its outputs and the enclosure become live as soon as power is connected.

The supplied power must meet the input requirements that are listed in Table 10.

Table 10. DC power supply input requirements

Requirement	**Min**	**Max**
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	

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.

The DC power cable must be totally contained in a single rack and must not extend outside the rack to another rack.

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.

Direct current power replaceable units

The DC power supply model has two replaceable units.

Table 11. Direct current power 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 Storwize V5000 Gen2 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 V5000 Gen2 physical installation planning" topic in the IBM Knowledge Center for Storwize V5000 Gen2.

Review enclosure location guidelines

Before you install the enclosures, you must be familiar with these enclosure location guidelines.

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 Storwize V5000 enclosure to be installed requires 2U of rack space.
- Each assembled 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 enclosures that constitute one system in contiguous positions in a rack. Place the control enclosure in the middle of the rack.
- Storwize V5010 and Storwize V5020 control enclosures systems can support up to 10 expansion enclosures on one chain. Storwize V5030 systems can support two chains and each chain can support up to 10 expansions 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 V5030 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 2. Installing the Storwize V5000 Gen2 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 Storwize V5000 Gen2 enclosures, this connection is made by using the front enclosure mounting screws that are part of the standard installation described in Installing the support rails and Installing the enclosures. 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 Storwize V5000 Gen2 system is required to be NEBS-compliant, some system configuration settings must be made. For details, see "Configuring a Storwize V5000 Gen2 system to be NEBS-compliant" on page 148.
2. For more information about Storwize V5000 Gen2 configuration guidelines and restrictions, see the following website: `http://www-01.ibm.com/support/docview.wss?uid=ssg1S1005422`
3. If a Storwize V5000 Gen2 system is clustered with a Storwize V5000 system, NEBS compliance cannot be enabled. NEBS compliance is not supported on Storwize V5000 systems.

Installing support rails for Storwize V5000 Gen2 systems

Storwize V5000 Gen2 systems use the same rails for control and expansion enclosures. Before you install a control or expansion enclosure, you must first install the support rails for it.

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 19.

Procedure

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

1. Locate the control enclosure rails (Figure 11). The rail assembly consists of two rails that must be installed in the rack cabinet.

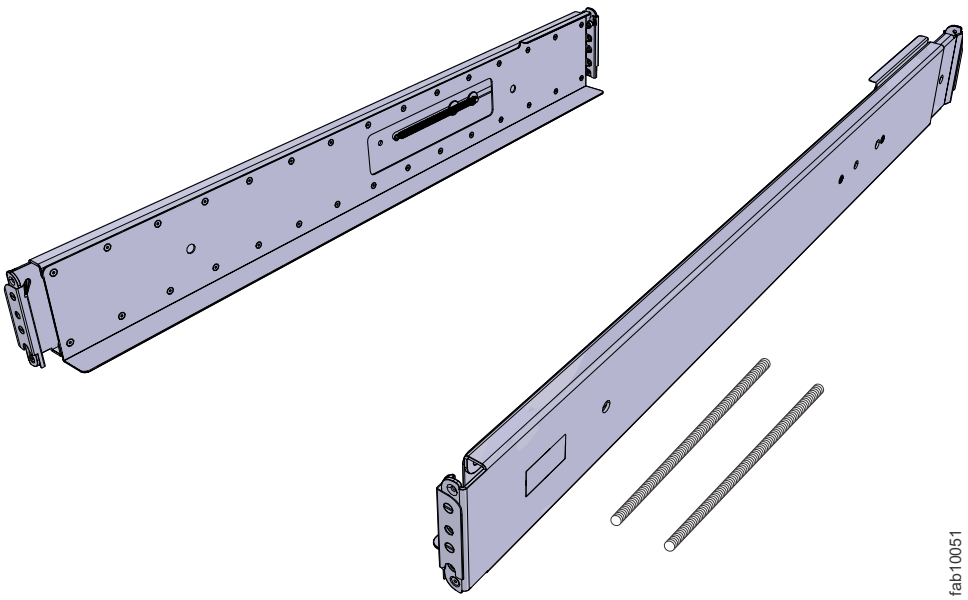


Figure 11. Control enclosure support rails

2. Install a spring on each rail.
   a. Extend the rail to its full length.
   b. Push one looped end of a spring over one stud on the inside of the rail. (See Figure 12 on page 21.)
   c. Stretch the spring slightly and push the other looped end of the spring onto the other stud on the inside of the rail.

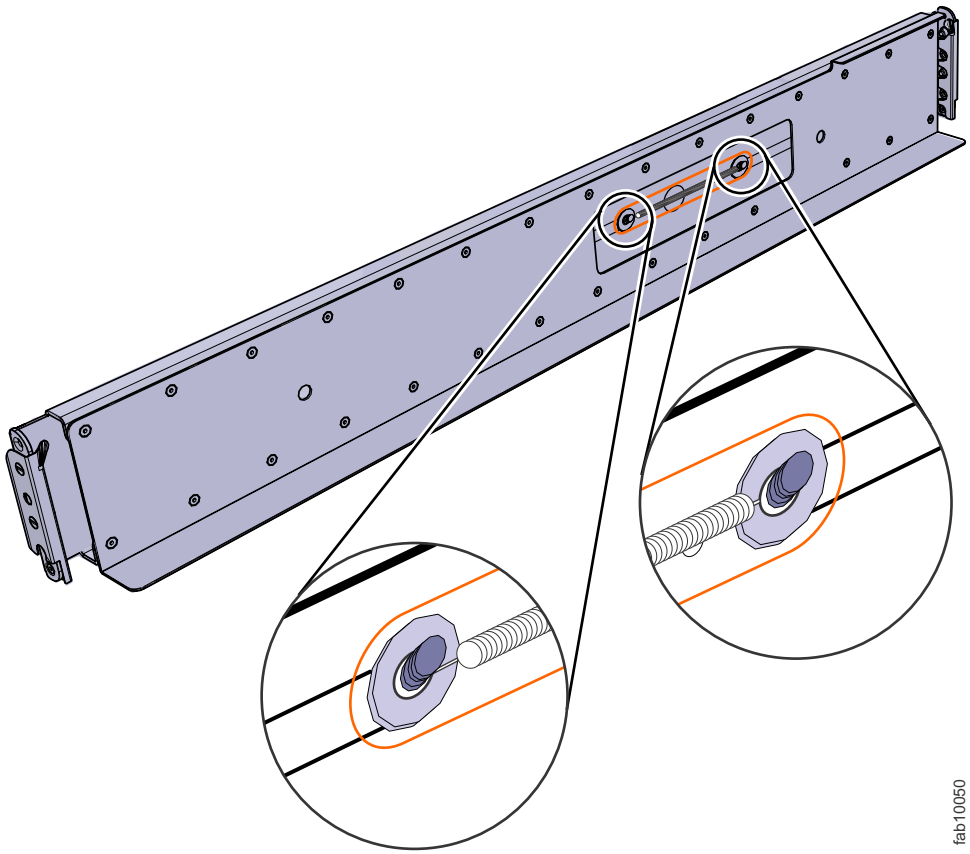


Figure 12. Installing the rail spring

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 13 on page 22 shows two rack units with the front mounting holes identified.

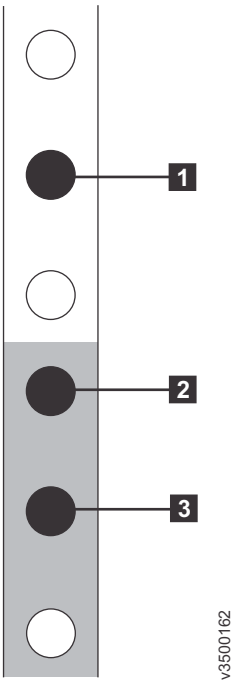


Figure 13. Hole locations in the front of the rack

- **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 12).

Table 12. Selecting bracket pins for your rack

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.

5. At each end of the rail, grasp the tab and pull *firmly* to open the hinge bracket. (See Figure 14 on page 23.)

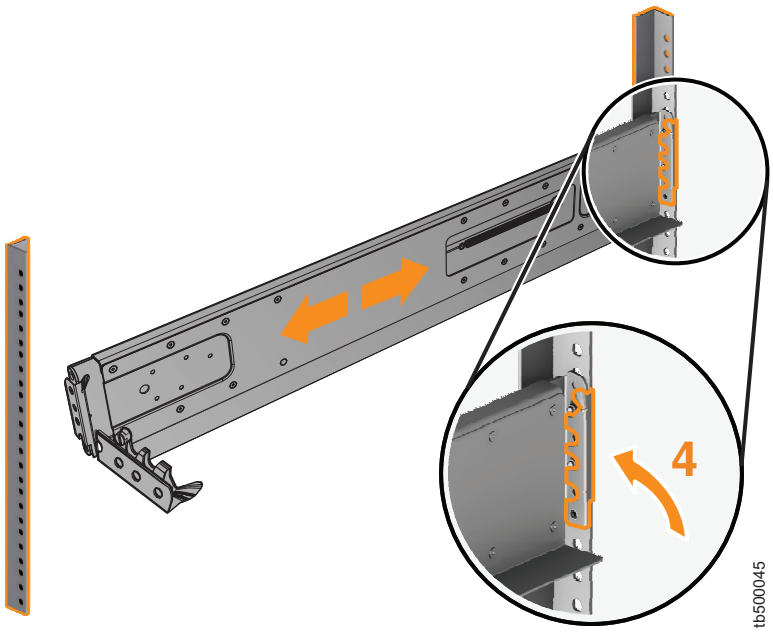


Figure 14. Opening the hinge brackets

6. 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.
7. On the rear of the rail, press the two bracket pins into the holes in the rack flanges.
8. Close the rear hinge bracket to secure the rail to the rack cabinet flange. (See Figure 15.)

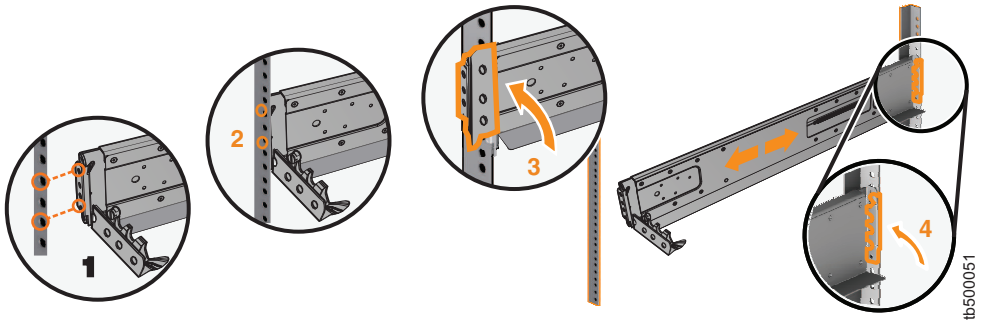


Figure 15. Closing the hinge brackets

9. On the front of the rail, press the two bracket pins into the holes in the rack flanges.
10. Close the front hinge bracket to secure the rail to the rack cabinet flange. Figure 15 shows an example.
11. Secure the rear of the rail to the rear rack flange with an M5 screw.
12. Repeat the steps to secure the opposite rail to the rack cabinet.
13. Repeat the procedure to install rails for each additional control enclosure.

Installing enclosures for Storwize V5000 Gen2 systems

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 19.

CAUTION:

- **To lift and install the enclosure into the rack requires at least two people.**
- **To lift a control enclosure with drives installed requires at least three people.**
- **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 16.)

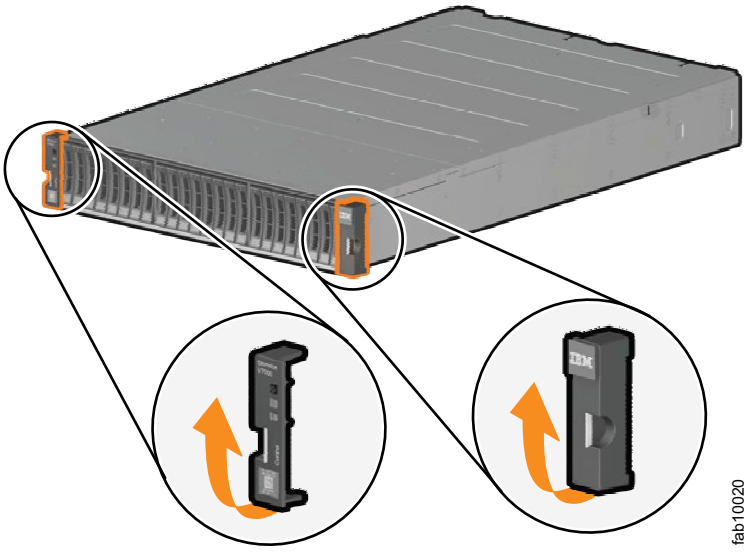


Figure 16. Removing enclosure end caps

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 17 on page 25).

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

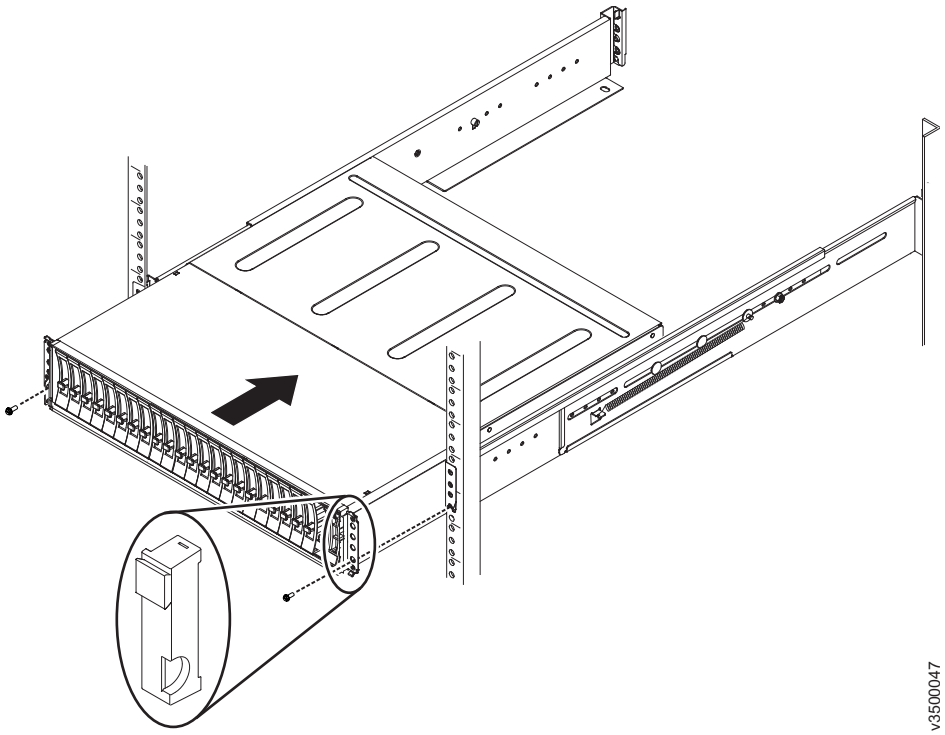


Figure 17. Inserting the enclosure

4. Secure the enclosure with a screw in the rack mounting screw hole.
5. Reinstall the left and right end caps. (See Figure 17.) 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.

Connecting SAS cables to expansion enclosures

If you have installed expansion enclosures, you must connect them to a control enclosure.

About this task

This task applies if you are installing one or more expansion enclosures.

The number of SAS chains and enclosures varies per each type of system, as shown in Table 13 on page 26.

Table 13. Summary of SAS chains and enclosures

System	Expansion ports	Number of SAS chains supported	Control enclosures per system	Expansion enclosures per chain	Maximum Number of Enclosures
Storwize V5010 and Storwize V5020	Port 1 only	1	1	10	11
Storwize V5030	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 30.

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 18 on page 27 shows how to connect SAS cables on a Storwize V5010 system.

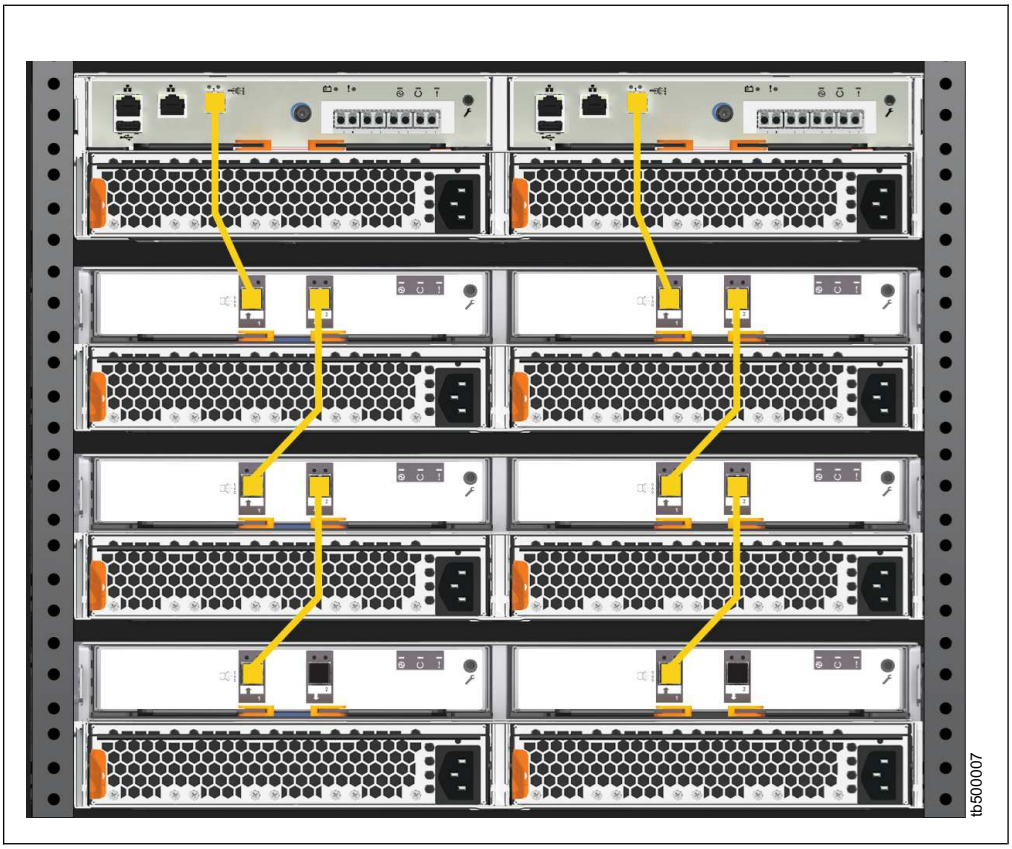


Figure 18. Connecting the SAS cables to a Storwize V5010 system

Figure 19 on page 28 shows how to connect SAS cables on a Storwize V5020 system.

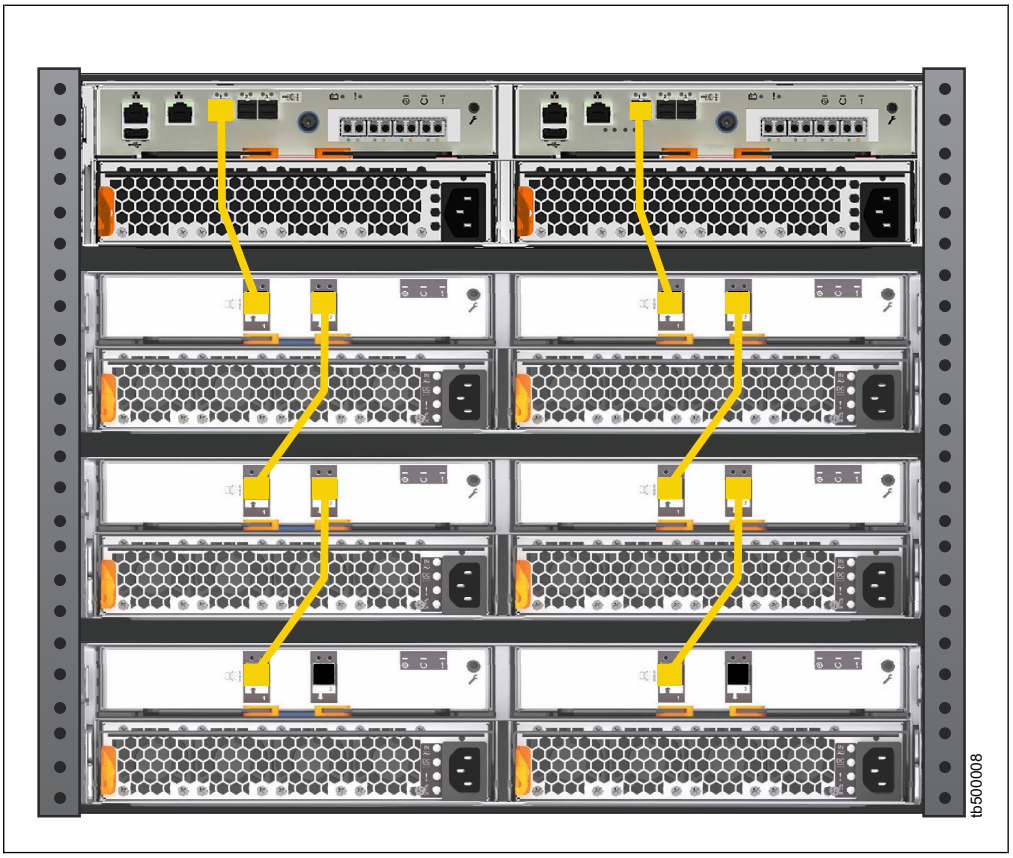


Figure 19. Connecting the SAS cables to a Storwize V5020 system

Figure 20 on page 29 shows how to connect SAS cables on a Storwize V5030 system. In this figure, two expansion chains are connected to the Storwize V5030 system.

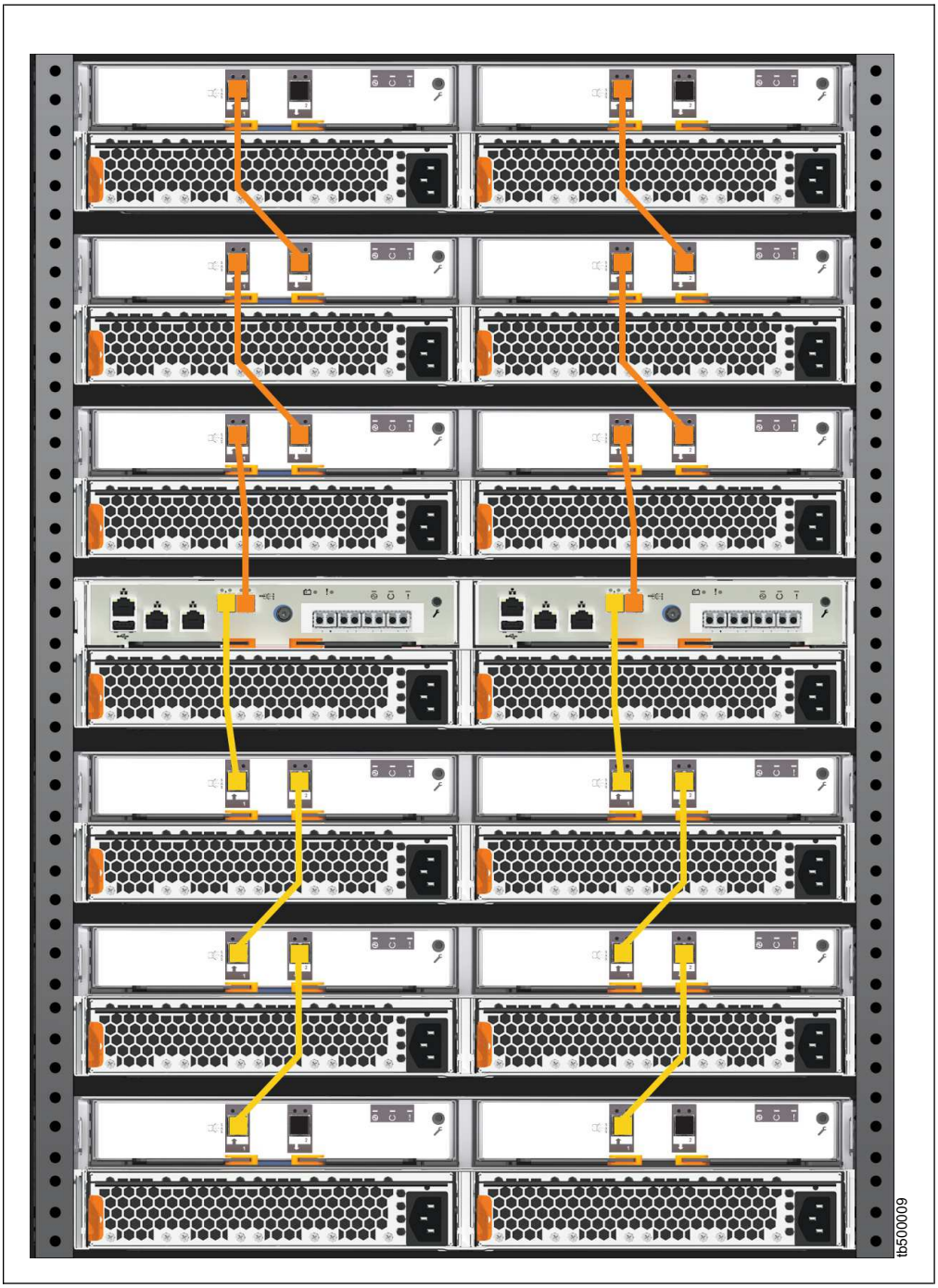


Figure 20. Connecting the SAS cables to a Storwize V5030 system

2. To add a second expansion chain to the Storwize V5030 control enclosure, use the supplied SAS cables to connect the control enclosure to the expansion enclosure at rack position 2, as shown in Figure 20.

   Note: Storwize V5010 and Storwize V5020 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 20 on page 29.
4. If two control enclosures are installed (Storwize V5030 only), 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 21) 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.

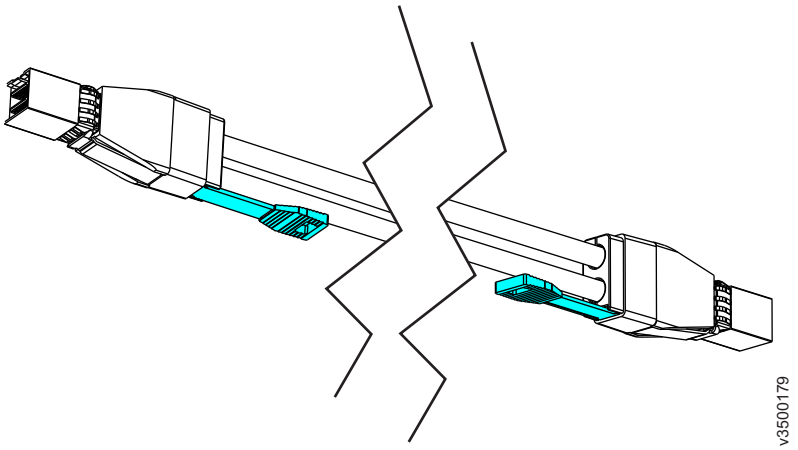


Figure 21. SAS cable connectors

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 Storwize V5010, Storwize V5020, or Storwize V5030 node canister. The expansion enclosures in this chain should be installed below the control enclosure.

- For Storwize V5030 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.
- 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.

Refer to "Connecting SAS cables to expansion enclosures" on page 25 for examples of SAS cable connections on each Storwize V5000 Gen2 system.

For information about the SAS cabling requirements for 5U expansion enclosures, see "Connecting the optional 2077-92F SAS expansion enclosures" on page 117.

Installing an optional 5U SAS expansion enclosure

Up to 2 chains of expansion enclosures can be attached to each I/O group in the system.

Installing an optional 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.

Safety notices and considerations: 2077-92F

Before you install, service, or move the 2077-92F expansion enclosure, you must review and follow the safety notices.

Always read and following the following safety notices and guidelines for the 2077-92F expansion enclosure.

Safety notices

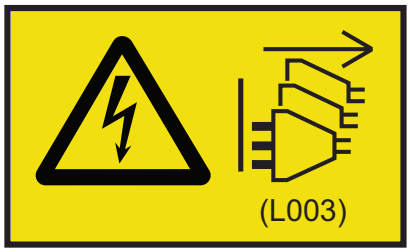
Use the reference numbers in parentheses at the end of each notice (for example, D005) to find the matching translated notice in *IBM Systems Safety Notices*.

DANGER

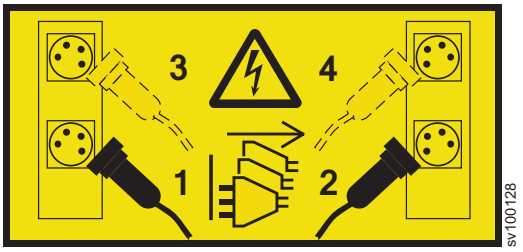
DANGER: Serious injury or death can occur if loaded lift tool falls over or if a heavy load falls off the lift tool. Always completely lower the lift tool load plate and properly secure the load on the lift tool before moving or using the lift tool to lift or move an object. (D010)

DANGER

Multiple power cords. The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords. (L003)



or



DANGER

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

DANGER

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

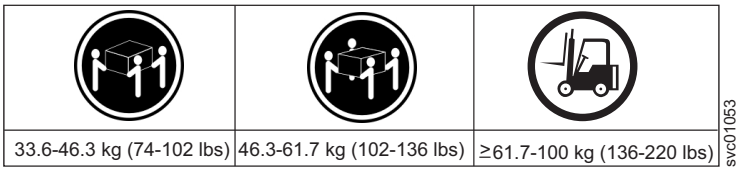
Do not transport the rack via fork truck unless it is properly packaged, secured on top of the supplied pallet. (R004)

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:



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:
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: 2077-92F

Before you install, move, or perform service on a 2077-92F 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 2077-92F expansion enclosure and its parts. See “Safety notices and considerations: 2077-92F” on page 31 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 2077-92F 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.
- Ensure that the drives are easily accessible. It is best not to install the 2077-92F expansion enclosure above position 22U in the rack

Weight of expansion enclosure parts

Table 14 summarizes the weight and quantity of the parts (FRUs) that are shipped with the 2077-92F expansion enclosure.

Table 14. Weight of expansion enclosure parts

FRU description	FRU part number	Weight per unit		Quantity shipped	Total weight	
		kg	lbs		kg	lb
Enclosure FRU	01LJ112	42.5	93.696	1	42.500	93.696
Rail kit	01LJ114	9.231	20.351	1	9.231	20.351
Front fascia (4U front cover)	01LJ116	0.303	0.668	1	0.303	0.668
Display panel assembly	01LJ118	0.020	0.044	1	0.020	0.044
PSU fascia (1U cover)	01LJ120	0.010	0.022	1	0.010	0.022
Power supply unit (PSU)	01LJ122	3.335	7.352	2	6.670	14.705
Secondary expansion module	01LJ124	0.826	1.821	2	1.652	3.642
Fan module	01LJ126	0.890	1.962	4	3.560	7.848
Expansion canister	01LJ128	1.588	3.501	2	3.176	7.002
Cable management arm (lower and upper arms)	01LJ130	1.373	3.027	1	1.373	3.027
Top cover	01LJ132	3.720	8.201	1	3.720	8.201
Fan interface board	01LJ134	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 2077-92F expansion enclosure. The enclosure can support up to 92 SAS drives; however, the quantity varies depending on the number of drives ordered.

Table 15 summarizes the weight of the SAS drives in a 2077-92F expansion enclosure. All Storwize V5000 Gen2 systems that are running software level 7.8 can support the 2077-92F expansion enclosure.

Table 15. Weight of expansion enclosure drives

FRU description	FRU part number	Feature code	Comments	Approximate weight per unit	
				kg	lb
600 GB 15 K 2.5-inch hard disk drive	01LJ037	ACP0	Common to all Storwize V5000 Gen2 systems.	0.304	0.670
1.2 TB 10 K 2.5-inch hard disk drive	01LJ038	ACP3		0.304	0.670
1.8 TB 10 K 2.5-inch hard disk drive	01LJ039	ACP4		0.304	0.670
6 TB 7.2 K 3.5-inch Near-Line SAS hard disk drive	01LJ040	ACP7		0.876	1.931
8 TB 7.2 K 3.5-inch Near-Line SAS hard disk drive	01LJ041	ACP8		0.876	1.931
10 TB 7.2 K 3.5-inch Near-Line SAS hard disk drive	01LJ042	ACP9		0.876	1.931
1.6 TB 2.5-inch tier 0 flash drive	01LJ043	ACPD	For systems with a 1-year warranty (2077-xxx).	0.224	0.494
1.6 TB 2.5-inch tier 0 flash drive		ACQD	For systems with a 3-year warranty (2078-xxx).	0.224	0.494
3.2 TB 2.5-inch tier 0 flash drive	01LJ044	ACPE	For systems with a 1-year warranty (2077-xxx).	0.224	0.494
3.2 TB 2.5-inch tier 0 flash drive		ACQE	For systems with a 3-year warranty (2078-xxx).	0.224	0.494
1.92 TB 2.5-inch tier 1 flash drive	01LJ045	ACPJ	For systems with a 1-year warranty (2077-xxx).	0.224	0.494
1.92 TB 2.5-inch tier 1 flash drive		ACQJ	For systems with a 3-year warranty (2078-xxx).	0.224	0.494

Table 15. Weight of expansion enclosure drives (continued)

FRU description	FRU part number	Feature code	Comments	Approximate weight per unit	
				kg	lb
3.84 TB 2.5-inch tier 1 flash drive	01LJ046	ACPK	For systems with a 1-year warranty (2077-xxx).	0.224	0.494
3.84 TB 2.5-inch tier 1 flash drive		ACQK	For systems with a 3-year warranty (2078-xxx).	0.224	0.494
15.36 TB 2.5-inch tier 1 flash drive	01LJ047	ACPL	For systems with a 1-year warranty (2077-xxx).	0.224	0.494
7.68 TB 2.5-inch tier 1 flash drive		ACQL	For systems with a 3-year warranty (2078-xxx).	0.224	0.494
15.36 TB 2.5-inch tier 1 flash drive	01LJ048	ACPM	For systems with a 1-year warranty (2077-xxx).	0.224	0.494
15.36 TB 2.5-inch tier 1 flash drive		ACQM	For systems with a 3-year warranty (2078-xxx).	0.224	0.494

Note: The part numbers and feature codes for the tier 1 flash drives vary, depending on the model type and warranty of the Storwize V5000 Gen2 system. Table 16 summarizes the warranty values.

Table 16. Storwize V5000 Gen2 system and warranty summary

System model	1-year warranty	3-year warranty
Storwize V5010	2077-124	2078-124
Storwize V5020	2077-224	2078-224
Storwize V5030	2077-324	2078-324

Weight increases as FRUs are installed

The 2077-92F expansion enclosure supports up to 92 SAS drives. As Table 17 shows, substantial weight is added to the enclosure when all drives are installed.

Table 17. 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 2.5-inch tier 1 flash drive	0.224	0.494	92	20.608	45.433
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 18 shows the weight progression as different combinations of FRUs are installed.

Table 18. Enclosure weight as FRUs are installed

Enclosure assembly		Approximate weight	
FRUs installed	**FRUs not installed**	**kg**	**lb**
• Enclosure (01LJ112)	• Secondary expansion modules • Fascia (1U and 4U) • PSUs • Expansion canisters • Fan modules • Fan interface board • Display assembly • Drives • Cover	42.5	93.7
• Enclosure (01LJ112) • Secondary expansion modules	• Fascia (1U and 4U) • PSUs • Expansion canisters • Fan modules • Fan interface board • Display assembly • Drives • Cover	44.3	97.7
• Enclosure (01LJ112) • Secondary expansion modules • Fascia (1U and 4U) • PSUs • Expansion canisters • Fan modules • Fan interface board • Display assembly	• Drives • Cover	58	127.9
Note: The following FRUs are installed when the enclosure is initially shipped. • Enclosure (01LJ112) • Secondary expansion modules • PSUs • Expansion canisters • Fan modules • Fan interface board • Display assembly • Cover	• Fascia (1U and 4U) • Drives	61.5	135.4

Table 18. Enclosure weight as FRUs are installed (continued)

Enclosure assembly		Approximate weight	
FRUs installed	**FRUs not installed**	**kg**	**lb**
• Enclosure (01LJ112) • Secondary expansion modules • Fascia (1U and 4U) • PSUs • Expansion canisters • Fan modules • Fan interface boards • 92 2.5-inch tier 1 flash drives	• Cover	78.6	173.3
• Enclosure (01LJ112) • Secondary expansion modules • Fascia • PSUs • Expansion canisters • Fan modules • Fan interface board • 92 2.5-inch hard disk drives	• Cover	86	189.6
• Enclosure (01LJ112) • Secondary expansion modules • Fascia • PSUs • Expansion canisters • Fan modules • Fan interface board • 92 3.5-inch Near-Line SAS hard disk drives	• Cover	138.6	305.6

Conversely, the overall weight of the expansion enclosure is reduced as you remove parts. However, even with parts removed, the 2077-92F 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: 2077-92F

You should become familiar with the external components of the 2077-92F expansion enclosure.

Components on the front of the enclosure

Figure 22 on page 43 shows the front of the 2077-92F expansion enclosure. In the figure, all parts are installed in the enclosure.

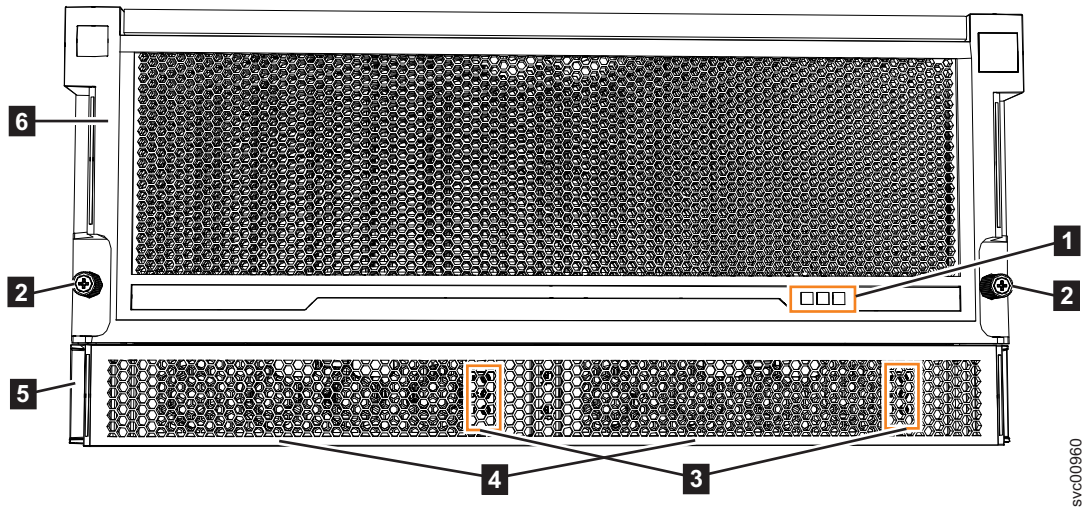


Figure 22. Features on the front of the 2077-92F expansion enclosure

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 23 on page 44 shows, the 4U and 1U fascias are packaged separately. You must attach them to the front of the 2077-92F expansion enclosure as part of the initial installation process.

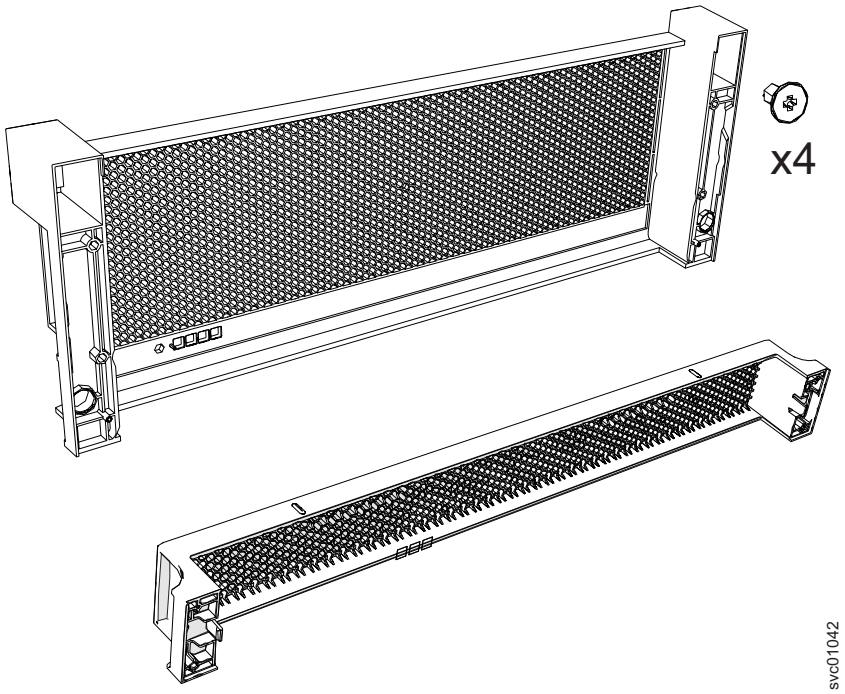


Figure 23. Front fascia of the 2077-92F expansion enclosure

Components on the rear of the enclosure

Figure 24 shows the components on the rear of the 2077-92F expansion enclosure. Four fan modules and two expansion enclosures are accessible from the back of the enclosure.

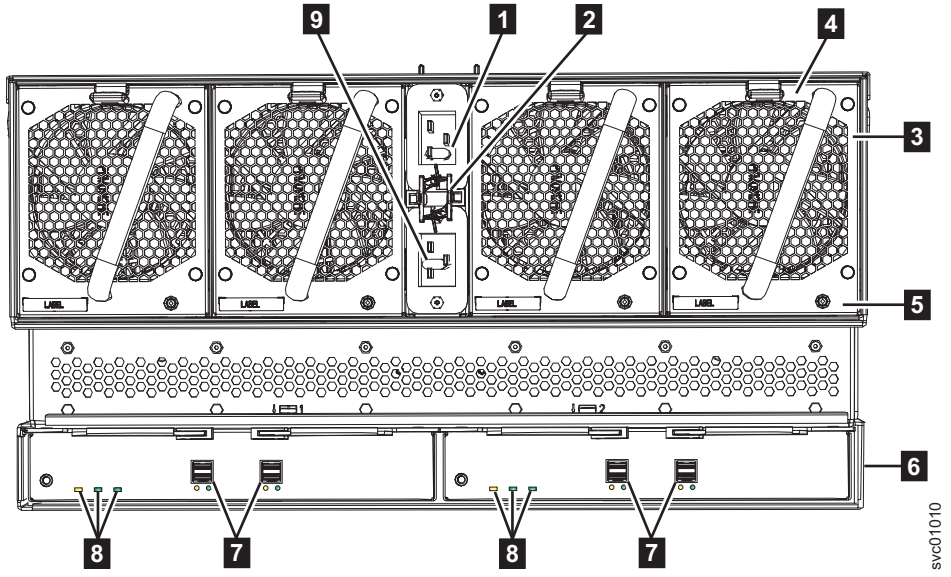


Figure 24. Features on the rear of the 2077-92F expansion enclosure

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 25 shows the support rails for the expansion enclosure. The support rails are packaged separately from the expansion enclosure.

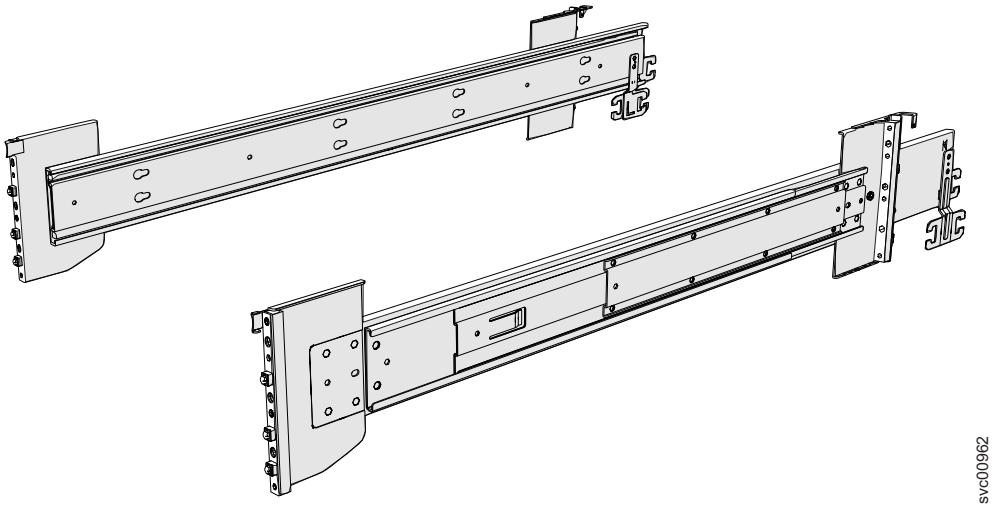


Figure 25. 2077-92F support rails

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 26 on page 46 shows, each CMA assembly is attached to the rear end of the support rails.

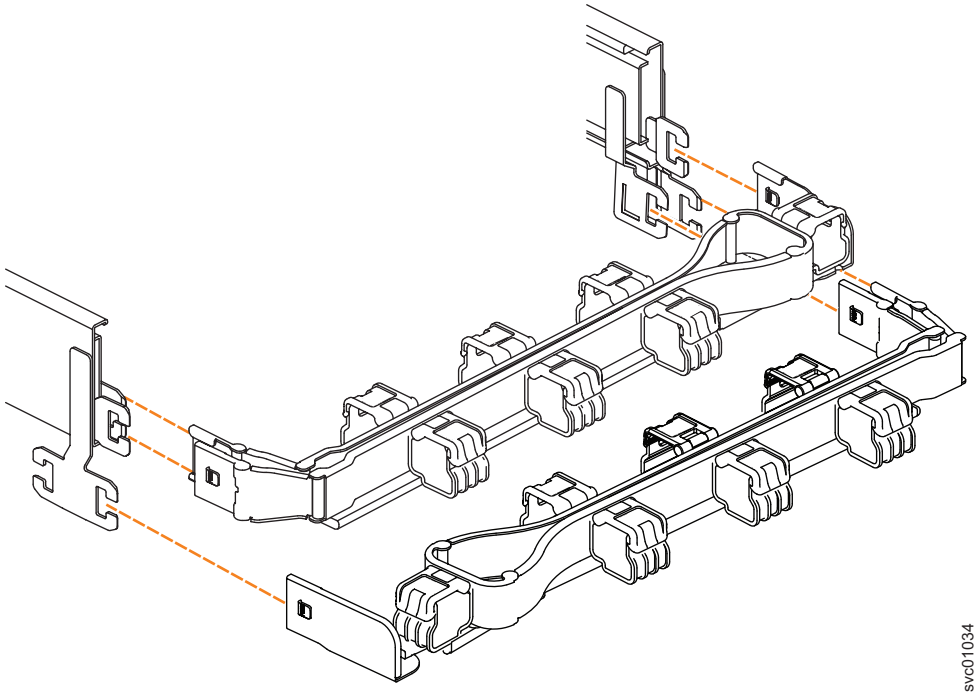


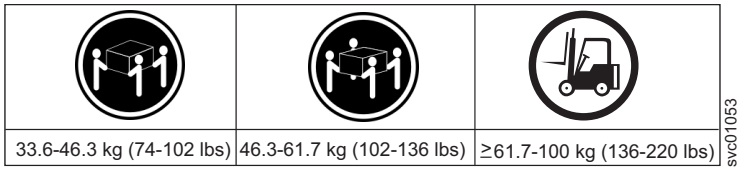
Figure 26. 2077-92F CMA assemblies

Unpacking and installing the enclosure: 2077-92F

Before you unpack and install the 2077-92F expansion enclosure, ensure that you review and follow the installation checklist and safety notices.

Before you begin

CAUTION:



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 2077-92F expansion enclosure and its parts, always perform the following tasks:

- Read and follow the safety notices and instructions, as described in "Safety notices and considerations: 2077-92F" on page 31.
- Read and follow the guidelines that are described in "Weight considerations: 2077-92F" on page 37.

- Ensure that a suitably rated mechanical lift is available to support the weight of the expansion enclosure as it inserted into the rack for installation.

About this task

The 2077-92F expansion enclosure and most parts are shipped together in one large box. A tray on 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 27 shows how the enclosure is packaged for shipment.

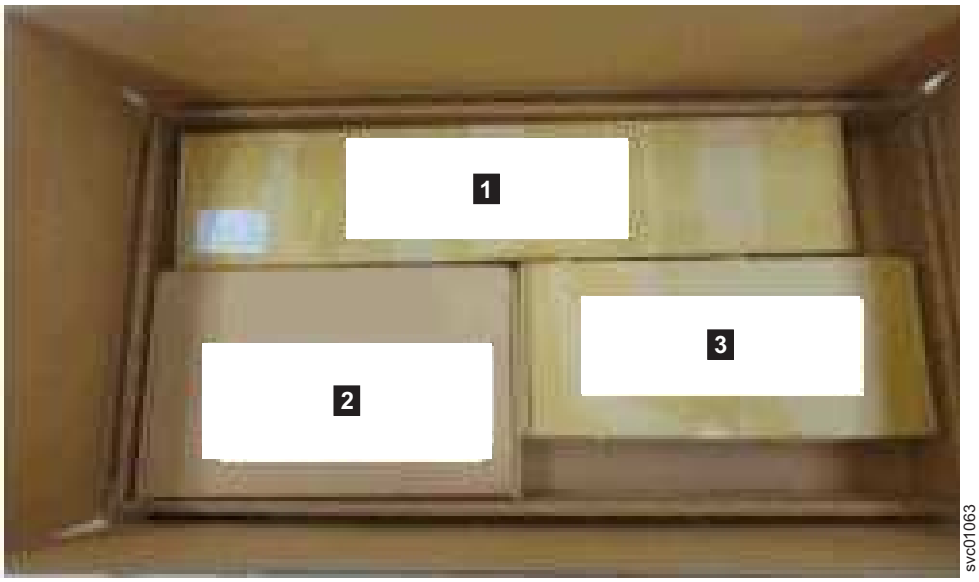


Figure 27. Tray containing expansion enclosure parts

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 2077-92F 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 28 on page 48.

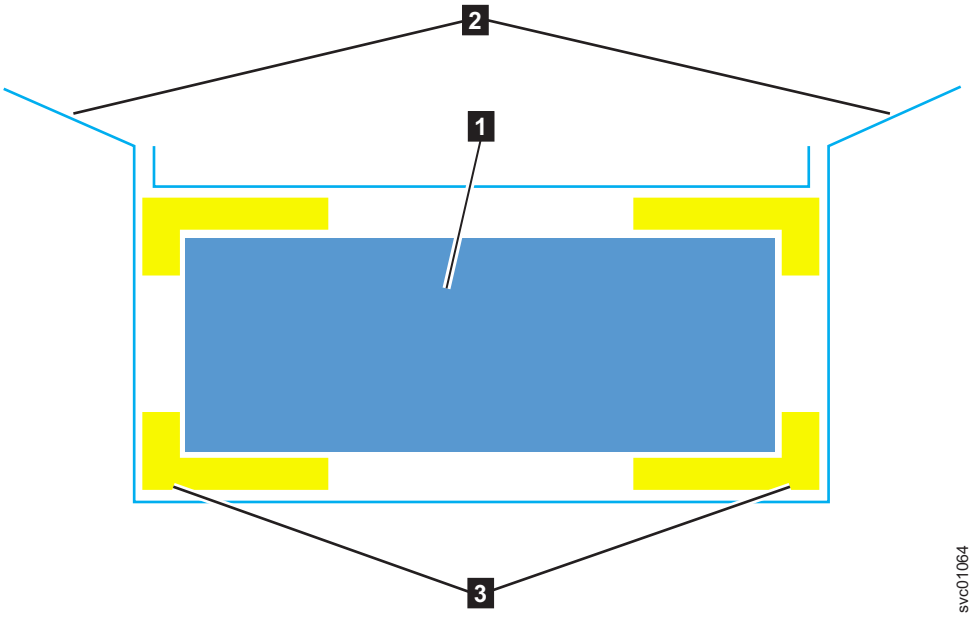


Figure 28. Packaging materials

1 Enclosure
2 Top of shipping box, folded back
3 Foam protectors

4. Remove the top cover, as described in "Removing the top cover: 2077-92F" on page 49.
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 27 on page 47).
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 51 through 5 on page 52 in "Installing or replacing the support rails: 2077-92F" on page 51.
8. Attach the remaining sections of the support rails to the rack, as described in step 6 on page 53 in "Installing or replacing the support rails: 2077-92F" on page 51.
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 60 in "Installing or replacing an expansion enclosure in a rack: 2077-92F" on page 54.
11. Remove the 4U and 1U fascia from the boxes in which they were shipped, as shown in Figure 29 on page 49.

Figure 29. 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: 2077-92F" on page 77.
13. Install the drives, as described in "Installing or replacing a drive: 2077-92F" on page 69.
14. Replace the top cover, as described in "Installing or replacing the top cover: 2077-92F" on page 68.
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 6 on page 61 through 8 on page 61 in "Installing or replacing an expansion enclosure in a rack: 2077-92F" on page 54.
17. Remove the cable management arm assembly from its packaging (**2** in Figure 27 on page 47).
18. Attach the cable management arm, as described in "Installing or replacing the cable-management arm: 2077-92F" on page 63.
19. Connect the SAS cables, as described in "Removing and installing a SAS cable: 2077-92F" on page 85.
20. Connect the power cables.

Removing the top cover: 2077-92F

To perform service tasks, you might need to remove the top cover from a 2077-92F 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. Use the slide rails to pull the enclosure out from the rack. See "Removing an expansion enclosure from a rack: 2077-92F" on page 91 for details.
2. Slide the release latch (**1**) in the direction that is shown in Figure 30.

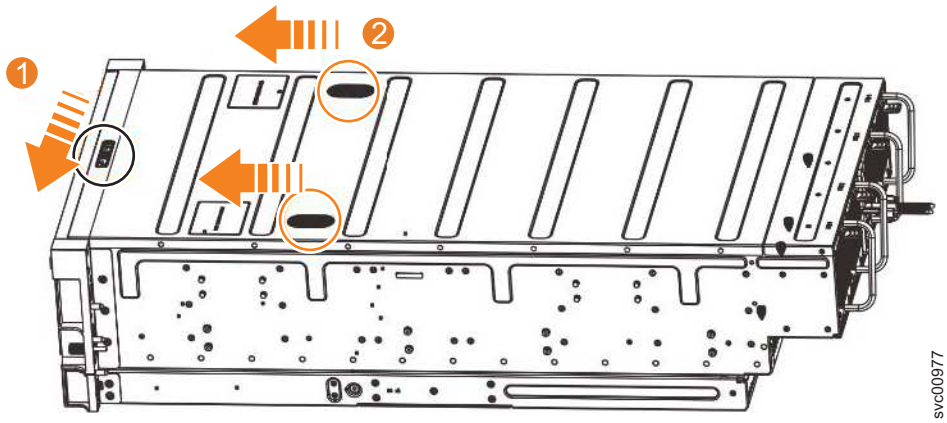


Figure 30. Releasing the 2077-92F cover

3. Slide the cover toward the front of the expansion enclosure (**2**), as shown in Figure 30.
4. Carefully lift the cover up, as shown in Figure 31.

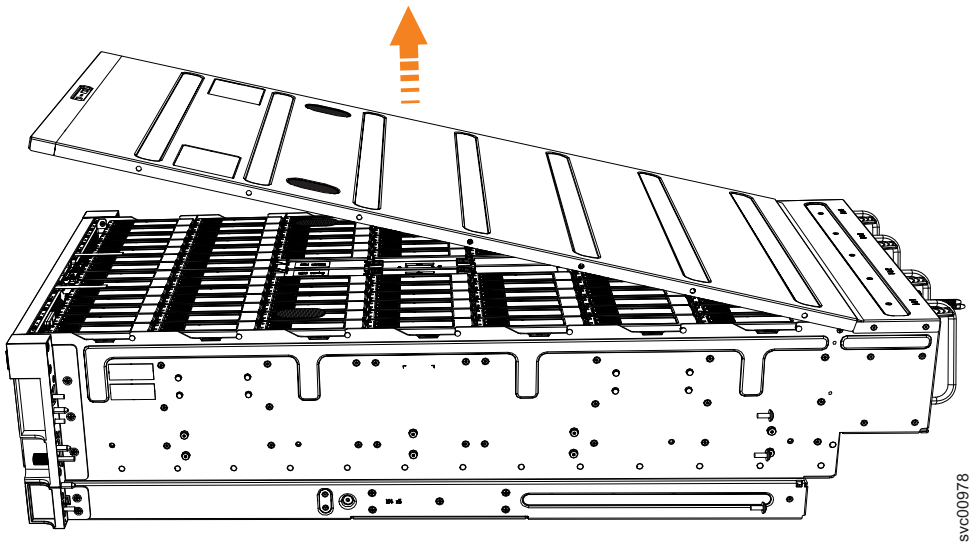


Figure 31. Removing the 2077-92F cover

5. Place the cover in a safe location.

Replace the cover

6. To reinstall the cover, or replace it with one from FRU stock, follow the procedure in "Installing or replacing the top cover: 2077-92F" on page 68.

Installing or replacing the support rails: 2077-92F

You must install the support rails before you can install a 2077-92F 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 32, aside for use later in the installation process.

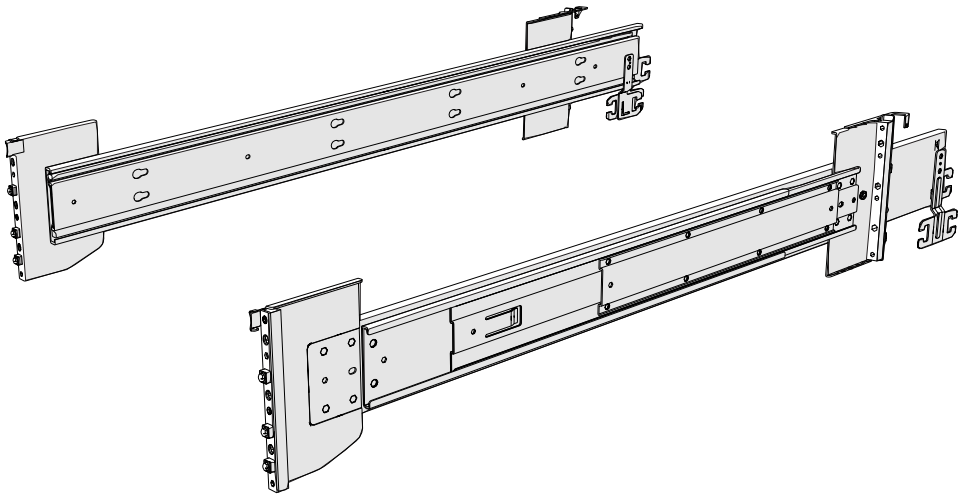


Figure 32. Support rails

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

   Important: 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 33 on page 52.

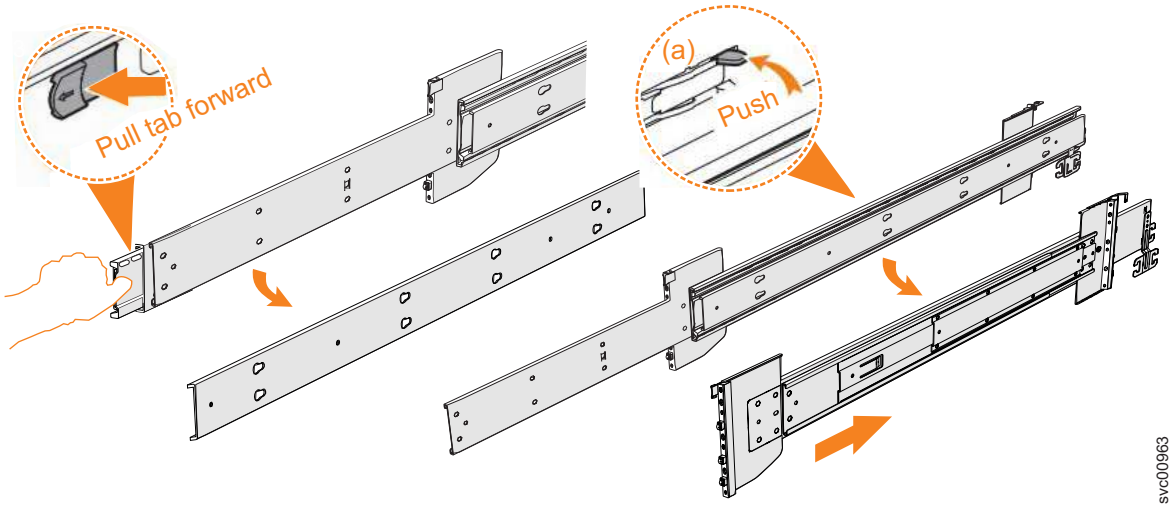


Figure 33. Detaching the inner rail section

4. Use four M4 screws to attach the inner rail to the side of the enclosure. Figure 34 shows the screw locations.

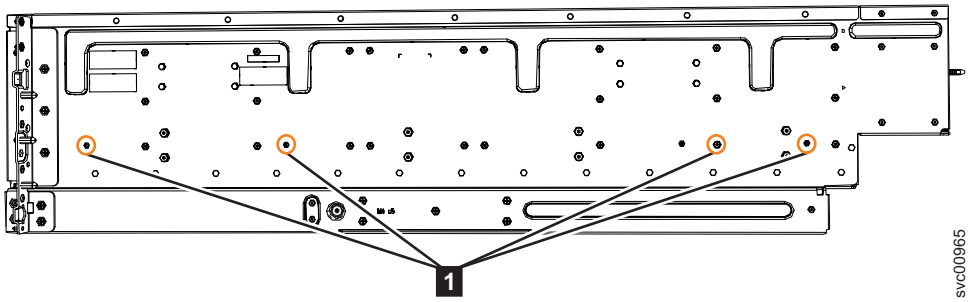


Figure 34. Screw locations to attach the inner rail to the enclosure

5. Install the inner section of the rail onto each side of the expansion enclosure, as shown in Figure 35.

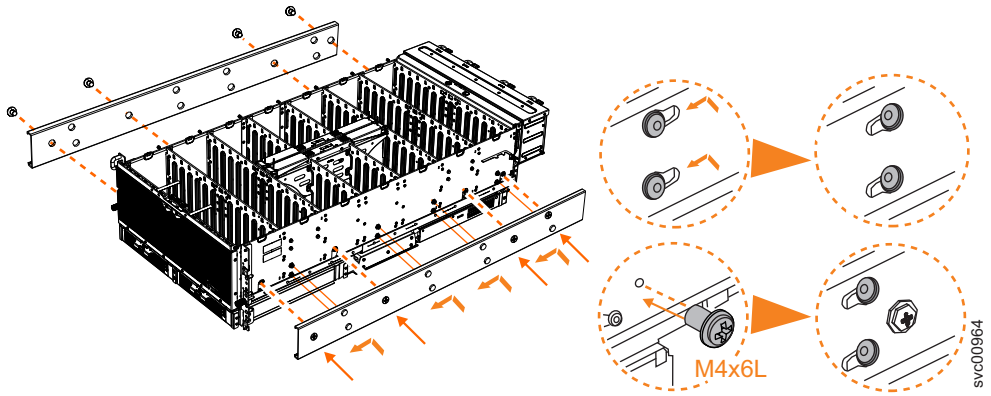


Figure 35. Attaching the inner rail section to the enclosure

6. Use the M5 screws to install the outer rail member and bracket assembly to the rack, as shown in Figure 36.

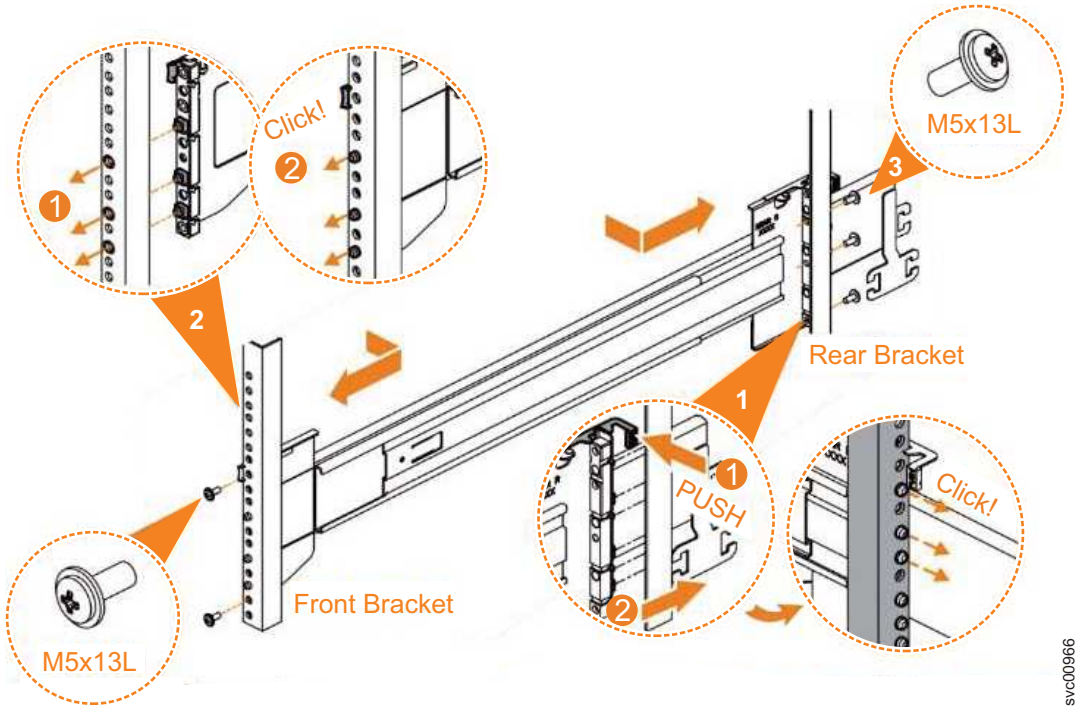


Figure 36. Installing the rail assembly to the rack frame

For example, Figure 37 on page 54 shows the front of the rail attached to the frame.

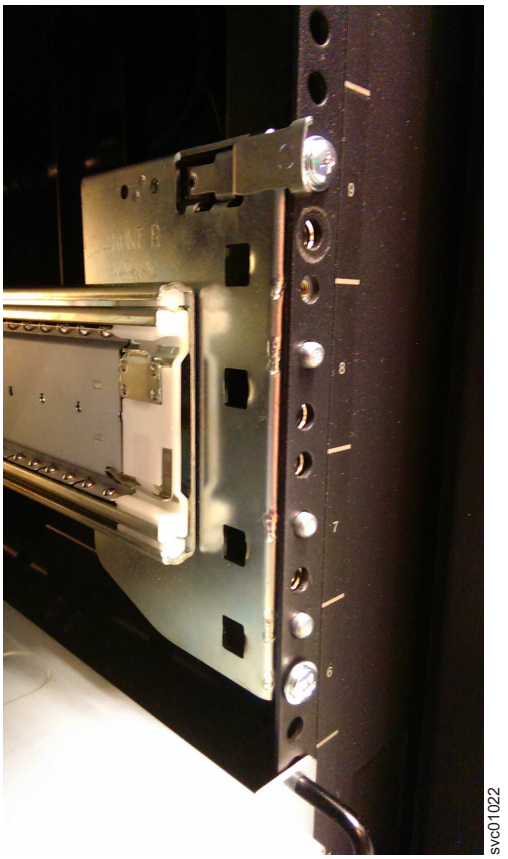


Figure 37. Example of required rack space

7. Repeat steps 5 on page 52 through 6 on page 53 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: 2077-92F."

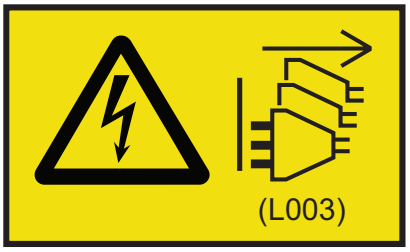
Installing or replacing an expansion enclosure in a rack: 2077-92F

Use the following procedure to place the 2077-92F expansion controller 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.

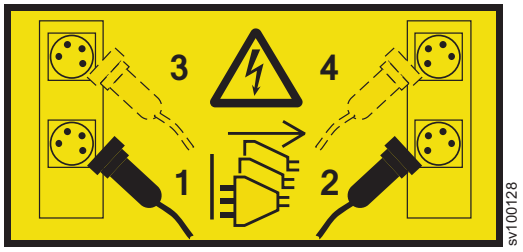
Before you begin

DANGER

Multiple power cords. The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords. (L003)



or



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:

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)**

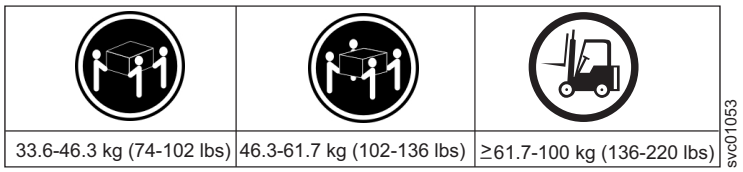
DANGER

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)

CAUTION:



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:
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)

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)

About this task

Important: The 2077-92F 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, perform 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 38 shows an example.

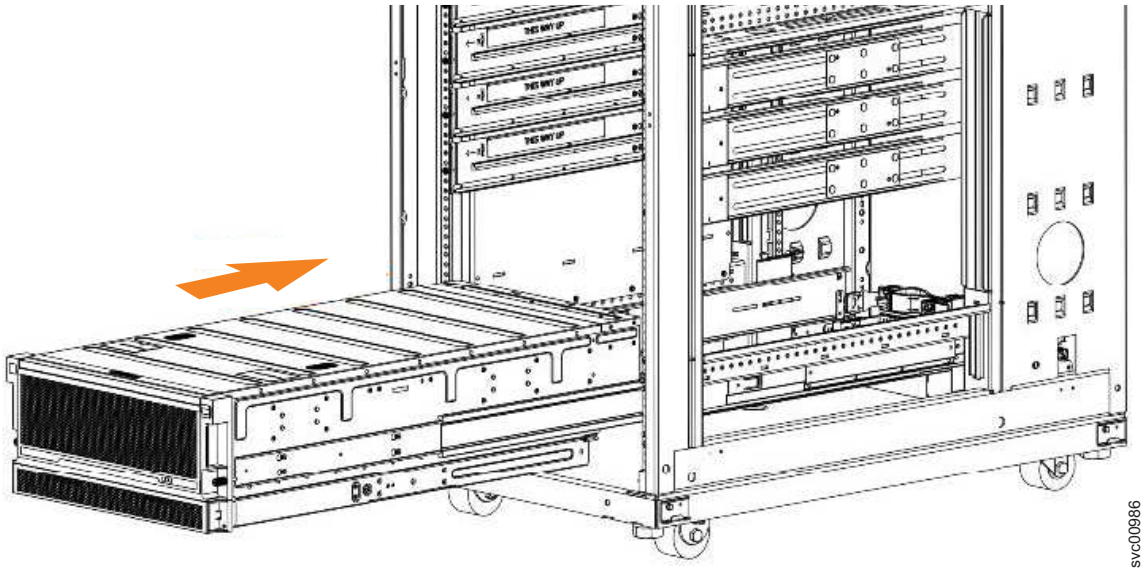


Figure 38. Example installation of the enclosure in the rack

- Ensure that the drives are easily accessible. Avoid installing the 2077-92F expansion enclosure above position 22U in the rack.

If you are reinstalling the expansion enclosure in the rack after you performed a service task (for example, replacing the enclosure), you must also perform the following tasks:

- Reinstall all of the following parts:
  - Cover
  - Drives
  - Fan modules
  - Power supply units and 1U fascia
  - Secondary expansion modules
  - Expansion canisters (and SAS cables)
- Reconnect both power cables to the expansion enclosure.

Procedure

1. Fully extend the left and right drawer sections from the rack to lock the rails in the extended position (**1** in Figure 39 on page 61).

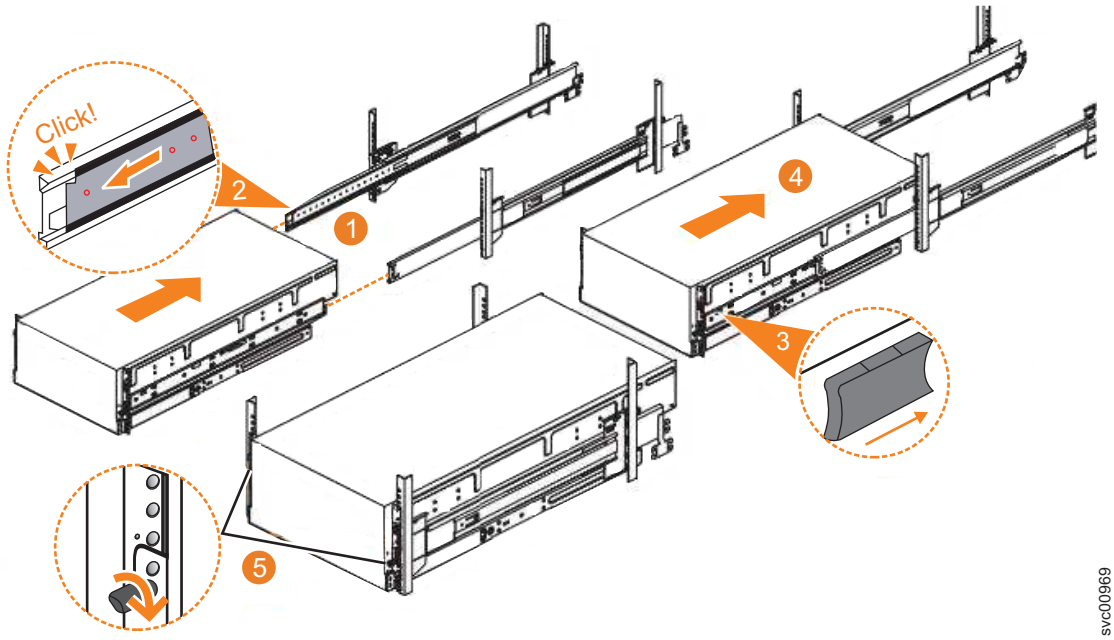


Figure 39. Replacing the 2077-92F enclosure in the rack

2. Ensure that the ball bearing retainer clicks into place inside the front of the left and right drawer sections (**2** in Figure 39).

Reinstalling parts into the enclosure

3. If you took the enclosure out of the rack, reinstall the following parts inside of the enclosure, as described in the following topics. You can reinstall the parts in any order.
   - "Installing or replacing a drive: 2077-92F" on page 69
   - "Installing or replacing a secondary expander module: 2077-92F" on page 74

   Remember: The weight of the enclosure increases as more drives are installed.
4. Replace the top cover, as described in "Installing or replacing the top cover: 2077-92F" on page 68.
5. Reinstall the remaining enclosure parts, as described in the following topics. You can reinstall the parts in any order.
   - "Installing or replacing a power supply: 2077-92F" on page 79 and "Installing or replacing the fascia: 2077-92F" on page 77
   - "Installing or replacing an expansion canister: 2077-92F" on page 62 and "Removing and installing a SAS cable: 2077-92F" on page 85
   - "Installing or replacing a fan module: 2077-92F" on page 87

Sliding the enclosure into the rack

6. 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 39).
7. Push the enclosure firmly into the rack (**4** in Figure 39).
8. Tighten the locking thumb screws (**5** in Figure 39) to secure the enclosure in the rack.
9. Reconnect power to the expansion enclosure.

Installing or replacing an expansion canister: 2077-92F

You can reinstall an expansion canister in a 2077-92F expansion enclosure or replace a faulty expansion canister with one from FRU stock.

Before you begin

Important: You can replace an expansion canister without powering off the expansion enclosure. However, to maintain operating temperature, replace the expansion canister within 10 minutes of its removal. When an expansion canister 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

An expansion canister provides SAS connectivity between the 2077-92F expansion enclosure and Storwize V5000 Gen2 system. The expansion enclosure contains two expansion canisters. Figure 40 shows an example of an expansion canister. If either of the two expansion canisters has a failure, the other expansion canister assumes the full I/O load.

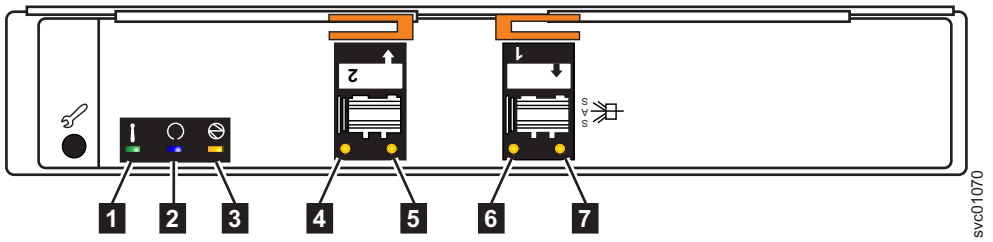


Figure 40. Expansion canister

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

Procedure

1. Disconnect the elbow of the lower cable management arm to swing it out of the way, as shown in Figure 41 on page 63.

   Follow the procedure that is described in Moving the cable management arms.
2. Carefully align the expansion canister with the expansion enclosure.
3. Rotate both the handles outward and insert the expansion canister into the expansion enclosure.
4. When the expansion canister is fully inserted, rotate each handle inward to lock it into position, as shown in Figure 41 on page 63.

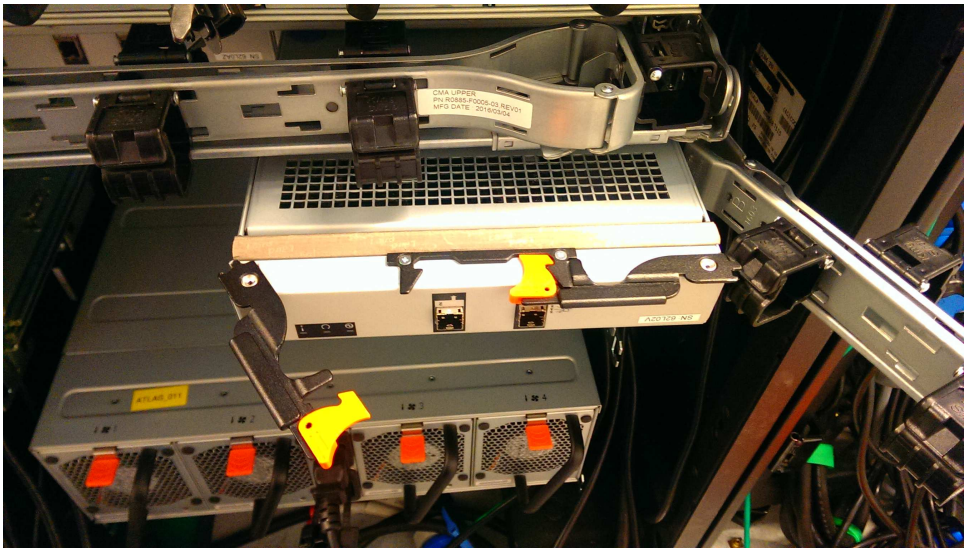


Figure 41. Install the expansion canister

5. Reconnect all the SAS cables to the appropriate SAS ports on the expansion canister, as described in "Removing and installing a SAS cable: 2077-92F" on page 85.
6. Reconnect the elbow of the lower cable management arm to the inner member of the slide rail.

Installing or replacing the cable-management arm: 2077-92F

Use these procedures to install the cable-management arm (CMA) for the 2077-92F expansion enclosure. You can also use these procedure to replace a faulty CMA assembly.

About this task

As part of the initial installation of the 2077-92F 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 42 on page 64 shows.

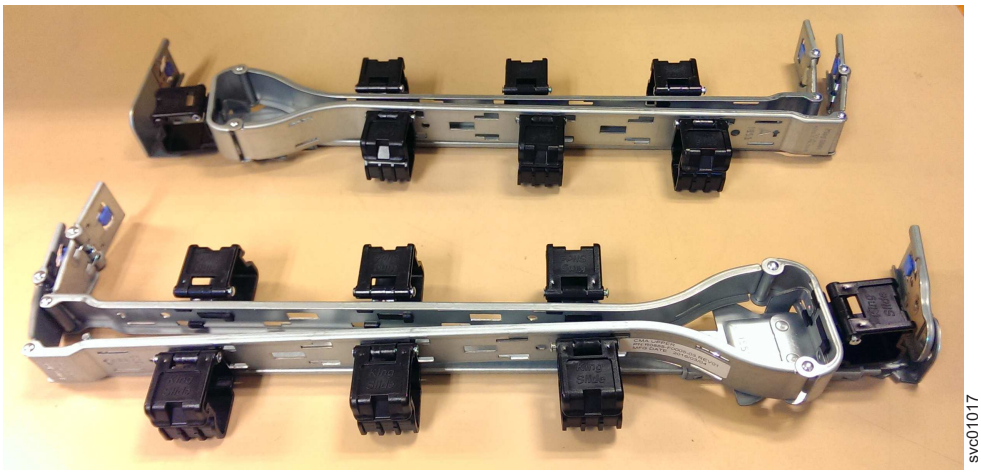


Figure 42. Upper and lower cable-management arms

As Figure 43 shows, the support rail connectors of each CMA assembly are installed on the rail hooks at the end of the support rails.

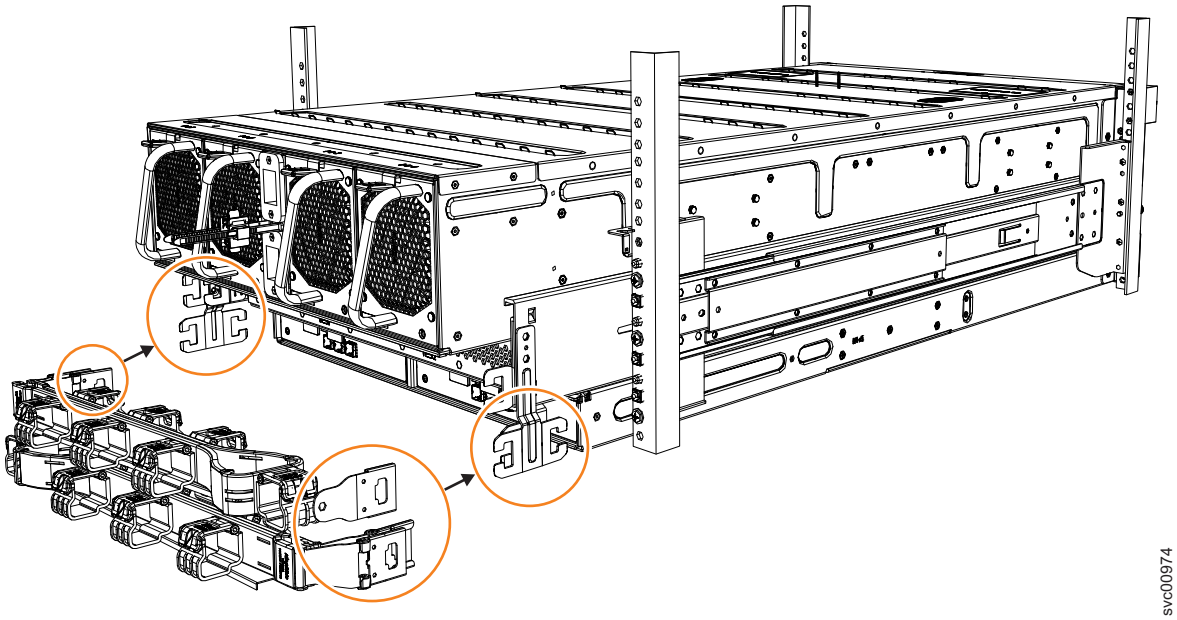


Figure 43. Upper and lower cable-management arms

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 44 on page 65 shows the connectors on the upper CMA assembly.

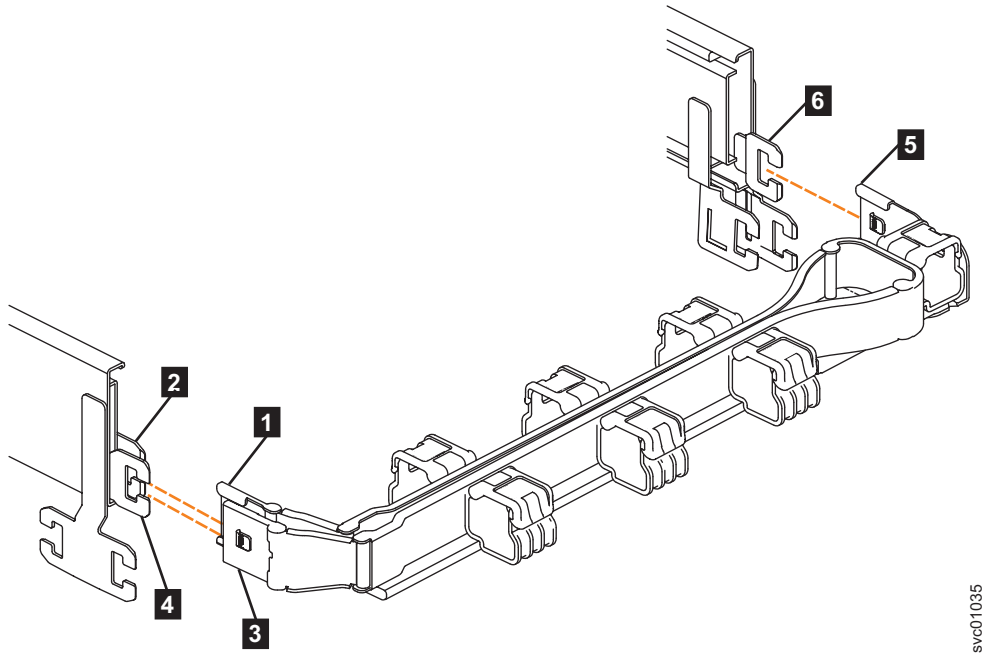


Figure 44. Connectors for the cable management arm

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 45 from the outer and inner support rails.

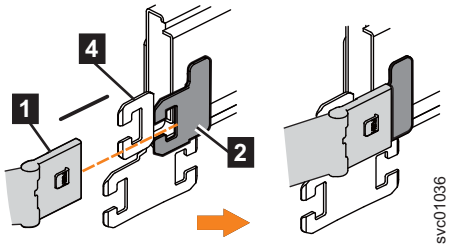


Figure 45. Install the inner connector of the upper CMA to the inner member of the support rail

3. Install the inner connector of the upper CMA assembly (3) to the inner member of the left support rail (4), as shown in Figure 46 on page 66.

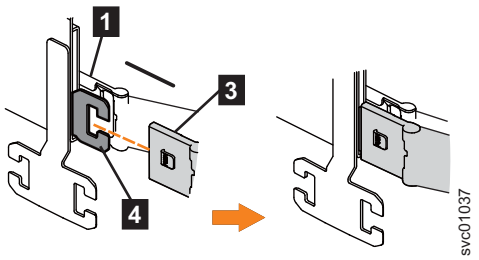


Figure 46. Install the inner connector of the upper CMA to the inner member of the support rail

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 47.

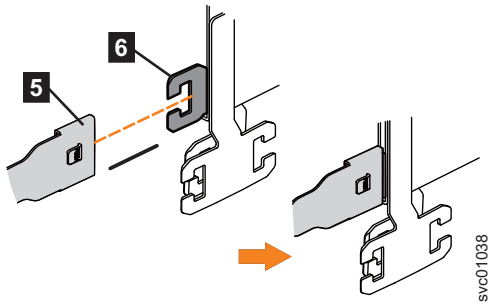


Figure 47. Attach the support rail connector of the upper CMA to the right support rail

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 48 on page 67 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.

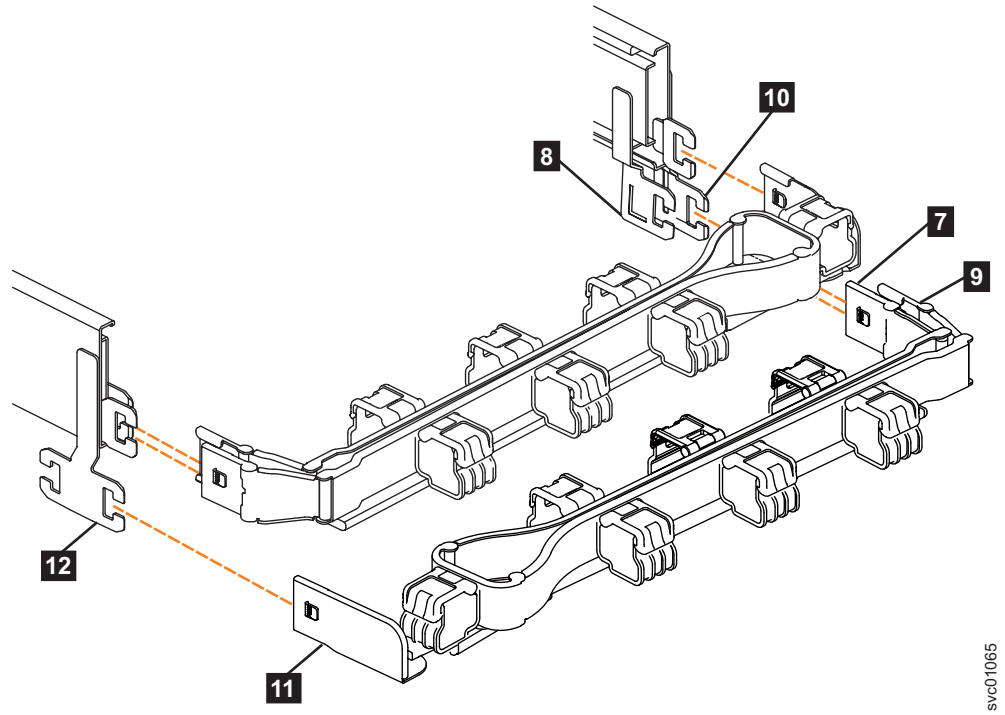


Figure 48. Comparing the location of the components of the CMA assemblies

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 48).
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 48.
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 48. Ensure 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.

Installing or replacing the top cover: 2077-92F

You can replace the top cover on a 2077-92F 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 2077-92F 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 49.

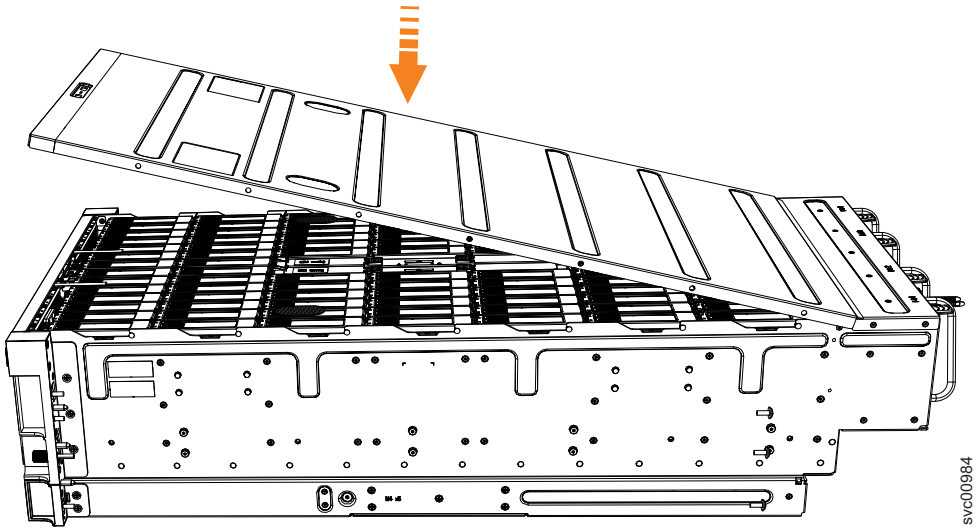


Figure 49. Aligning the 2077-92F top cover

2. Push the cover release lever to the side (**2**) as shown in Figure 50 on page 69.
3. Slide the cover towards the back of the enclosure (**3**) back until it stops, as shown in Figure 50 on page 69.

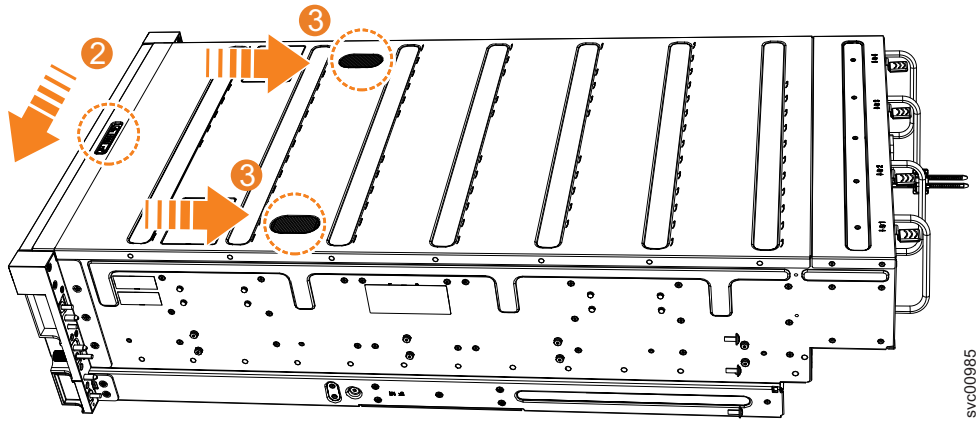


Figure 50. Replacing the 2077-92F top cover

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 51

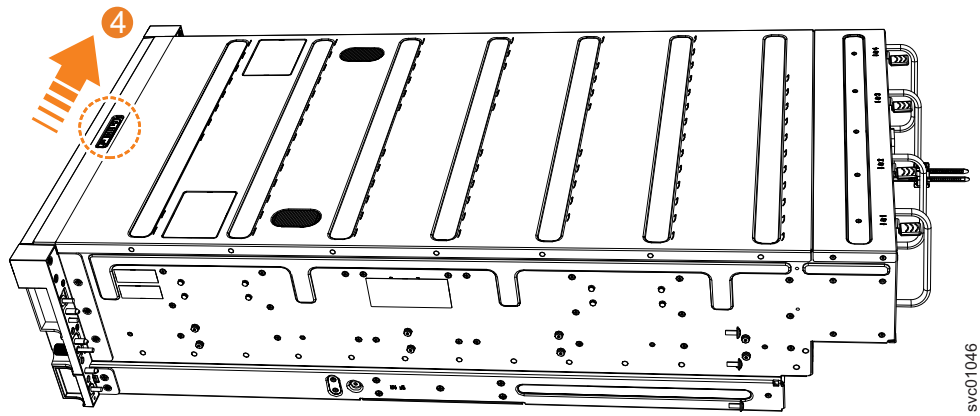


Figure 51. Locking the top cover

Installing or replacing a drive: 2077-92F

Use the following procedure to install a drive for the first time or to replace a faulty drive in a 2077-92F 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 2077-92F expansion enclosure supports 92 drives. Figure 52 shows an example of a drive assembly.

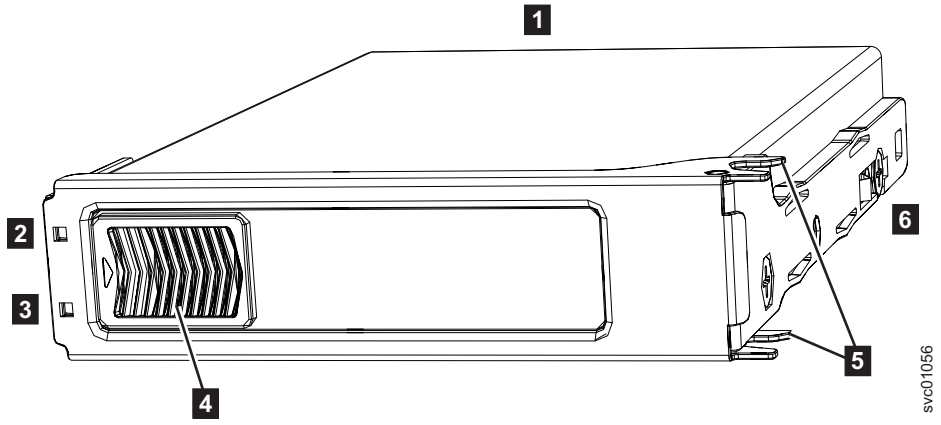


Figure 52. Drive assembly

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

Procedure

1. Read the all available safety information.
2. Carefully slide the expansion enclosure out of the rack, as described in "Removing an expansion enclosure from a rack: 2077-92F" on page 91.
3. Remove the top cover, as described in "Removing the top cover: 2077-92F" on page 49.
4. 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 52). 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 53 on page 71) 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.

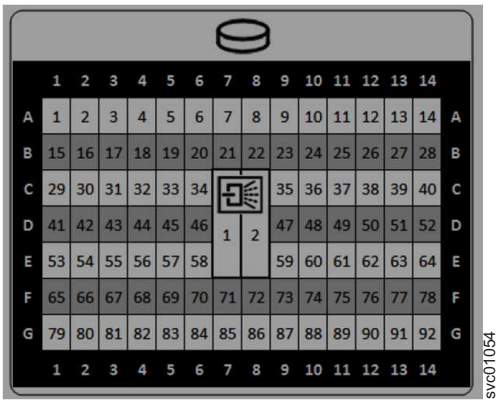


Figure 53. Drive locations in a 2077-92F expansion enclosure

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 54, 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.

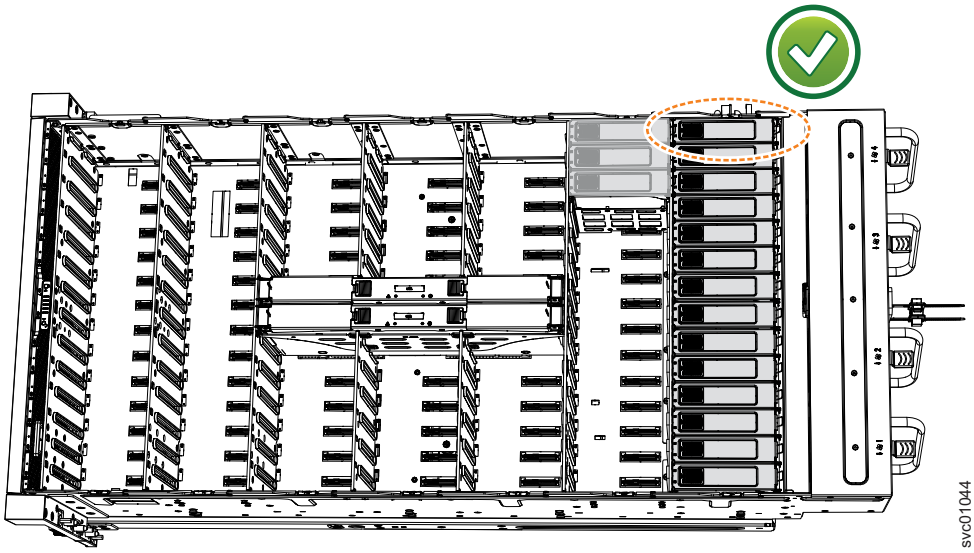


Figure 54. Correct drive installation

In Figure 55 on page 72, 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.

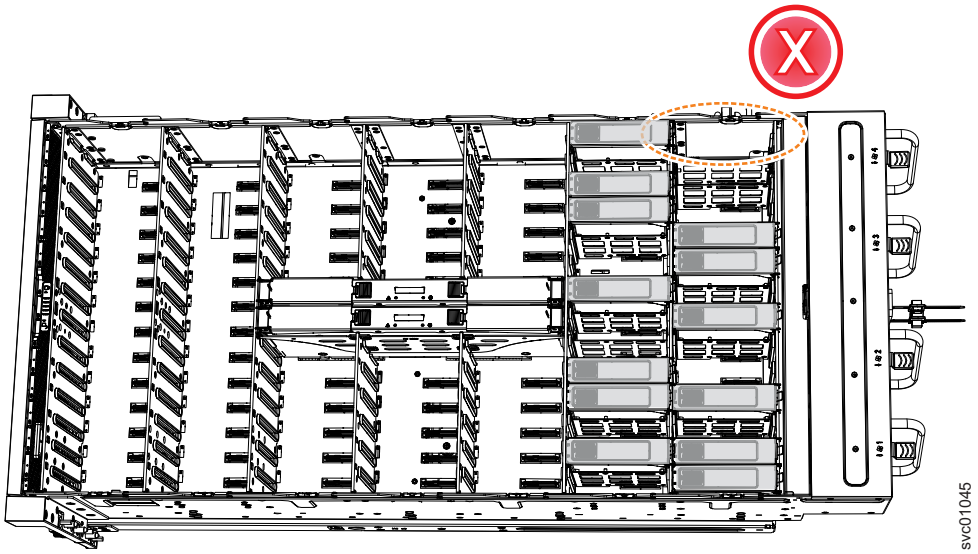


Figure 55. Incorrect drive installation

5. 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.
6. Ensure that the drive handle (**1** in Figure 56 on page 73) of the drive assembly is in the open (unlocked) position.
7. Align the drive carrier into the appropriate drive slot.
8. 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. (**2** in Figure 56 on page 73).

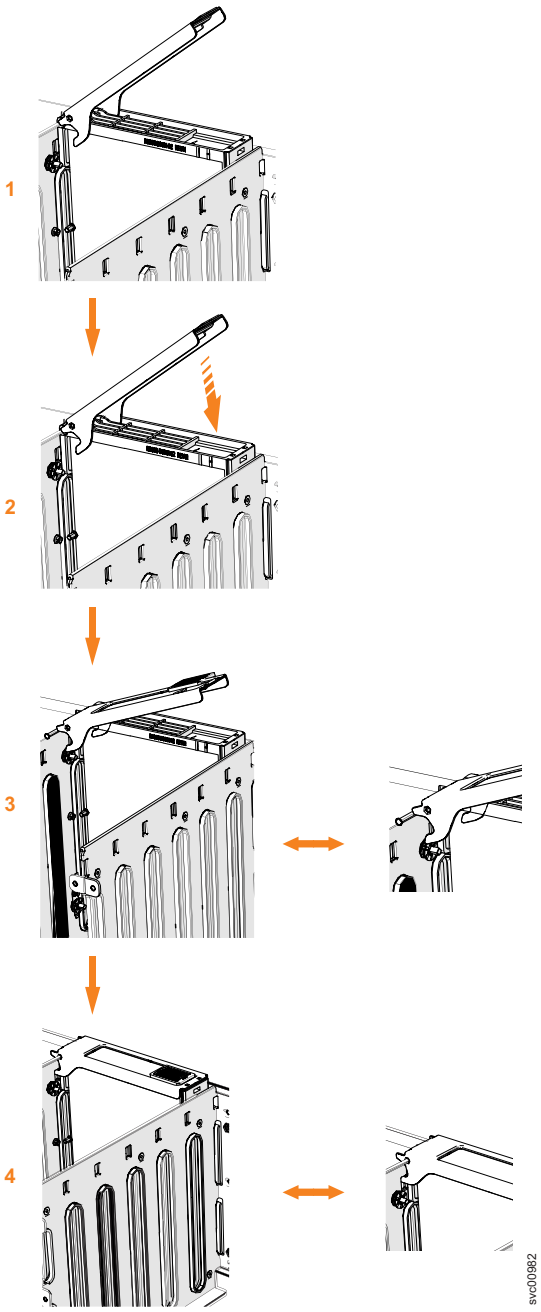


Figure 56. Replace the drive

9. Rotate the handle down to lock the drive assembly into the chassis (**3** in Figure 56).

10. Ensure the toe on the bottom of the latch is fully engaged with the partition in the chassis,
11. Ensure that the top toe of the latch is also fully engaged (4 in Figure 56 on page 73).
12. Repeat steps 5 on page 72 through 11 for each drive you are replacing.
13. Replace the top cover, as described in "Installing or replacing the top cover: 2077-92F" on page 68.
14. Slide the expansion enclosure back into the rack, as described in "Installing or replacing an expansion enclosure in a rack: 2077-92F" on page 54.

Installing or replacing a secondary expander module: 2077-92F

You can replace a faulty secondary expander module in a 2077-92F expansion enclosure. You can also reinstall the secondary expander modules after you perform other service tasks.

Before you begin

DANGER

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

DANGER

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

CAUTION:
Use caution when you are removing or replacing a secondary expander module from an enclosure (01LJ112) that is powered on. Avoid contact with the connectors on the main board. Only an IBM Service Support Representative (SSR) can remove the secondary expander module if the 01LJ112 enclosure is powered.

Important: You can replace a secondary expander module 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.

About this task

The 2077-92F expansion enclosure contains two secondary expander modules, as Figure 57 shows. The secondary expander modules provide SAS connectivity between the expansion canisters and the drives. Each drive has 2 SAS ports. SAS port 1 of each drive is connected to secondary expander module 1. SAS port 2 of each drive is connected to secondary expander module 2. Each expansion canister is connected to both secondary expander module 1 and secondary expander module 2. If secondary expander module 2 is missing or is faulty, the expansion canisters can communicate only with SAS port 1 on each drive. Similarly, if secondary expander module 1 is missing or is faulty, the expansion canisters can communicate only with SAS port 2 on each drive.

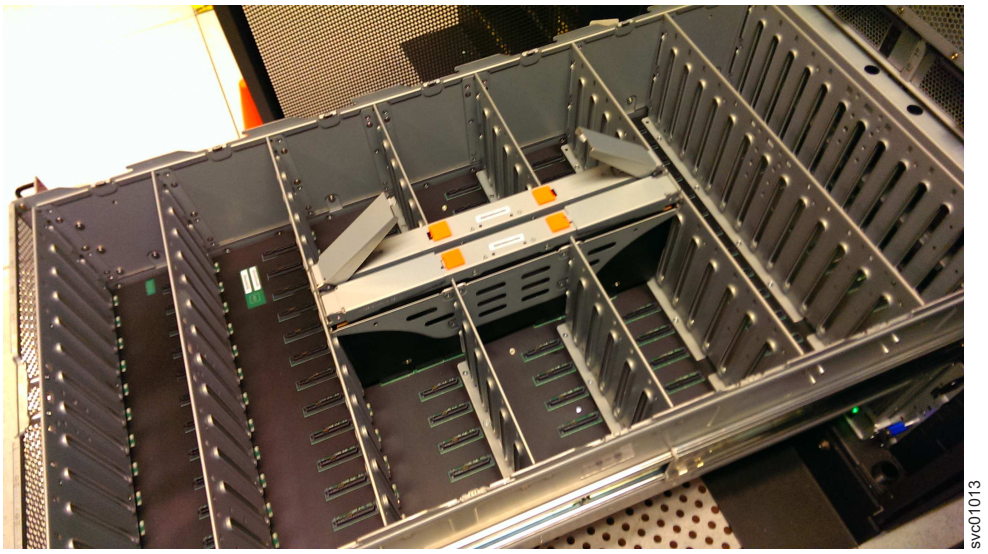


Figure 57. Location of secondary expander modules

This task assumes that the following conditions were met:

- The top cover was removed, as described in "Removing the top cover: 2077-92F" on page 49.
- The secondary expansion module was removed, as described in "Removing a secondary expander module: 2077-92F" on page 104.

Procedure

1. Slide the expansion enclosure out from the rack, as described in "Removing an expansion enclosure from a rack: 2077-92F" on page 91.
2. Identify the secondary expander module to be replaced; Figure 58 on page 76 shows the LEDs on top of a secondary expansion module.

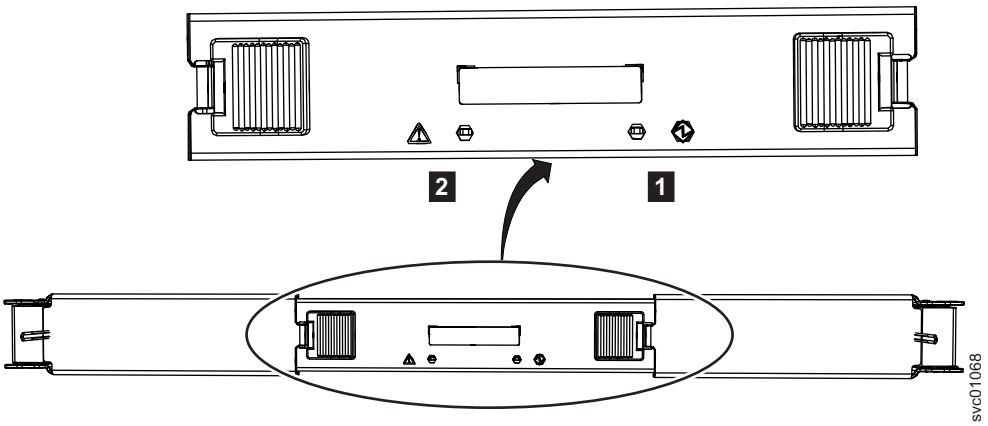


Figure 58. LEDs on a secondary expansion module

1. Online indicator
2. Fault indicator

3. Rotate both handles on the new secondary expander module to an open position, as shown in Figure 59.

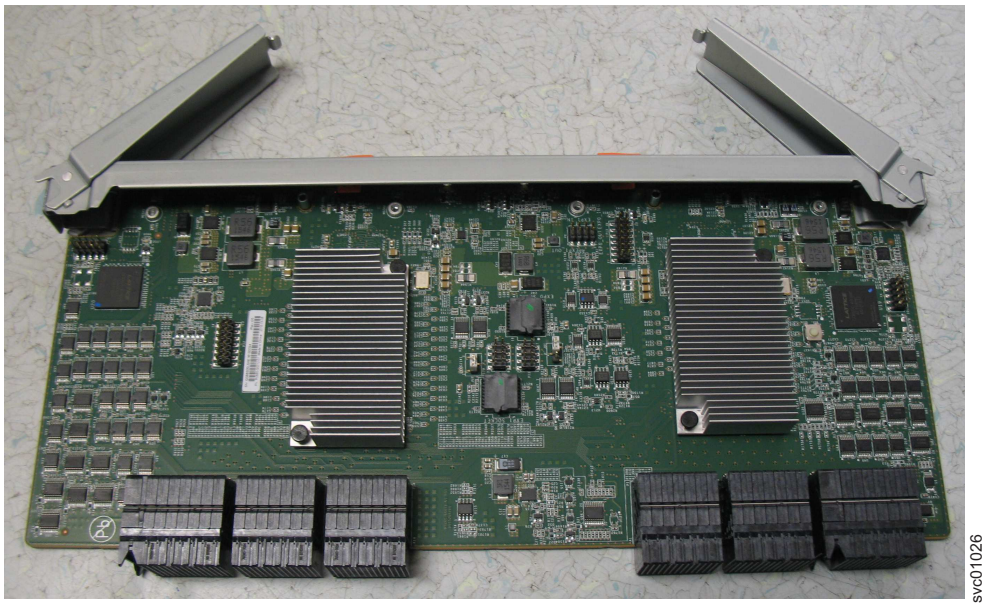


Figure 59. Open the secondary expander module handles

4. Carefully align the edges of the secondary expander module in the guide slot in the enclosure, as shown in Figure 60 on page 77.

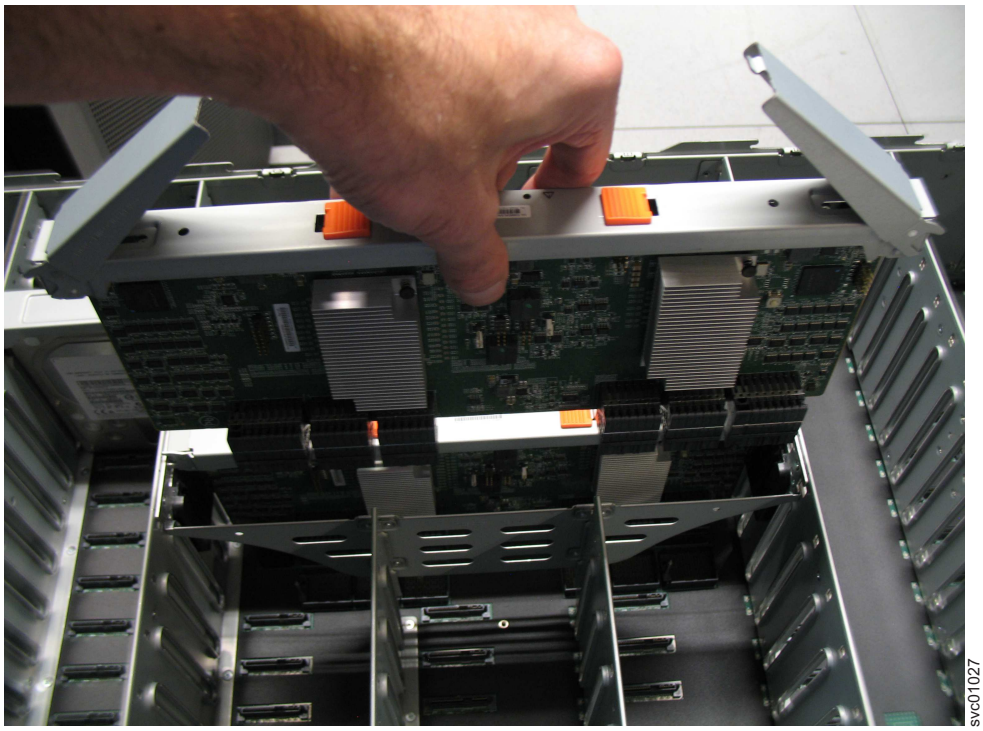


Figure 60. Replace the secondary expander module

5. Press the secondary expander module down into position in the enclosure.
6. Rotate the handles on the secondary expander module to the closed position to lock it in the enclosure.
7. If needed, repeat step 3 on page 76 through step 6 to replace the other secondary expander module.
8. Replace the top cover, as described in "Installing or replacing the top cover: 2077-92F" on page 68.
9. If needed, reconnect the power cables to the expansion enclosure, as described in "Powering on the expansion enclosure: 2077-92F" on page 120.
10. Check the LEDs on the top of the secondary expander module to verify that it is receiving power.

    "Storwize V5000 Gen2 2077-92F expansion enclosure LEDs and indicators" on page 124 describes the status indicated by the LEDs.

Installing or replacing the fascia: 2077-92F

During the initial installation process or after you perform service, you can install the fascia components on the front of a 2077-92F 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 61 on page 78 shows, the fascias are independent; you can remove or replace one without having to remove or replace the other.

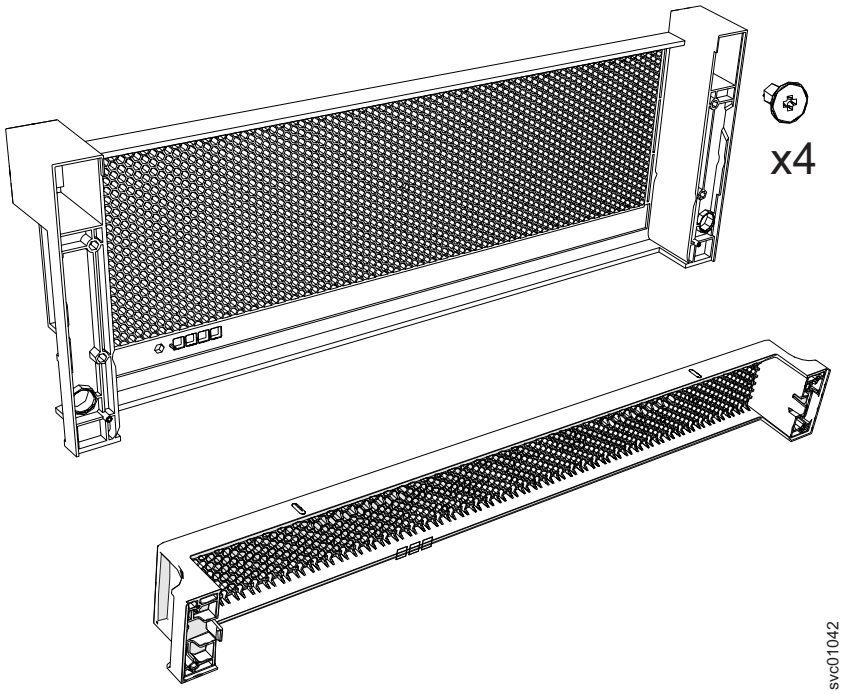


Figure 61. Fascia components on the expansion enclosure

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

1. Use the slide rails to pull the enclosure out of the rack, as described in "Removing an expansion enclosure from a rack: 2077-92F" on page 91.

Attach the front (4U) fascia

2. Align the front 4U fascia with the enclosure so that the thumbscrews go through the holes on each side. As Figure 62 on page 79 shows, this action aligns the screw holes on the back of the fascia with the screw holes on the front flange of the enclosure.
3. 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

4. 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 62 on page 79.

   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.

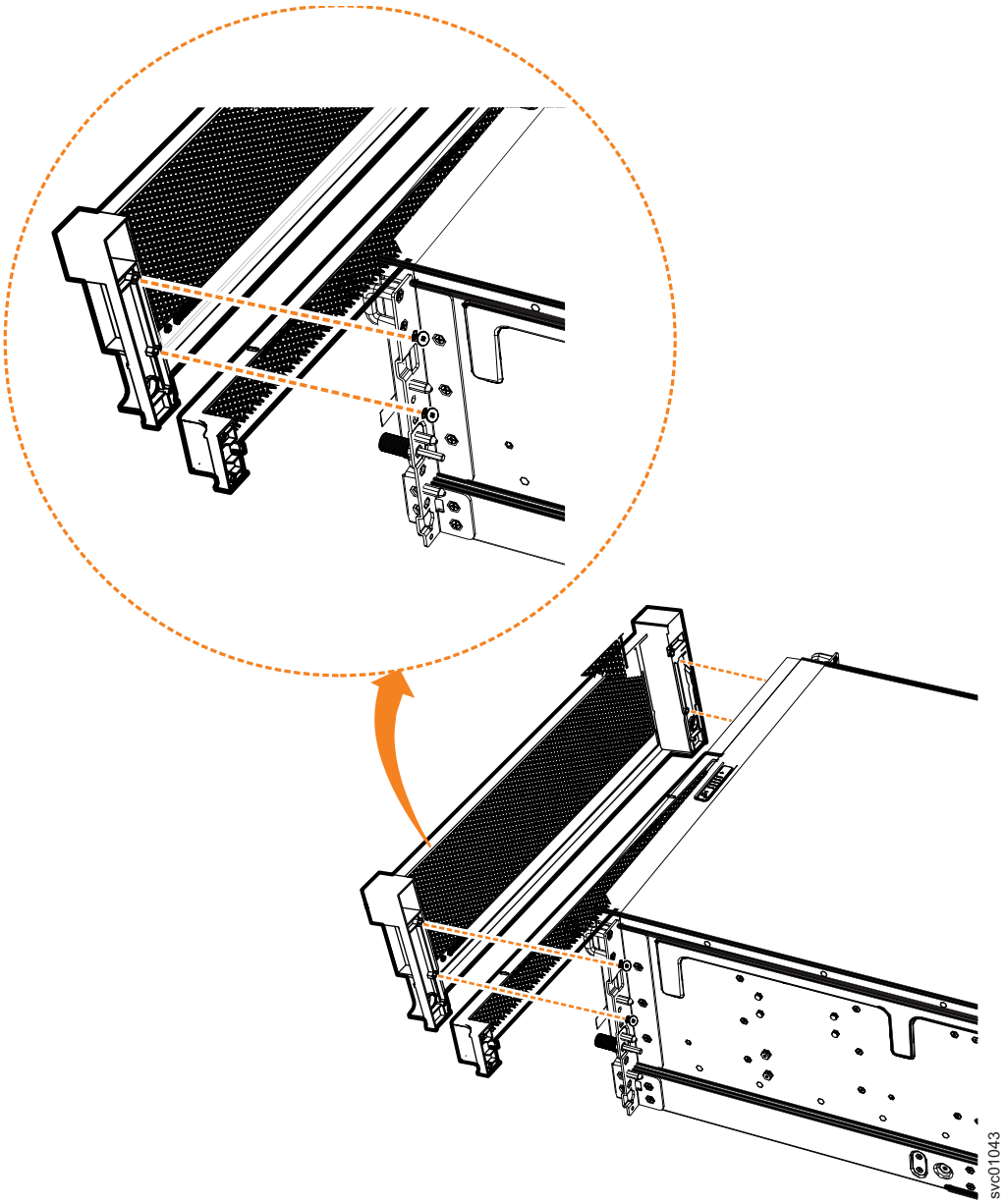


Figure 62. Replace fascia components on the expansion enclosure

Installing or replacing a power supply: 2077-92F

Use the following procedures to replace either of the redundant power supplies in the 2077-92F expansion enclosure. The redundant power supplies operate in parallel; one continues to provide power to the enclosure if the other fails.

Before you begin

Important: You can replace a PSU without powering off the expansion enclosure. However, to maintain operating temperature, replace the PSU within 10 minutes of its removal. When a PSU 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

This task assumes that the following conditions are met:

- You removed the PSU, following the procedure described in “Removing a power supply: 2077-92F” on page 99.
- You removed the fascia that covers the PSU from the front of the expansion enclosure, as described in “Removing the fascia: 2077-92F” on page 82.
- You are aware of the procedures for handling static-sensitive devices.

Procedure

1. Read all safety information.
2. Rotate the handles on the PSU outward, as shown in Figure 63.

Figure 63. Preparing to install the power supply

3. Slide the PSU forward into the chassis until it clicks in to place, as shown in Figure 64 on page 81.

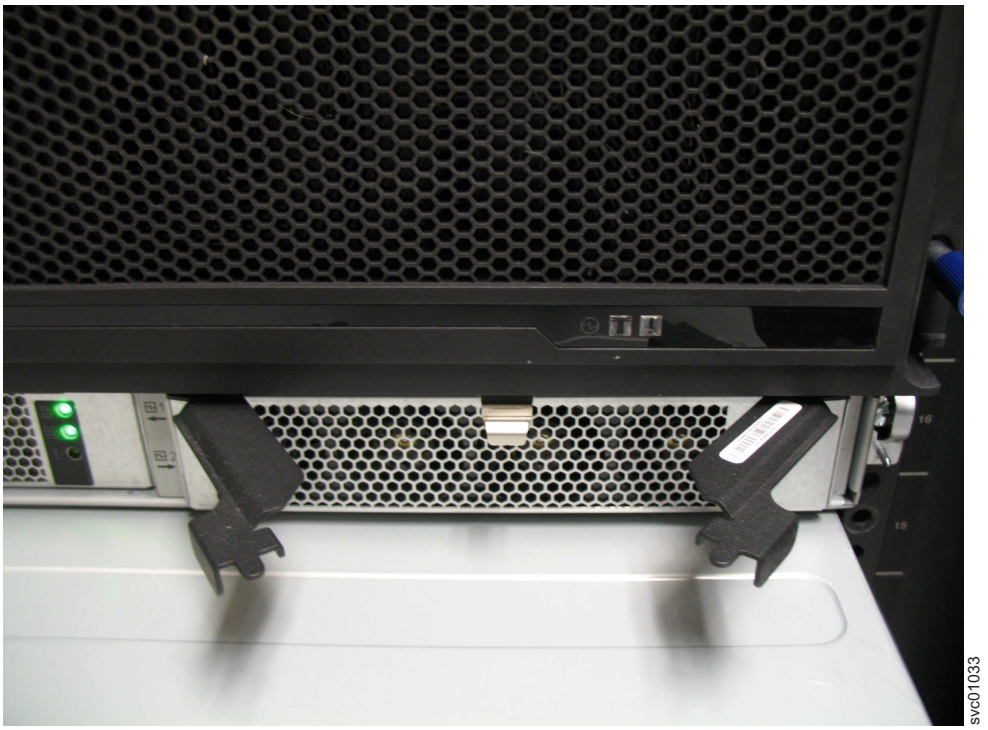


Figure 64. Install the power supply

4. Close the handles on the PSU and ensure the handle lock clicks in to place.
5. Verify that the AC input and the DC power indicators are lit on the front of the PSU, as shown in Figure 65 on page 82.

Figure 65. Power supply indicators

For more information about the power supply indicators, see “Storwize V5000 Gen2 2077-92F expansion enclosure LEDs and indicators” on page 124.

Removing the fascia: 2077-92F

To perform service tasks, you can remove each component of the fascia from the front of a 2077-92F expansion enclosure.

About this task

The expansion enclosure has a 4U front fascia that covers the display panel and a 1U fascia that covers the power supply units (PSUs). As Figure 66 on page 83 shows, the fascias are independent; you can remove or replace one without having to remove or replace the other.

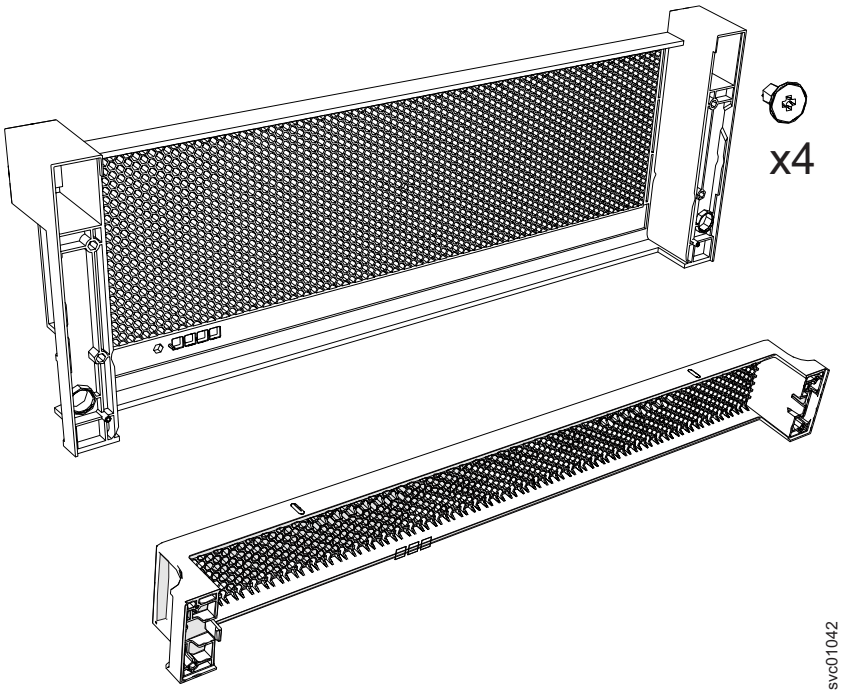


Figure 66. Fascia components on the expansion enclosure

Procedure

1. Use the slide rails to pull the enclosure out of the rack, as described in "Removing an expansion enclosure from a rack: 2077-92F" on page 91. Ensure that a mechanical lift is available to support the weight of the enclosure.

Remove the front (4U) fascia

2. Remove the front fascia by removing the two screws that attach the fascia to the flange on each side of the chassis, as shown in Figure 67 on page 84.

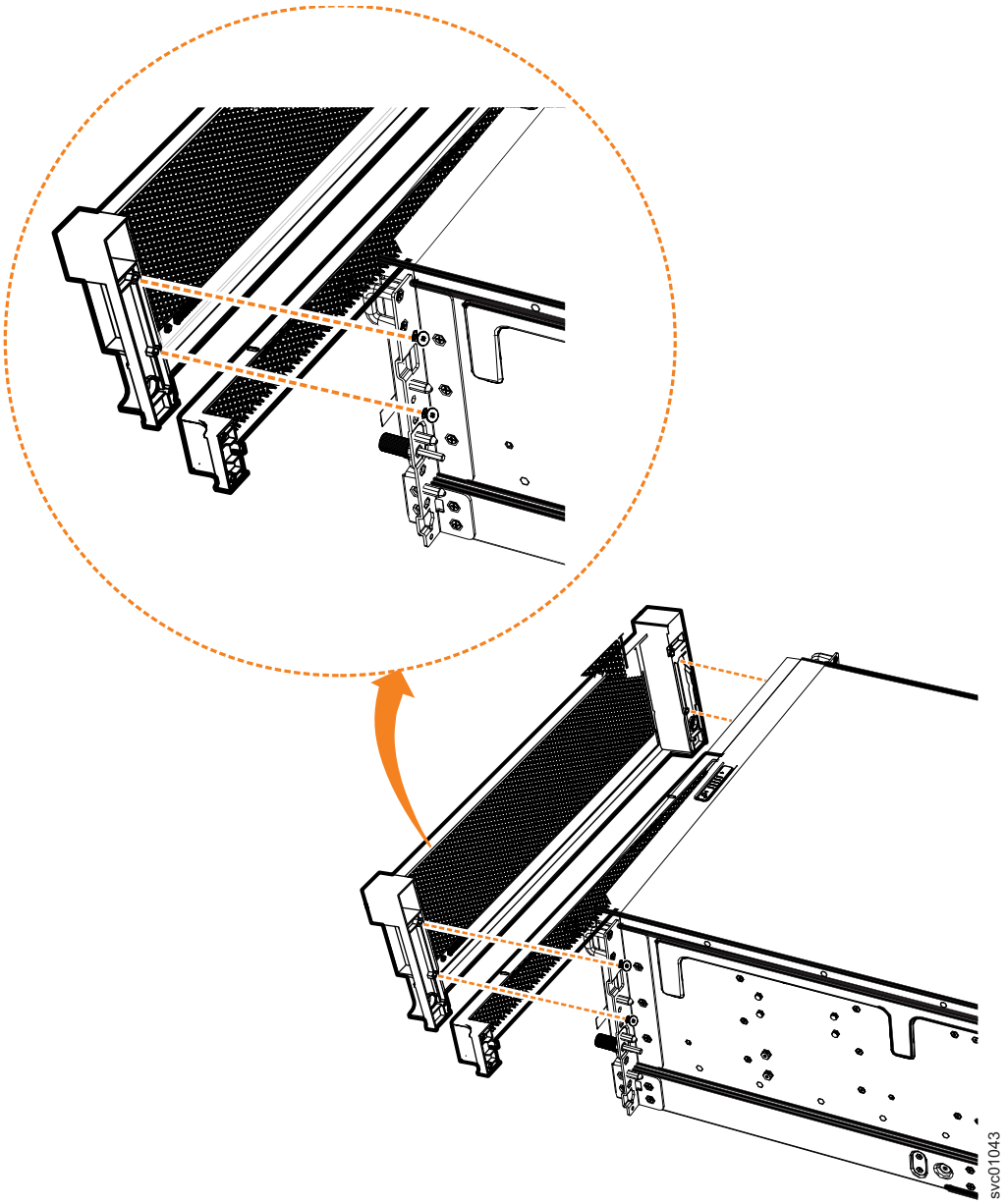


Figure 67. Remove fascia components from the expansion enclosure

Remove the bottom (1U) fascia

3. Gently pull on each side of the PSU fascia to remove it from the chassis, as shown in Figure 67. The PSU fascia will disengage from the slot and pin that connect it to each side of the chassis

   You must remove the bottom fascia to access and service either PSU. However, as Figure 68 on page 85 shows, you do not have to remove the front fascia.

Figure 68. Fascia removed from the PSUs

Replace the fascia

4. To reinstall the front or PSU fascia, or replace them with parts from FRU stock, follow the procedure in "Installing or replacing the fascia: 2077-92F" on page 77.

Removing and installing a SAS cable: 2077-92F

Use the following procedures to attach SAS cables to the 2077-92F enclosure during the initial installation process. You can also 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 2077-92F 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.

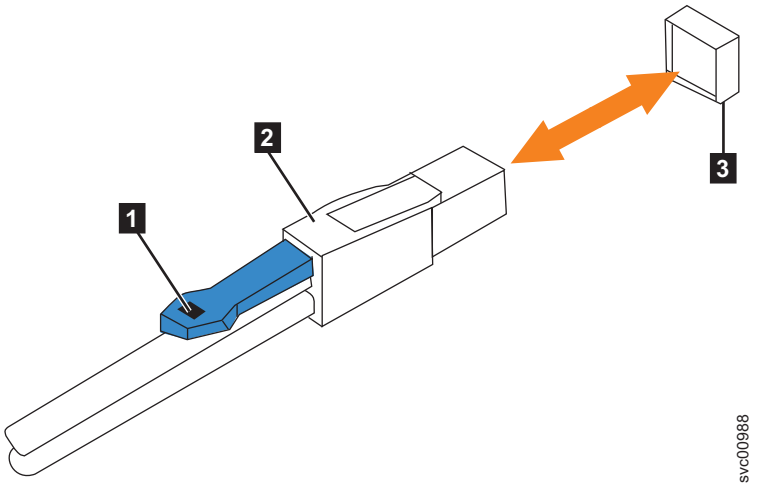
Procedure

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 and 3 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 69. The blue tab must face towards the top of the enclosure canister.



1 Blue pull tab
2 SAS cable
3 SAS port

Figure 69. 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 V5000 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).

   A click is heard or felt when the cable is successfully inserted; you cannot disconnect the cable without pulling on the blue tag.
8. 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 70 on page 87 shows the LEDs of expansion canister 1 on a 2077-92F expansion enclosure. The SAS cable is successfully inserted in to port 1 (input); port 2 (output) does not contain a SAS cable.

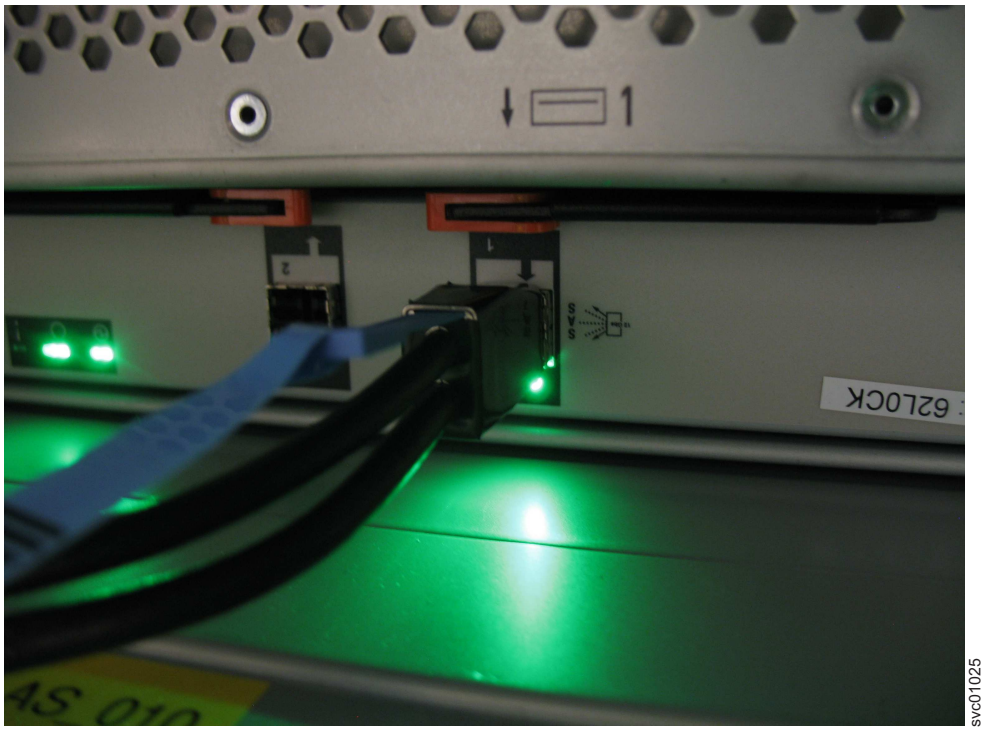


Figure 70. SAS cable correctly inserted into the SAS port

Installing or replacing a fan module: 2077-92F

You can reinstall a fan module or replace a faulty fan module in a 2077-92F expansion enclosure.

Before you begin

Important: You can replace a fan module without powering off the expansion enclosure. However, to maintain operating temperature, replace the fan module within 10 minutes of its removal. When a fan module 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

The expansion enclosure might or might not be powered on, depending on the number of fan modules that need to be replaced. For example, the expansion enclosure must be powered off if all four fan modules are removed. If you are removing the expansion enclosure from the rack, you must remove all of the fan modules.

This task assumes that the following condition was met:

- You have removed a fan module, following the process described in "Removing a fan module: 2077-92F" on page 110.

Procedure

1. Hold the fan module with the release tab on top and the connector pin on the bottom, as shown in Figure 71.

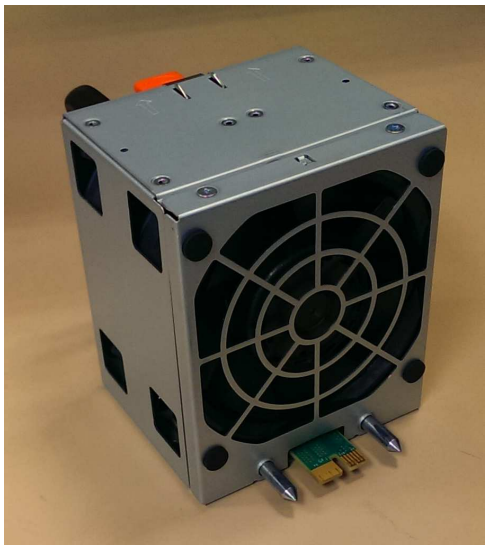


Figure 71. Fan module orientation

2. Carefully insert the fan module into the chassis until it clicks in place, as shown in Figure 72.

Replacing all fan modules

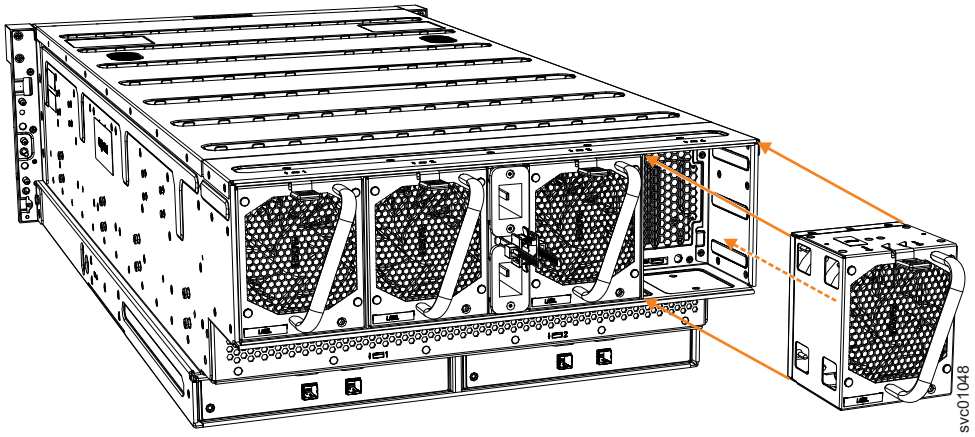


Figure 72. Replace fan module

3. Repeat steps 1 and 2 for each fan module to be replaced.
4. Power on the expansion enclosure.

Installing or replacing a fan interface board: 2077-92F

You can replace a fan interface board (FIB) in a 2077-92F expansion enclosure.

Before you begin

This task assumes that the following conditions are met:

- You have removed the fan interface board, following the process described in "Removing a fan interface board: 2077-92F" on page 112.
- All power cables were removed from the enclosure, as described in "Powering off the expansion enclosure: 2077-92F" on page 123.
- The expansion enclosure is removed from the rack, as described in "Removing an expansion enclosure from a rack: 2077-92F" on page 91.
- A lift is supporting the weight of the enclosure.
- The top cover, fans, drives, and other heavy FRUs are removed from the enclosure.

About this task

The 2077-92F expansion enclosure contains two fan interface boards (FIBs). The FIBs act as the interface between the fans and the system drive board. FIB 1 connects fan modules 1 and 2 to the drive board; FIB 2 connects fan modules 3 and 4. If the fault LED on each fan module is lit, it is possible that the FIB that controls those modules needs to be replaced. You can also issue the **lsenclosurefanmodule** command to display the status of the fans.

If you removed the FIBs from a faulty expansion enclosure, you must reinstall them in the replacement enclosure. Refer to the procedure described in "Replacing an enclosure: 2077-92F" on page 115.

Procedure

1. Assemble the new FIB, cover, and the cover screws (shown in Figure 73) in a safe location.

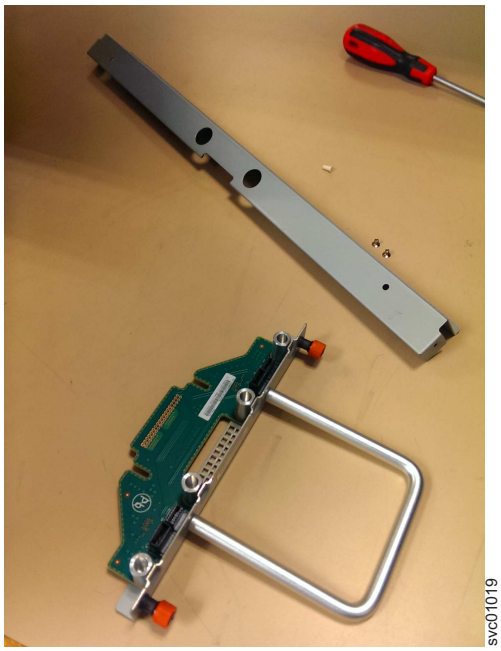


Figure 73. FIB parts for the chassis

2. Carefully insert the new FIB into the expansion enclosure chassis, as shown in Figure 74 on page 90.

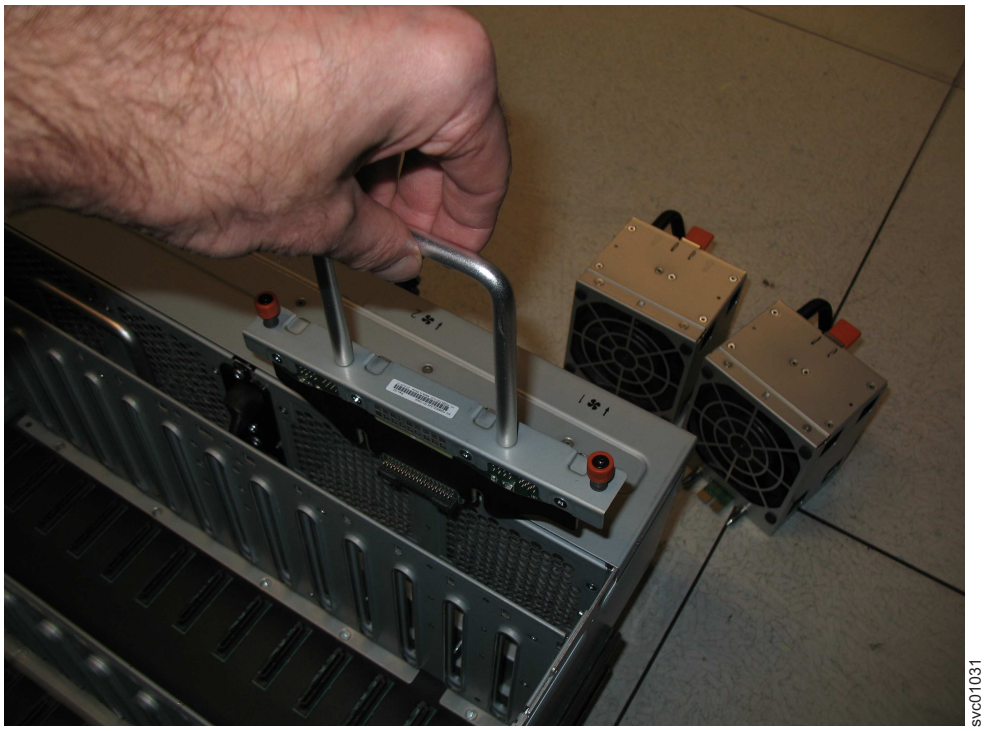


Figure 74. Insert the new FIB in the chassis

3. Use a cross head screwdriver to tighten the retaining screws that secure the FIB to the drive board, as shown in Figure 75.

Figure 75. Secure the FIB to the drive board

4. If needed, repeat steps 2 on page 89and 3 on page 90 to replace the other FIB.
5. Replace each of the fan modules. Follow the procedure that is described in "Installing or replacing a fan module: 2077-92F" on page 87.
6. Replace the narrow metal cover, which is shown in Figure 76, over the FIB assemblies. The attachment screws are on each side of the chassis.

Figure 76. Replace the FIB cover

7. Replace the drives, secondary expander modules, and other heavy FRUs that were removed before the enclosure was removed from the rack.
8. Replace the top cover, as described in "Installing or replacing the top cover: 2077-92F" on page 68.
9. Reconnect power to the enclosure, as described in "Powering on the expansion enclosure: 2077-92F" on page 120.

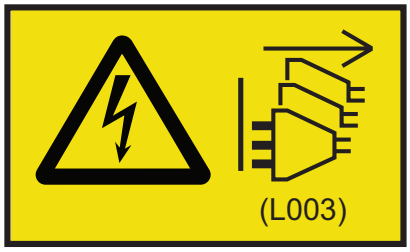
Removing an expansion enclosure from a rack: 2077-92F

You might need to slide the 2077-92F expansion enclosure out of the rack to apply service. For some tasks, you might need to completely remove the expansion enclosure from the rack.

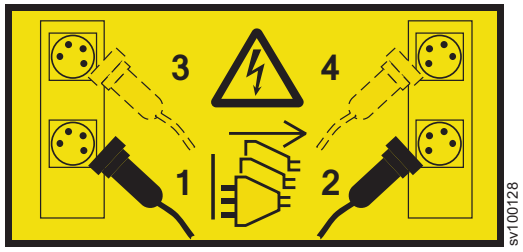
Before you begin

DANGER

Multiple power cords. The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords. (L003)



or

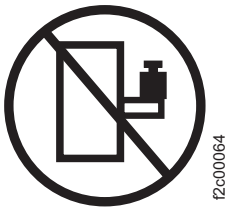


Use the reference numbers in parentheses at the end of each notice (for example, D005) to find the matching translated notice in *IBM Systems Safety Notices*.

DANGER:

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:

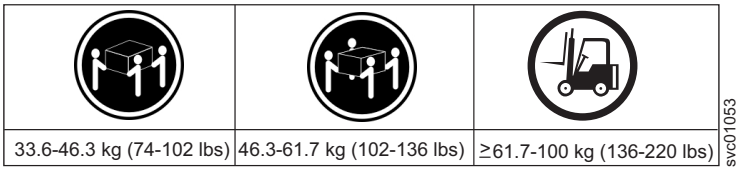
Main Protective Earth (Ground):

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)

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)

CAUTION:



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)**

About this task

To perform some service tasks, you might need to slide the enclosure out of the rack to gain access to parts. For these tasks, you do not have to completely remove the enclosure from the rack. However, in limited circumstances, you must remove the enclosure out of the rack.

Important:

The 2077-92F expansion enclosure is heavy. Always use a suitably rated mechanical lift or four persons to support the weight of the enclosure whenever you slide the enclosure out from the rack or remove it completely.

In addition to using a mechanical lift, always perform the following tasks before you attempt to remove the expansion enclosure from the rack:

- Remove both power cables from the expansion enclosure.
- Remove all of the following parts:
  - Cover
  - Drives
  - Fan modules
  - Power supply units and 1U fascia
  - Secondary expansion modules
  - Expansion canisters and SAS cables

  When the enclosure is not secured to the rails in a rack, you can minimize the risk of injury and make maneuvering the enclosure on a lift easier. However,

even after you remove the drives, power supply units, secondary expander modules, canisters, fans, and cover, the enclosure weighs 43 kg (95 lbs).

Procedure

Sliding the expansion enclosure out of the rack

Note: You can accomplish most service actions when the expansion enclosure is fully extended from the rack on its slide rails.

1. Loosen the locking thumb screws (**1**) on the front of the enclosure, as shown in Figure 77.

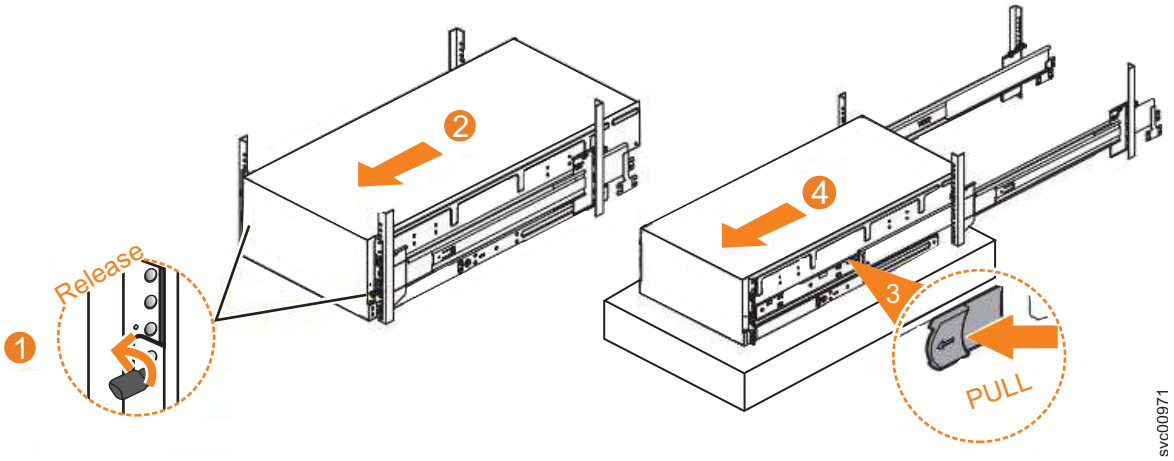


Figure 77. Removing the 2077-92F enclosure from the rack

2. Carefully slide the enclosure forward out of the rack (**2**), as shown in Figure 77.
3. Locate the left and right blue release tabs near the front of the enclosure. Pull both release tabs forward to unlock the drawer mechanism (**3** in Figure 77).
4. Slide the enclosure and inner rail member out of the rack (**4** in Figure 77).

   For safety, ensure a mechanical lift or other mechanism is available to support the weight of the enclosure.

Removing the expansion enclosure from the rack

Note: Continue the procedure (step 5 through step 7 on page 99) only if you must completely remove the expansion enclosure from the rack to perform a service procedure.

5. Power down the expansion enclosure and disconnect all power cords.
6. Remove all of the following parts from the enclosure, as described in the following procedures:
   - "Removing the top cover: 2077-92F" on page 49
   - "Removing the fascia: 2077-92F" on page 82 (for the PSU fascia) and "Removing a power supply: 2077-92F" on page 99
   - "Removing a drive: 2077-92F" on page 101
   - "Removing a secondary expander module: 2077-92F" on page 104
   - "Removing an expansion canister: 2077-92F" on page 108 and "Removing and installing a SAS cable: 2077-92F" on page 85
   - "Removing a fan module: 2077-92F" on page 110

7. With the help of multiple persons or a mechanical lift, lift and remove the enclosure from the rack.

Replace the enclosure in the rack

8. To reinstall or return the expansion enclosure in the rack, follow the procedure in "Installing or replacing an expansion enclosure in a rack: 2077-92F" on page 54.

Removing a power supply: 2077-92F

You can remove either of the redundant power supply units in a 2077-92F expansion enclosure. Redundant power supplies operate in parallel; one continues to provide power to the enclosure if the other fails.

Before you begin

Important: You can remove a PSU without powering off the expansion enclosure. However, to maintain operating temperature, ensure that you perform the following tasks.

- Do not remove a faulty PSU until its replacement is ready to be installed.
- Do not remove a PSU from an operational enclosure for more than approximately 10 minutes. The reduction in airflow through the enclosure might cause the enclosure or its components to shut down to protect from overheating.

About this task

Each PSU provides cooling to the lower part of the enclosure. Ensure that the second PSU in the enclosure is powered on and operating correctly. For example, in Figure 78 on page 100, PSU 1 is operating while PSU 2 is being removed.

Review and follow the procedures for handling static-sensitive devices before you remove the power supply unit (PSU).

Procedure

1. Read all safety information.
2. Remove the 1U fascia that covers the PSUs on the front of the expansion enclosure, as described in "Removing the fascia: 2077-92F" on page 82.
3. Press on the handle lock to release the handles on the PSU.
4. Rotate the handles outward, as shown in Figure 78 on page 100.

Figure 78. Releasing the power supply handles

5. Carefully pull the PSU out of the expansion enclosure chassis and place it in a safe location, as shown in Figure 79 on page 101.

Figure 79. Removed power supply

6. If you are instructed to return the power supply, follow all packaging instructions. Use any packaging materials for shipping that are supplied to you.

Replace the power supply

7. To reinstall the PSU, or replace it with one from FRU stock, follow the procedure in "Installing or replacing a power supply: 2077-92F" on page 79.

Removing a drive: 2077-92F

You can remove a faulty drive from a 2077-92F expansion enclosure to replace it with a new one received from FRU stock.

Before you begin

Ensure that the drive 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.

Important: You can remove a drive assembly without powering off the expansion enclosure. However, to maintain operating temperature, perform the following tasks.

- Do not remove a faulty drive assembly until its replacement is ready to be installed.
- 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.

About this task

The 2077-92F expansion enclosure supports 92 drives. Figure 80 shows an example of a drive assembly.

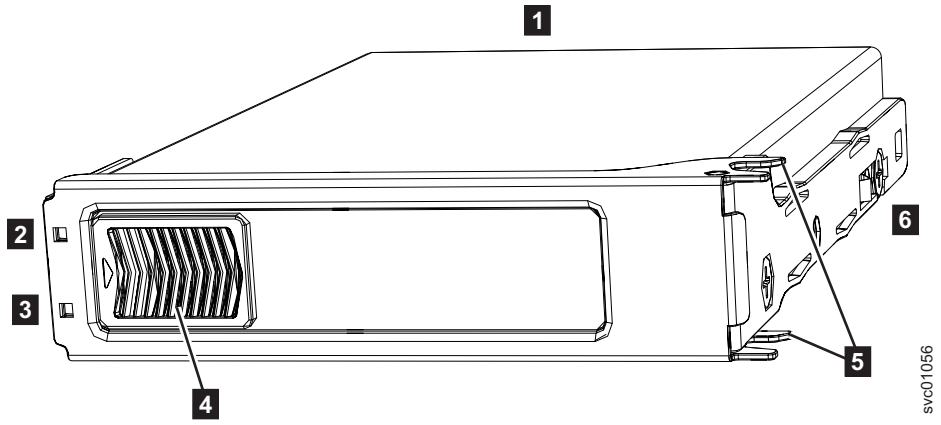


Figure 80. Drive assembly

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

Procedure

1. Read all available safety information.
2. Use the slide rails to pull the enclosure out from the rack, as described in "Removing an expansion enclosure from a rack: 2077-92F" on page 91.
3. Remove the top cover, as described in "Removing the top cover: 2077-92F" on page 49.
4. Locate the slot that contains the drive assembly that you want to remove.

   Note: When a drive is faulty, the amber fault indicator is lit (**3** in Figure 80). Do not replace a drive unless the drive fault indicator is on or you are instructed to do so by a fix procedure. When lit, the green indicator shows that activity is occurring on the drive.

   A label on the enclosure cover (Figure 81 on page 103) shows the location of the drive slots. The drive slots are numbered 1-14 from left to right and A-G from the back to the front of the enclosure.

The drive locations are also marked on the enclosure itself. The rows (A-G) are marked on the left and right edges of the enclosure. The columns (1-14) are marked on the front edge of the enclosure. The row and column marks are visible when the top cover is removed.

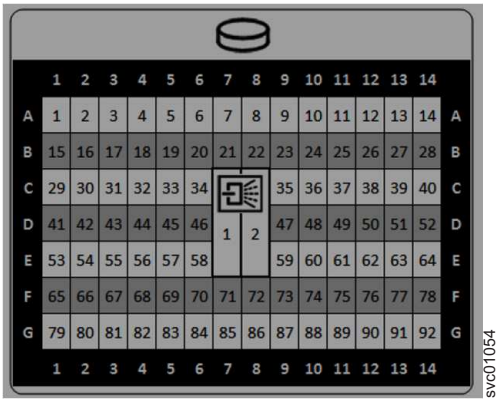


Figure 81. Drive locations in a 2077-92F expansion enclosure

5. Slide the release latch forward (**1**), as shown in Figure 82 on page 104.

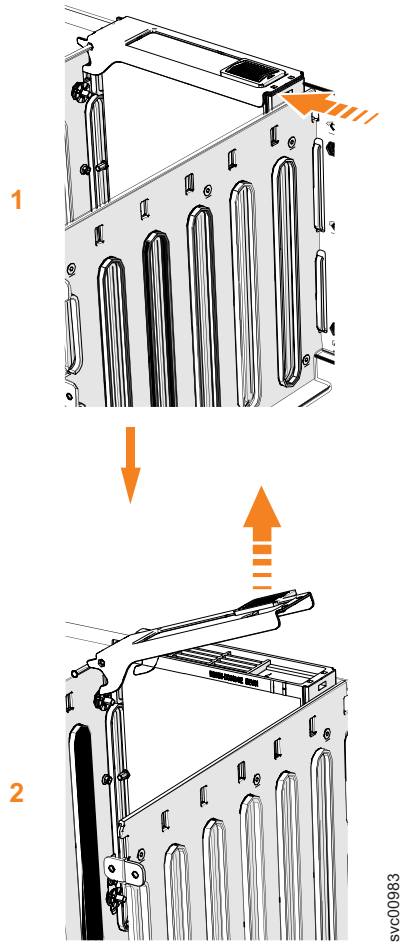


Figure 82. Remove the drive assembly

6. Lift the handle (**2**) to unlock the drive carrier from the partition, as shown in Figure 82. Ensure the toe on the bottom of the latch is fully disengaged.
7. Carefully lift the drive carrier up to remove it from the expansion enclosure.
8. Repeat step 4 on page 102 through step 7 for each drive you need to remove.

Replace the drive

9. To reinstall a drive, or replace it with one from FRU stock, follow the procedure in “Installing or replacing a drive: 2077-92F” on page 69.

Removing a secondary expander module: 2077-92F

You can remove a secondary expander module from a 2077-92F expansion enclosure if it is faulty or to perform other service tasks.

Before you begin

DANGER

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

DANGER

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

CAUTION:
Use caution when you are removing or replacing a secondary expander module from an enclosure (01LJ112) that is powered on. Avoid contact with the connectors on the main board. Only an IBM Service Support Representative (SSR) can remove the secondary expander module if the 01LJ112 enclosure is powered.

Important: You can remove a secondary expander module without powering off the expansion enclosure. However, to maintain operating temperature, perform the following tasks.

- Do not remove a faulty secondary expander module until its replacement is ready to be installed.
- 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.

About this task

The secondary expander modules provide SAS connectivity between the expansion canisters and the drives. Each drive has 2 SAS ports. SAS port 1 of each drive is connected to secondary expander module 1. SAS port 2 of each drive is connected to secondary expander module 2. Each expansion canister is connected to both secondary expander module 1 and secondary expander module 2. If secondary expander module 2 is missing or is faulty, the expansion canisters can communicate only with SAS port 1 on each drive. Similarly, if secondary expander module 1 is missing or is faulty, the expansion canisters can communicate only with SAS port 2 on each drive.

The two secondary expansion modules are already installed when the 2077-92F expansion enclosure is shipped, as Figure 83 shows.

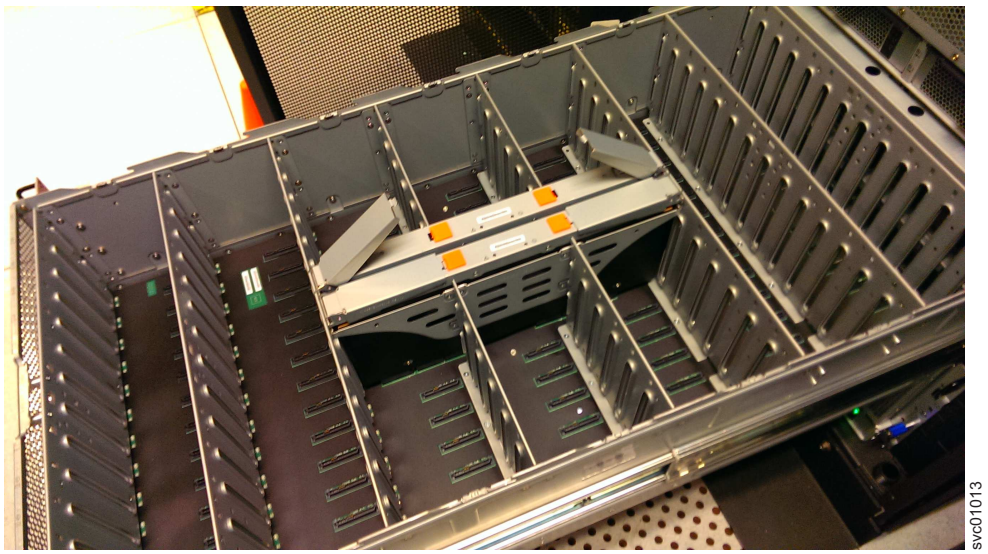


Figure 83. Location of secondary expander modules

Figure 84 shows the location of the LED indicators on the top of the secondary expander module. Each secondary expander module has its own set of LEDs. When power is connected to the expansion enclosure, the LEDs identify the operational status of the secondary expander modules.

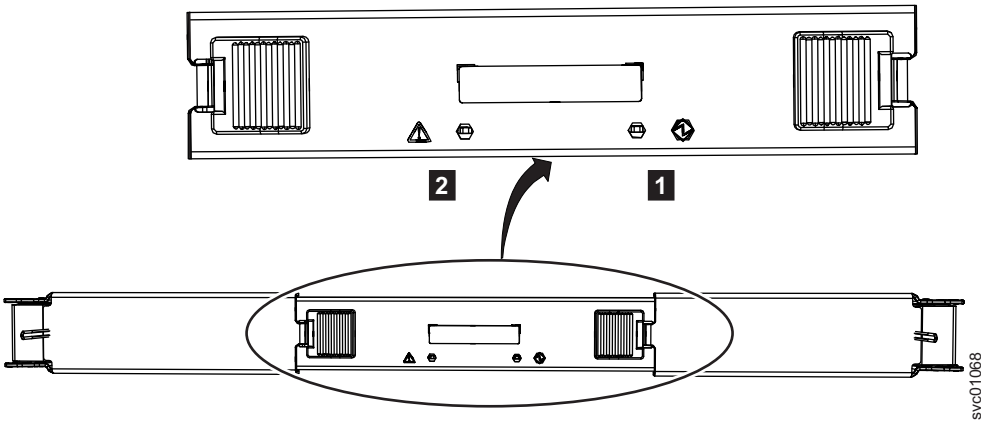


Figure 84. Location of LEDs on the secondary expander module

Table 19 describes the function and status values of each LED indicator.

Table 19. LEDs on the secondary expander modules

LED	Color	Status	Description
Power 1	Green	On	The secondary expander module is receiving power.
		Off	The secondary expander module is not receiving power.

Table 19. LEDs on the secondary expander modules (continued)

LED	Color	Status	Description
Fault 2	Amber	On	Not used.
		Blink	The secondary expander module is being identified.
		Off	Normal operation.

This task assumes that the following conditions were met:

- The expansion enclosure is slid out from the rack, as described in "Removing an expansion enclosure from a rack: 2077-92F" on page 91.
- The top cover was removed, as described in "Removing the top cover: 2077-92F" on page 49.

Procedure

1. Identify the secondary expander module to be replaced; refer to Table 19 on page 106.
2. Press the release buttons on top of the secondary expander module to release the handles.
3. Rotate the handles outward to the unlocked position.
4. Carefully lift the secondary expander module out of the enclosure, as shown in Figure 85.

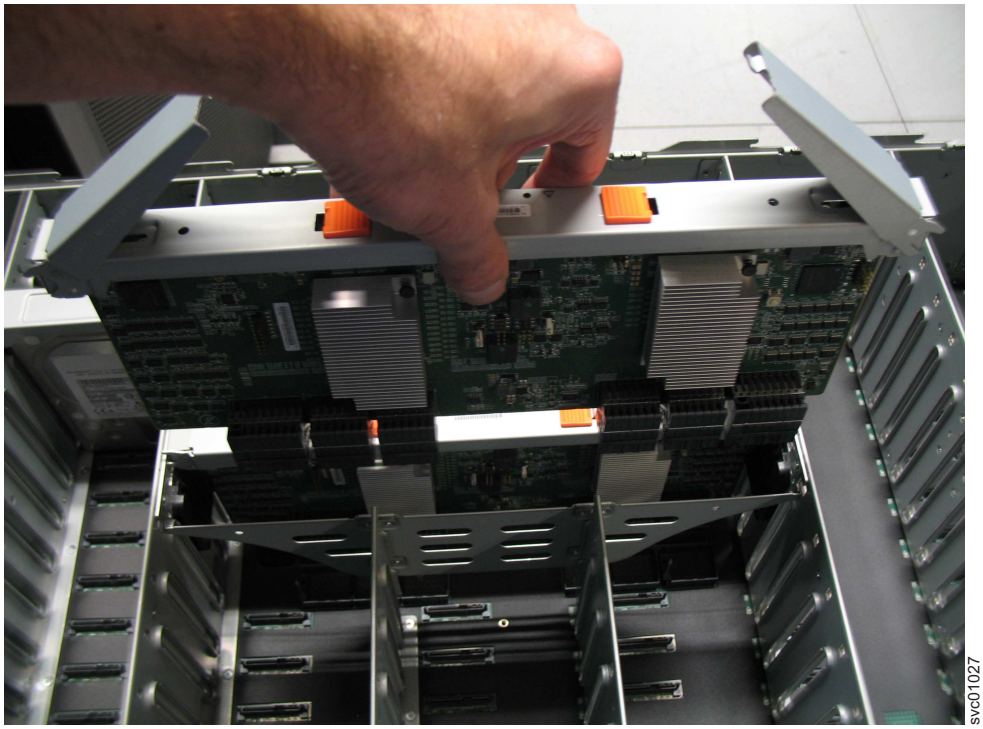


Figure 85. Remove the secondary expander module

Important: To avoid electric shock after you remove the secondary expander module, do not touch the connectors, which are shown in Figure 86 on page 108.

Figure 86. Secondary expander module connectors

5. Place the secondary expander module in a safe location, as shown in Figure 87.

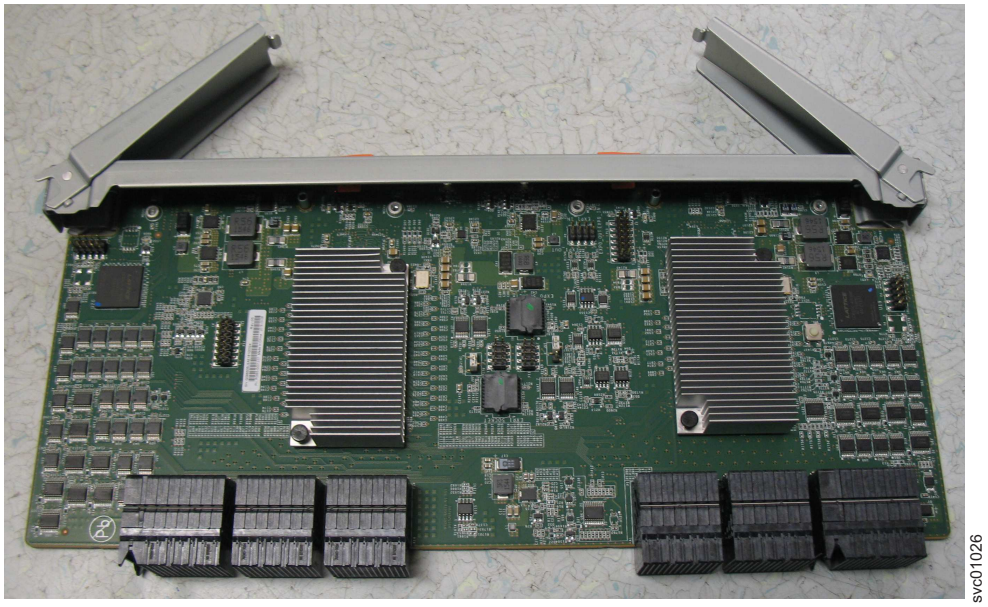


Figure 87. Secondary expander module removed from the enclosure

6. If needed, repeat step 2 on page 107 through step 5 to remove the other secondary expander module.

Replace the secondary expansion module

7. To reinstall the secondary expansion module, or replace it with one from FRU stock, follow the procedure in "Installing or replacing a secondary expander module: 2077-92F" on page 74.

Removing an expansion canister: 2077-92F

You can remove the expansion canisters in a 2077-92F expansion enclosure.

Before you begin

Important: You can remove an expansion canister without powering off the expansion enclosure. However, to maintain operating temperature, perform the following tasks.

- Do not remove a faulty expansion canister until its replacement is ready to be installed.
- Do not remove an expansion canister from an operational enclosure for more than approximately 10 minutes. The reduction in airflow through the enclosure might cause the enclosure or its components to shut down to protect from overheating.

About this task

An expansion canister provides SAS connectivity between the 2077-92F expansion enclosure and Storwize V5000 Gen2 system. If either of the two expansion canisters has a failure, the other expansion canister assumes the full I/O load. Figure 88 shows the features of an expansion enclosure.

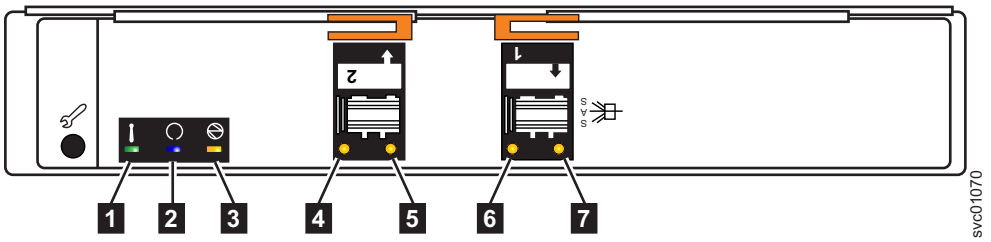


Figure 88. Expansion canister

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

Procedure

1. Read all safety information.
2. Locate the expansion canister to be removed.
3. Release the lower cable management arm to swing it out of the way, as described in Moving the cable management arms.
4. Remove the SAS cables from the expansion canister, as described in "Removing and installing a SAS cable: 2077-92F" on page 85.
5. Rotate the handles on the expansion canister outward, as shown in Figure 89 on page 110.

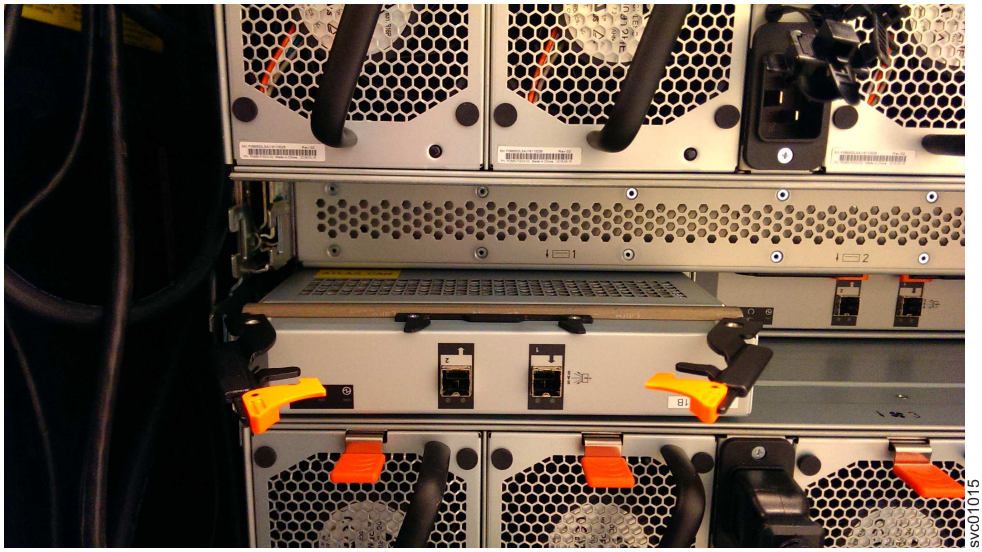


Figure 89. Removing the expansion canister

6. Carefully pull the expansion canister out of the chassis and place it on a safe, level surface.

Replace the expansion canister

7. To reinstall an expansion canister, or replace it with one from FRU stock, follow the procedure in "Installing or replacing an expansion canister: 2077-92F" on page 62.

Removing a fan module: 2077-92F

You can remove a faulty fan module from a 2077-92F expansion enclosure.

Before you begin

Important: You can remove a fan module without powering off the expansion enclosure. However, to maintain operating temperature, do not remove more than one fan module at a time.

- Remove a faulty fan module only when its replacement is ready to be installed.
- Do not remove a fan module from an operational enclosure for more than approximately 10 minutes. The reduction in airflow through the enclosure might cause the enclosure or its components to shut down to protect from overheating.

About this task

Procedure

1. Identify the fan module to be replaced. When lit, the amber LED on the front of the fan module (**1** in Figure 90 on page 111) identifies a fault.

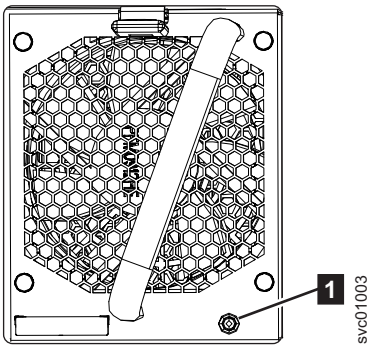


Figure 90. Fan module LED

You can also issue the **lsenclosurefanmodule** command to display the status of the fan modules.

2. Press the release tab on the fan module, as Figure 91 shows.

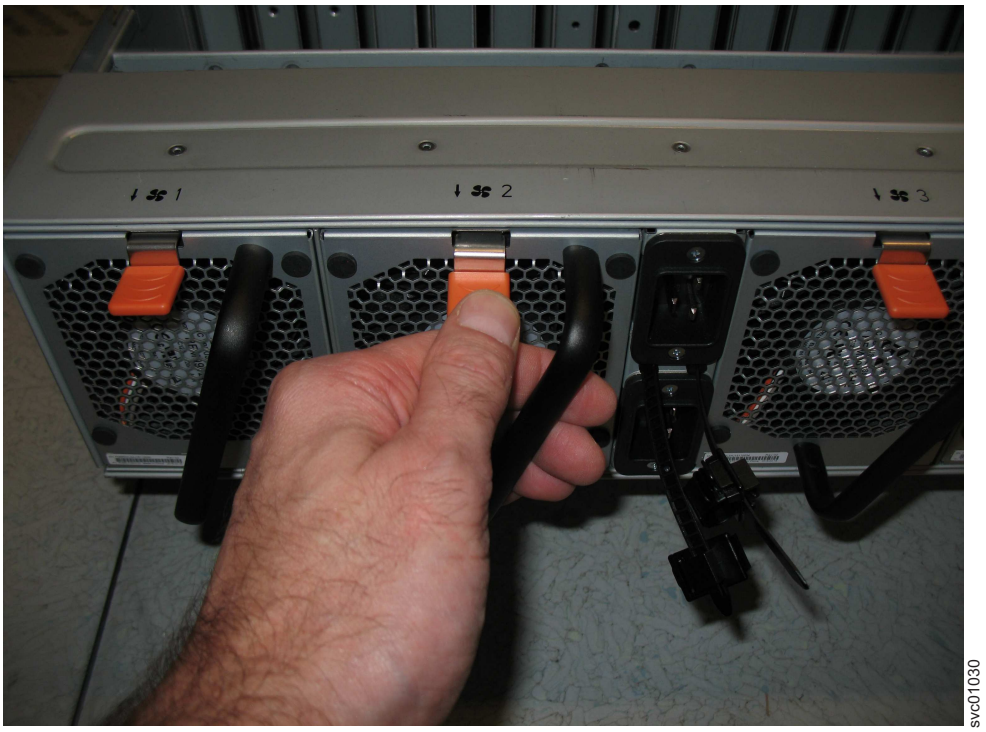


Figure 91. Fan module release tab

3. Use the handle to pull the fan module out of the expansion enclosure chassis, as shown in Figure 92 on page 112.

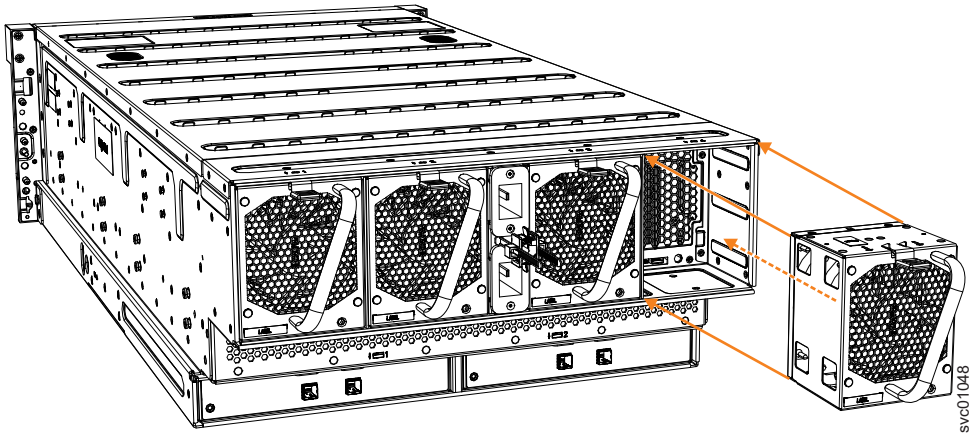


Figure 92. Remove fan module

4. Repeat steps 2 on page 111 and 3 on page 111 for each additional fan module you need to remove.

Replace a fan module

5. To reinstall a fan module, or replace it with one from FRU stock, follow the procedure in "Installing or replacing a fan module: 2077-92F" on page 87.

Removing a fan interface board: 2077-92F

You can remove a fan interface board (FIB) from a 2077-92F expansion enclosure.

Before you begin

This task assumes that the following conditions were met:

- All power cables were removed from the enclosure, as described in "Powering off the expansion enclosure: 2077-92F" on page 123.
- The top cover, fan modules, and the other heavy FRUs (drives, secondary expander modules) were removed before the enclosure was removed from the rack.
- The expansion enclosure was removed from the rack, as described in "Removing an expansion enclosure from a rack: 2077-92F" on page 91.

  Ensure that you use a lift to support the weight of the enclosure.

About this task

The 2077-92F expansion enclosure contains two fan interface boards (FIBs). The FIBs act as the interface between the fans and the system drive board. FIB 1 connects fan modules 1 and 2 to the drive board; FIB 2 connects fan modules 3 and 4. If both fan modules controlled by a FIB fail, it is possible that the FIB needs to be replaced.

Important: Because this task is disruptive to the storage system, always attempt fan replacement first. See "Removing a fan module: 2077-92F" on page 110 and "Installing or replacing a fan module: 2077-92F" on page 87 for information about the removal and replacement procedures. Ensure that both fans are installed correctly. Perform the following procedure only if the amber fault LED on each fan remains lit (**1** in Figure 93 on page 113).

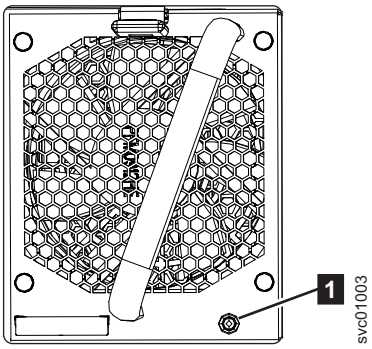


Figure 93. Fan module LED

Procedure

1. Using a cross head screwdriver, remove the narrow metal cover that is over the FIBs, as shown in Figure 94. The screws are on each side of the chassis. Place the cover and cover screws in a safe location.

Figure 94. Location of the FIB cover

2. Use a cross head screwdriver to loosen the retaining screws on the FIB, as shown in Figure 95 on page 114.

Figure 95. Loosen the FIB screws

3. Use the handle to pull the FIB out of the expansion enclosure chassis, as shown in Figure 96.

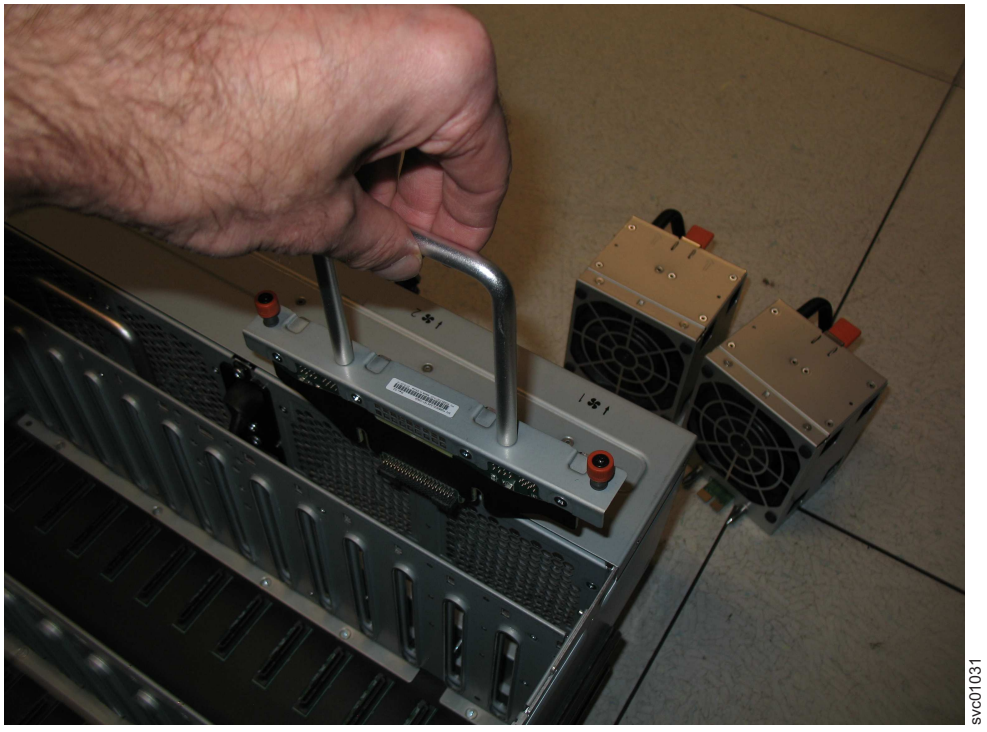


Figure 96. Remove the FIB from the chassis

4. Place the FIB (shown in Figure 97) in a safe location.

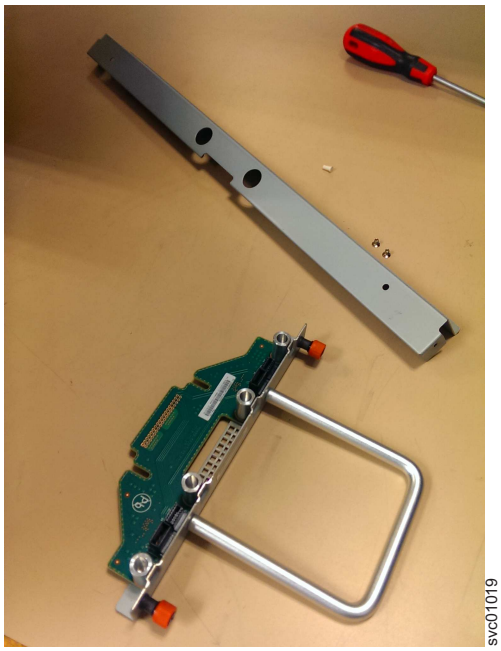


Figure 97. FIB parts removed from the chassis

5. If needed, repeat steps 2 on page 113 through 3 on page 114 to remove the other FIB.

Replace the fan interface board

6. To reinstall a fan interface board, or replace it with one from FRU stock, follow the procedure in "Installing or replacing a fan interface board: 2077-92F" on page 88.

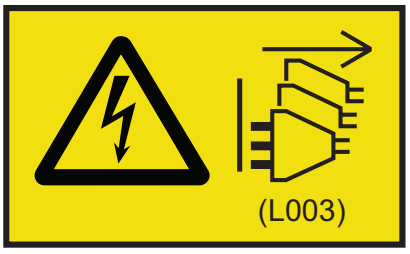
Replacing an enclosure: 2077-92F

You can replace a faulty enclosure (FRU 01LJ112) of a 2077-92F expansion enclosure with a new one from FRU stock.

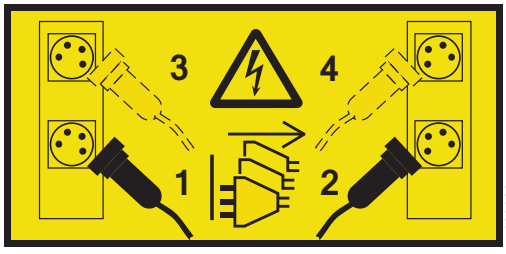
Before you begin

DANGER

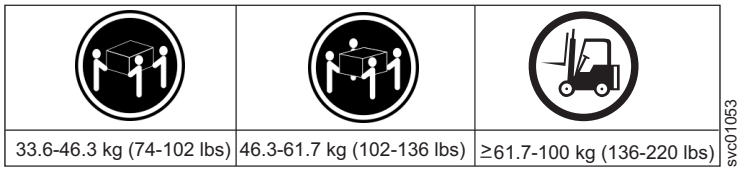
Multiple power cords. The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords. (L003)



or



CAUTION:



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)

Note: Perform the following procedure only if directed to do so by IBM Remote Technical support or by a fix procedure in the management GUI.

This task assumes that the following conditions are met:

- All power cables were removed from the enclosure, as described in "Powering off the expansion enclosure: 2077-92F" on page 123.
- All SAS cables were removed, as described in "Removing and installing a SAS cable: 2077-92F" on page 85.
- The following FRUs were removed from the enclosure, as described in the applicable tasks:
  - Top cover ("Removing the top cover: 2077-92F" on page 49)
  - Drives ("Removing a drive: 2077-92F" on page 101)
  - PSU (1U) fascia ("Removing the fascia: 2077-92F" on page 82)
  - Power supply units ("Removing a power supply: 2077-92F" on page 99)
  - Secondary expander modules ("Removing a secondary expander module: 2077-92F" on page 104)
  - Expansion canisters ("Removing an expansion canister: 2077-92F" on page 108)
  - Fan modules ("Removing a fan module: 2077-92F" on page 110)
- The expansion enclosure was removed from the rack, as described in "Removing an expansion enclosure from a rack: 2077-92F" on page 91.
- A suitably rated mechanical lift is available to support the weight of the enclosure.

About this task

The expansion enclosure (FRU 01LJ112) contains the drive board, signal interconnect board, and internal power cables. If a fault with the drive board or the intercanister link is suspected, you can replace the enclosure. However, you can remove the parts from the old expansion enclosure and reinstall them in the replacement enclosure.

Procedure

1. Remove the front display (4U) and PSU (1U) fascia from the old enclosure, as described in "Removing the fascia: 2077-92F" on page 82

a. Install the front display (4U) and PSU (1U) fascia on the new enclosure, as described in "Installing or replacing the fascia: 2077-92F" on page 77.

2. Remove the display panel assembly from the old enclosure, as described in Removing the display panel assembly: 2077-92F.
   a. Install the display panel assembly into on the new enclosure, as described in Installing or replacing the display panel assembly: 2077-92F.
3. Remove the fan interface boards from the old enclosure, as described in "Removing a fan interface board: 2077-92F" on page 112.
   a. Install the fan interface boards into on the new enclosure, as described in "Installing or replacing a fan interface board: 2077-92F" on page 88.
4. Remove the inner section of the slide rail from the old enclosure, as described in Removing the support rails: 2077-92F.
5. Attach the inner rail section to the new enclosure, as described in "Installing or replacing the support rails: 2077-92F" on page 51.
6. Replace the new enclosure in rack, as described in "Installing or replacing an expansion enclosure in a rack: 2077-92F" on page 54.
7. Reinstall the remaining parts into the enclosure, as described in the following topics. You can install the parts in any order.

   Important: Ensure a mechanical lift is available and in place to support the additional weight as the FRUs are reinstalled in the enclosure.
   - "Installing or replacing a power supply: 2077-92F" on page 79
   - "Installing or replacing a drive: 2077-92F" on page 69
   - "Installing or replacing a secondary expander module: 2077-92F" on page 74
   - "Installing or replacing an expansion canister: 2077-92F" on page 62
   - "Installing or replacing a fan module: 2077-92F" on page 87
   - "Installing or replacing the top cover: 2077-92F" on page 68
8. Reconnect the SAS cables, as described in "Removing and installing a SAS cable: 2077-92F" on page 85.
9. Reconnect the power cables, as described in "Powering on the expansion enclosure: 2077-92F" on page 120.
10. Run the next recommended fix procedure in the management GUI to set the serial number of the 2077-92F enclosure.

Connecting the optional 2077-92F SAS expansion enclosures

After you install expansion enclosures into the rack, you must connect them to each Storwize V5000 Gen2 system that will use them. The system requires software version 7.8.0. Do not connect the expansion enclosure if software version 7.8.0 is not installed on the system.

About this task

This task applies if you are installing a 2077-92F expansion enclosure.

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

- For Storwize V5000 Gen2 control enclosures and 2145-24F or 2145-12F expansion enclosures, the blue pull tab must be below the cable (**1** in Figure 98 on page 118).

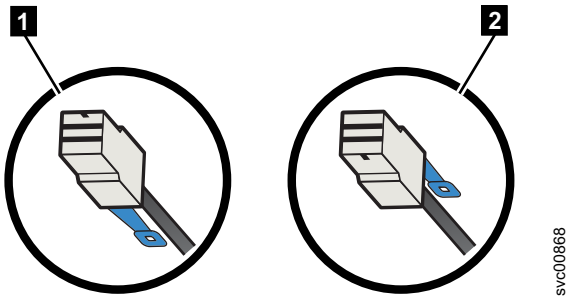


Figure 98. SAS cable connector orientation

- For 2077-92F enclosures, the blue pull tab must be above the connector (**2** in Figure 98).
- 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 and Fibre Channel over Ethernet (FCoE) ports. If your system has an optionally installed Fibre Channel and FCoE 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 99 on page 119.

   Note: Figure 99 on page 119 shows the cable connections between the SAS enclosures and the Storwize V5030 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 2077-92F enclosure near the bottom of the rack.

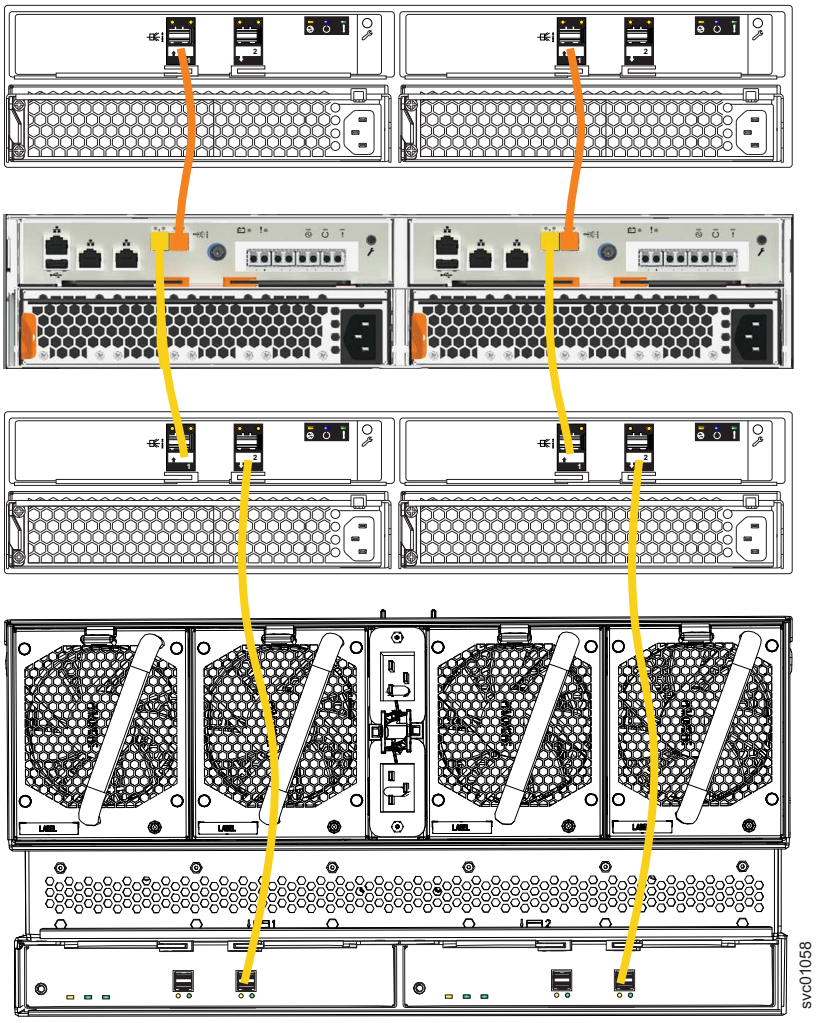


Figure 99. Connecting the SAS cables

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 99 shows, you can combine 2145-24F, 2145-12F, and 2077-92F 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:

- 2077-92F enclosures have a chain weight of 2.5
- 2145-24F and 2145-12F enclosures have a chain weight of 1.

Example

Table 20 shows example of different combinations of SAS weights.

Table 20. Examples of supported SAS chain combinations

2145-12F Enclosures	2145-24F Enclosures	2077-92F 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 99 on page 119)

In addition, the orientation of the Input and Output SAS ports on the 2U and 5U SAS enclosures differs. Figure 100 shows the SAS ports on the 2077-92F, 2145-12F, and 2145-24F enclosures

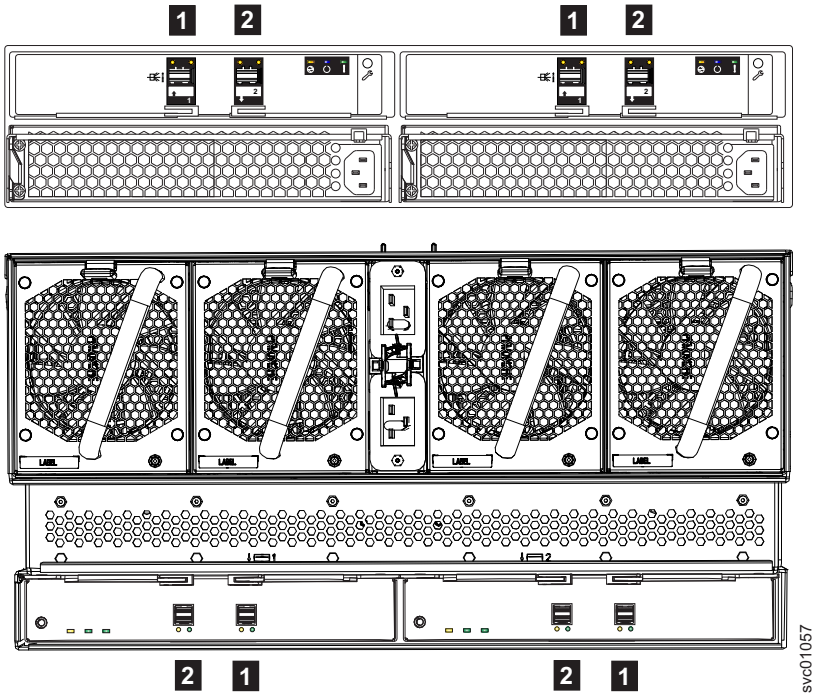


Figure 100. SAS port orientation on expansion enclosures

1. Input SAS port
2. Output SAS port

Powering on the expansion enclosure: 2077-92F

Use the following procedure to provide power to the 2077-92F expansion enclosure as part of the initial installation process or after a service procedure.

Before you begin

Important:

- To support the 2077-92F expansion enclosure, the Storwize V5000 Gen2 system requires software version 7.8.0. If software version 7.8.0 is not installed on the system, do not connect or power on the expansion enclosure.
- 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 101) to ensure that the enclosure drawer does not roll open.

About this task

The 2077-92F expansion enclosure has two power supply units (PSUs) that are accessible from the front of the enclosure (**4** in Figure 101). As the figure also shows, the PSUs are covered by the 1U fascia (**5**).

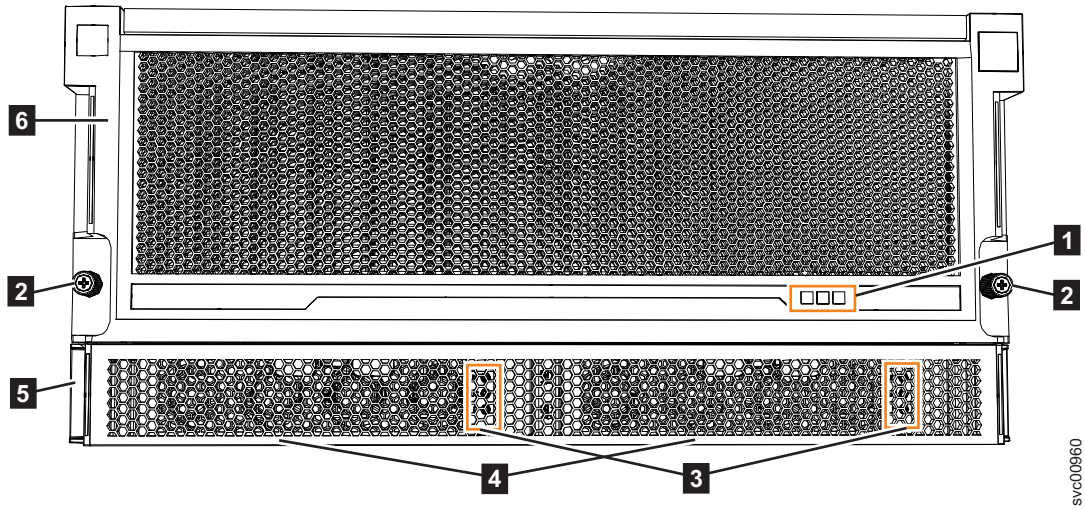


Figure 101. Features on the front of the 2077-92F expansion enclosure

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, as shown in Figure 102 on page 122. 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.

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 the cables are secured, the power cables stay connected when you slide the expansion enclosure out of the rack to perform service tasks.

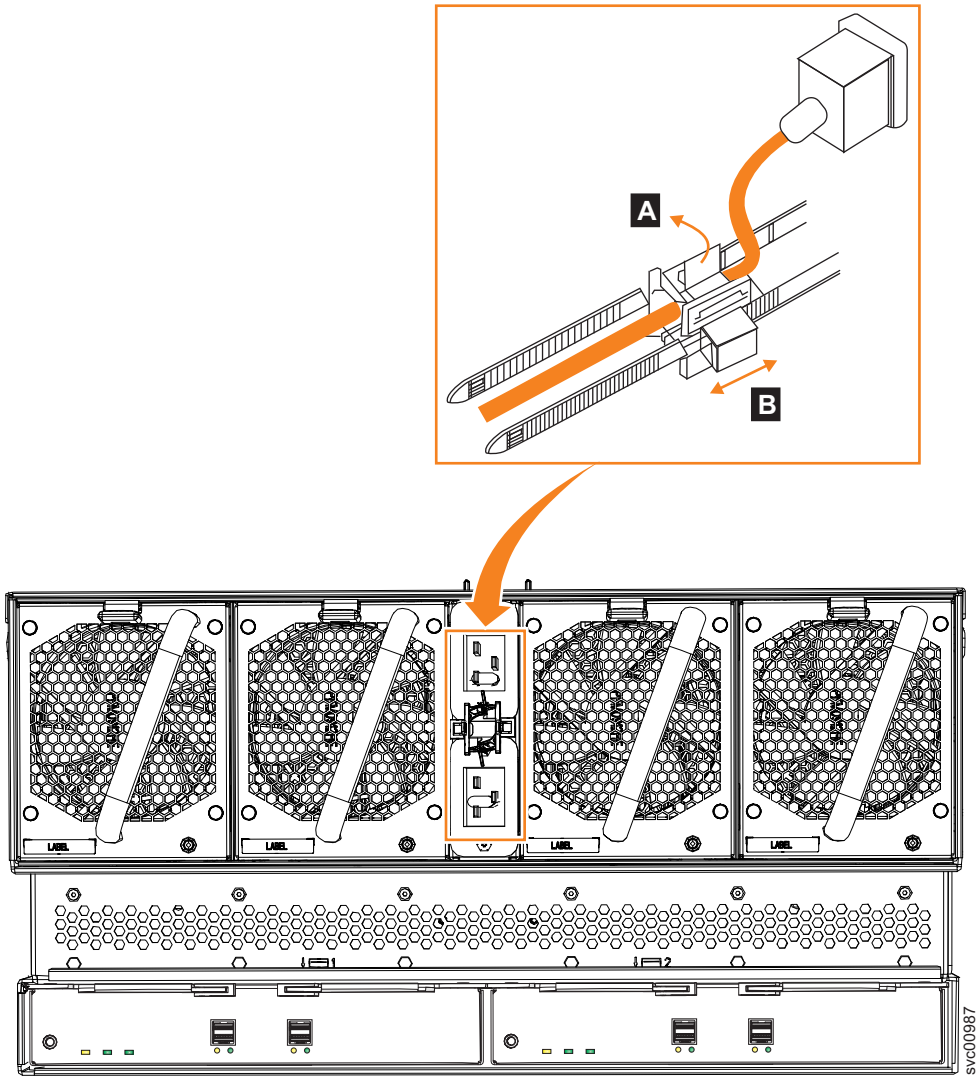


Figure 102. Power cable connections on the back of the expansion enclosure

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 103 on page 123) become active when the power is connected.

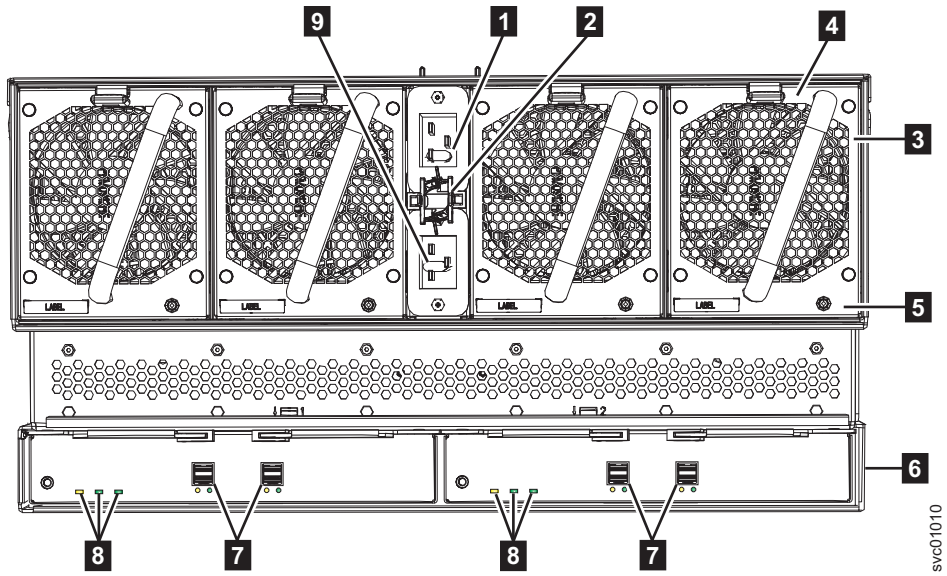


Figure 103. Features on the rear of the 2077-92F expansion enclosure

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

On the front of the enclosure, the indicators on the front display panel and each PSU (1 and 3 in Figure 101 on page 121) are also lit when the power is connected. See "Storwize V5000 Gen2 2077-92F expansion enclosure LEDs and indicators" on page 124 for information about the status that is provided by the indicators.

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: 2077-92F

Before you power down a 2077-92F 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 V5000 Gen2 2077-92F expansion enclosure LEDs and indicators

The 2077-92F expansion enclosure has several sets of LEDs that provide information about the overall status of the enclosure, power, drives, fans, canisters, and SAS connections.

A 2077-92F 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.

Note: All of the information about the 2077-92F expansion enclosure is also applicable to the 2078-92F expansion enclosure.

LEDs on the front of the expansion enclosure

As Figure 104 on page 125 shows, the front of the 2077-92F expansion enclosure contains LEDs for the display panel (**1**) and for each of the power supply units (**3**).

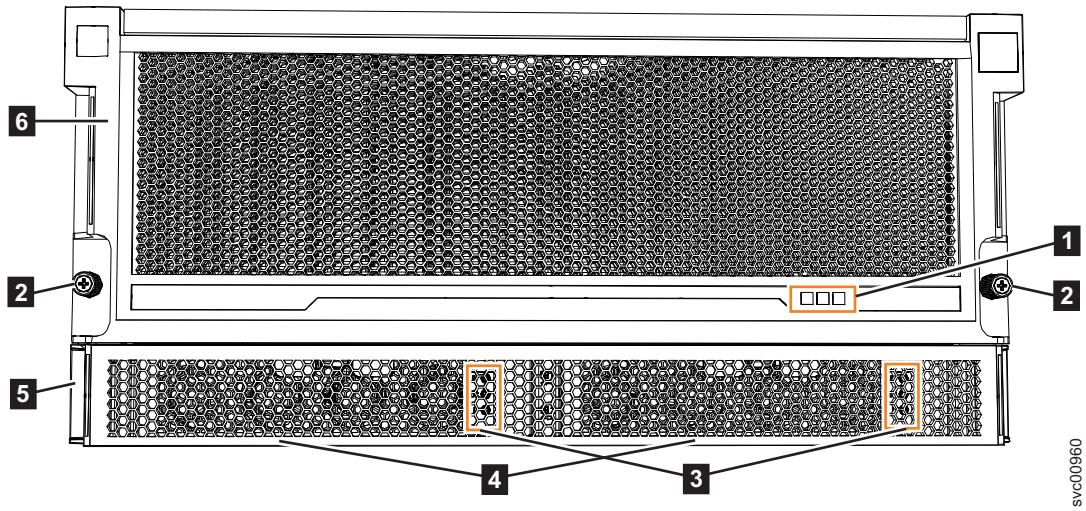


Figure 104. LEDs on the front of the expansion enclosure

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 21 describes the function and meaning of the LEDs on the front display panel.

Table 21. Display panel LEDs

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.
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.

Table 21. Display panel LEDs (continued)

Function	Color	Status	Description
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 2077-92F expansion enclosure contains two PSUs (**4** in Figure 104 on page 125) that are accessible from the front of the enclosure. Each PSU has its own a set of LEDs, as shown in Figure 105.

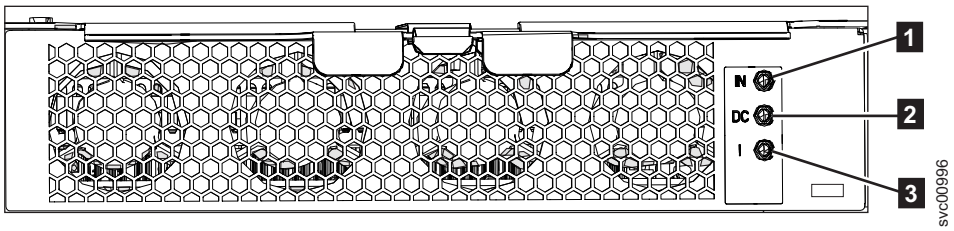


Figure 105. LEDs on the front of a power supply unit

1 Input power
2 DC power
3 Fault indicator

Table 22 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 108 on page 129.

Table 22. Power supply unit LEDs

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.
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 2077-92F expansion enclosure has two LED indicators. To view the drives and secondary expansion modules, you must remove the top cover of the enclosure, as described in "Removing the top cover: 2077-92F" on page 49.

Figure 106 shows the components of a drive assembly. Each drive has an online indicator (**2**) and fault indicator (**3**).

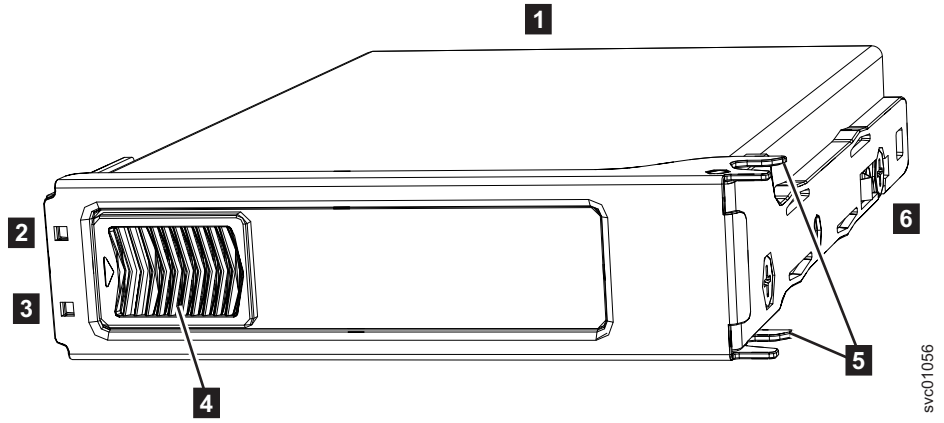


Figure 106. LEDs on a drive assembly

Table 23 describes the meaning of the LEDs on each drive.

Table 23. LED indicators on drives

Function	Color	Status	Description
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.
Fault	Amber	On	A fault occurred on the drive. The LED is turned off when the drive is removed and replaced.
		Blink	The drive is being identified; a fault might or might not be detected.
		Off	The installed drive is operating normally.

Figure 107 on page 128 shows the LEDs on top of a secondary expansion module.

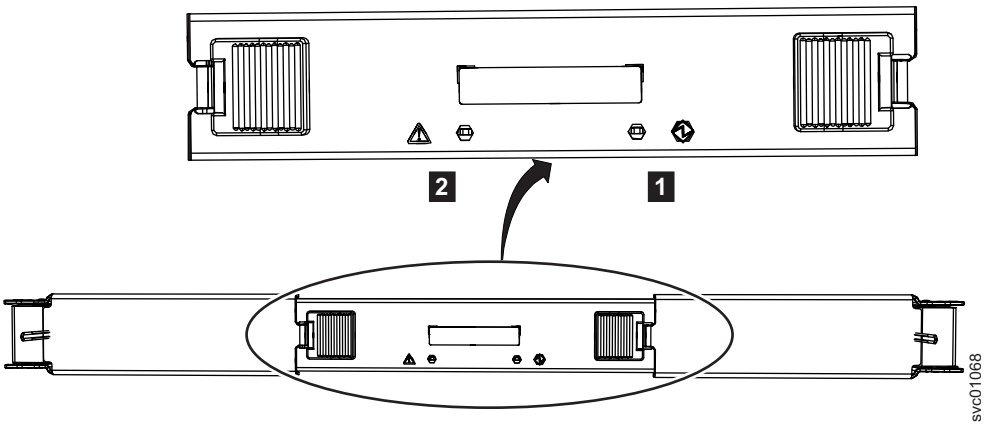


Figure 107. LEDs on a secondary expansion module

1 Online indicator
2 Fault indicator

Table 24 describes the meaning of the LEDs on each secondary expansion module.

Table 24. LED indicators on secondary expansion modules

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

LEDs on the rear of the expansion enclosure

Figure 108 on page 129 shows the rear view of a 2077-92F expansion enclosure. LEDs on the rear of the enclosure provide information about each fan module, each expansion canister, and SAS links.

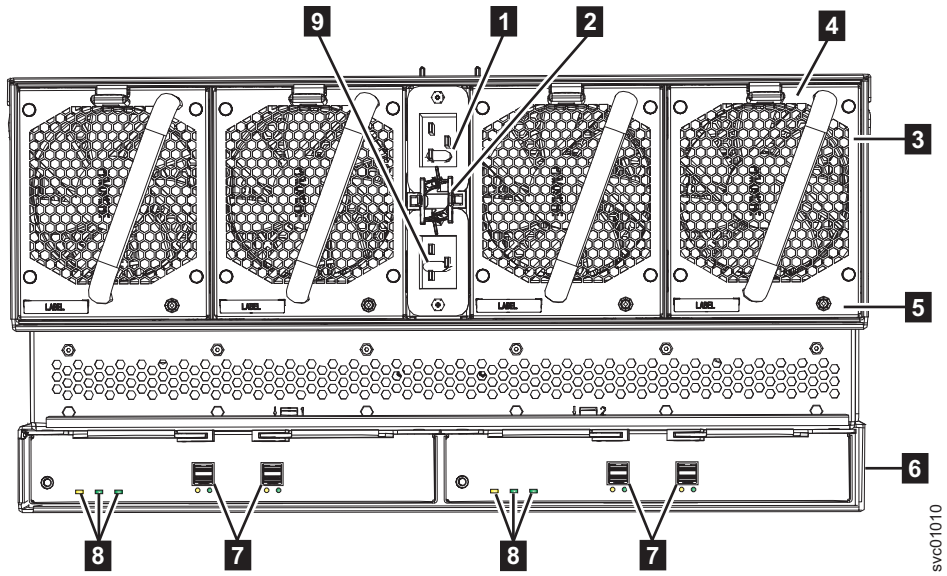


Figure 108. LEDs on the back of the expansion enclosure

The expansion enclosure has four fans. Each fan has one LED; for example, Figure 108 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 108 also shows, the expansion enclosure contains two expansion canisters. Each expansion canister contains its own set of LEDs, as shown in Figure 109. The LEDs provide status information about the expansion canister itself and the SAS connections.

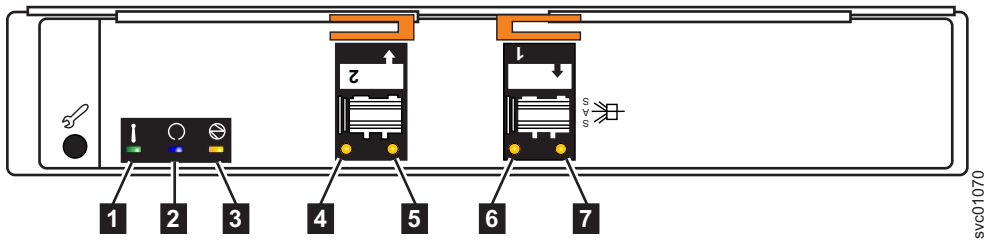


Figure 109. LEDs on the back of the expansion canister

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 25 on page 130 describes the values and meaning of each LED.

Table 25. Expansion canister and SAS port LEDs

Name	Color	State	Meaning
1 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.
2 Canister status	Green	Off	Canister is off.
		On	Normal operation.
		Flashing	There is a vital product data (VPD) error.
3 Canister power	Green	Off	Canister is off.
		On	Canister is receiving power.
4 and 6 SAS link fault	Amber	Off	No faults are detected. All four lanes have a link connection.
		On	Several error conditions are possible: • Only 1, 2, or 3 lanes are connected, but not all 4. • The lanes are not operating at the same speed. • All lanes are not connected to the same remote port. One or more of the connected lanes are attached to a different address.
5 and 7 SAS link active	Green	Off	No link connection on any lane. The connection is down.
		On	The SAS link is active. At least one of the 4 lanes is connected.

Connecting Ethernet cables to node canisters

The control enclosures on Storwize V5000 Gen2 systems 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 of the Storwize V5000 Gen2 systems.

Procedure

To install the Ethernet cables, complete the following steps.

1. If you have a Storwize V5010 or Storwize V5020 system, complete the following steps.
   a. Identify the location and function of the Ethernet ports on your system; refer to Figure 110 and Figure 111 on page 132.
      - Port 1 can be used to provide Ethernet connections; in the figures, port 1 is identified by the green cable.
      - Port 2 serves as the technician port when the system is initially set up or when service is needed. In the figures, port 2 is identified by the blue cable. After the system initializes, port 2 can also be used for iSCSI connectivity or IP replication.

        Note: Do not connect port 2 to a network switch until the system initialization or service is complete. After the system initializes, the technician port is automatically disabled and port 2 can be used for Ethernet connectivity. However, when port 2 is used to perform system service, you must first enter the **satask chserviceip -techport disable** command to disable the technician port. You can then use port 2 to provide additional Ethernet connectivity.

   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 110 shows the Ethernet cabling and the ports on the back of a Storwize V5010 system.

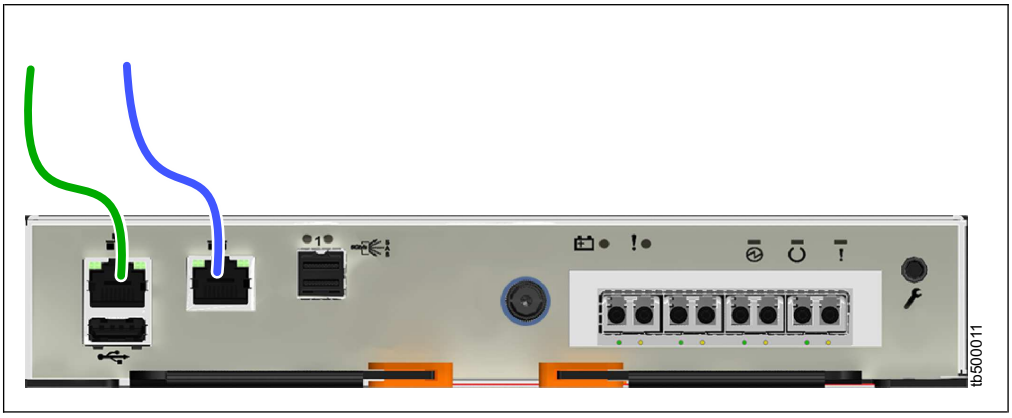


Figure 110. Connecting the Ethernet cables to a Storwize V5010 system

Figure 111 on page 132 shows the Ethernet cabling and the ports on the back of a Storwize V5020 system.

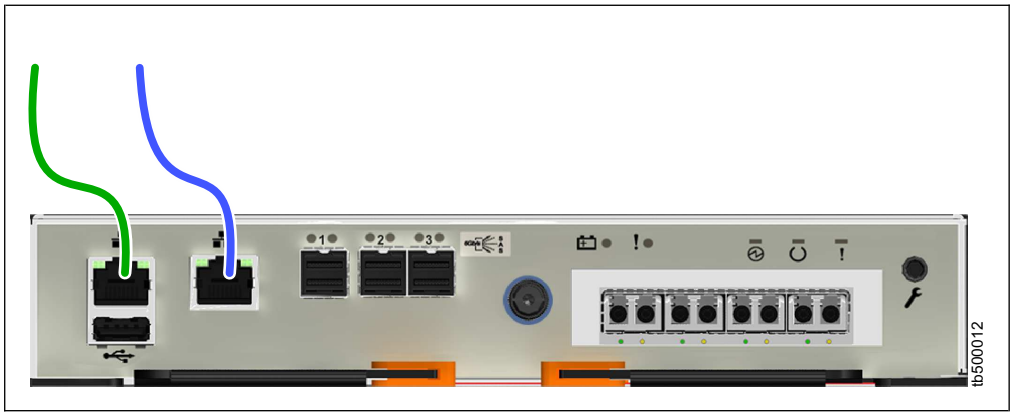


Figure 111. Connecting the Ethernet cables to a Storwize V5020 system

c. Optionally, 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 110 on page 131 and Figure 111. 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 V5010 and Storwize V5020 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 V5030 system, complete the following steps.
   a. Identify the location and function of the Ethernet ports on your system; refer to Figure 112 on page 133.
      - The technician port should only be used to initialize or service the system. In Figure 112 on page 133, the technician port is identified by the green cable.

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

   b. Connect Ethernet port 1 of each Storwize V5030 node canister in the system to the IP network that will provide a connection to the system management interfaces. Figure 112 on page 133 shows the port locations and Ethernet cabling on a Storwize V5030 node canister.

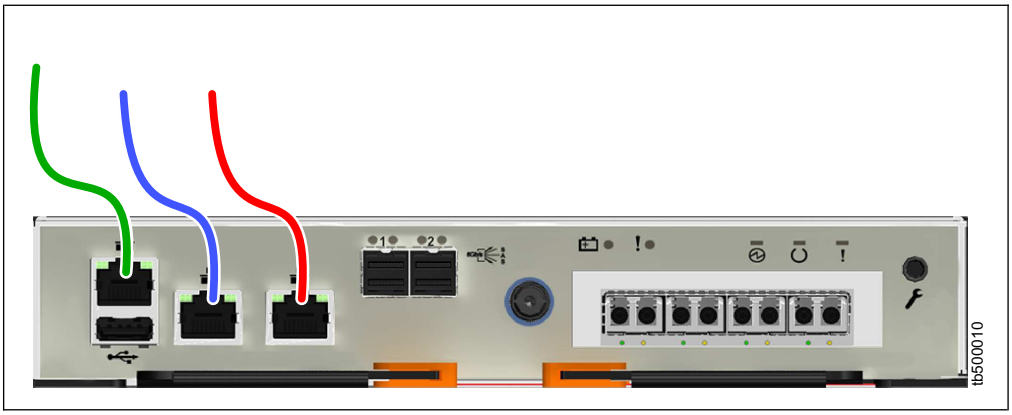


Figure 112. Connecting the Ethernet cables to a Storwize V5030 system

c. Optionally, 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 112. 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 1 Gbps iSCSI 4-port host interface adapters

If you installed an optional 1 Gbps iSCSI 4-port host interface adapter, you can use Ethernet cables to connect the system to your Ethernet SAN.

About this task

Each Storwize V5000 Gen2 system has two Ethernet ports, port 1 and port 2, that are built into the canister. When a 4-port Ethernet host interface adapter is installed, the port number starts at 3.

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

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.

Results

Figure 113 on page 134 shows the Ethernet ports on a node canister, as seen from the back of a Storwize V5010 system.

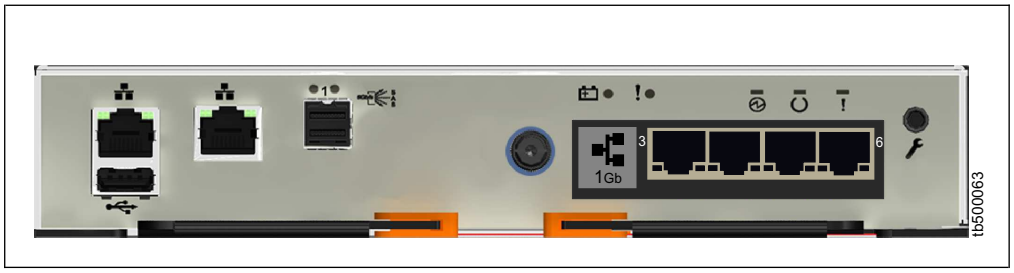


Figure 113. Example of a Storwize V5010 system with a 4-port Ethernet host interface adapter

Connecting Fibre Channel cables to a 10 Gbps iSCSI-FCoE 4-port host interface adapter

If 10 Gbps iSCSI-FCoE 4-port host interface adapters are installed on your Storwize V5000 Gen2 system, you can use Fibre Channel cables to connect them to your 10 Gbps Ethernet or FCoE SAN.

About this task

The Fibre Channel cables are connected in pairs. Both canisters must have the same number of cables connected.

Procedure

To install the cables, complete the following steps.

If optional 4-port 10 Gbps Ethernet host interface adapters are installed in the node canisters, connect each port to the network that will provide connectivity to that port. To provide redundant connectivity, connect both node canisters in a control enclosure to the same networks.

Results

Figure 114 shows an example Storwize V5010 configuration that uses 10 Gbps iSCSI-FCoE 4-port host interface adapters.

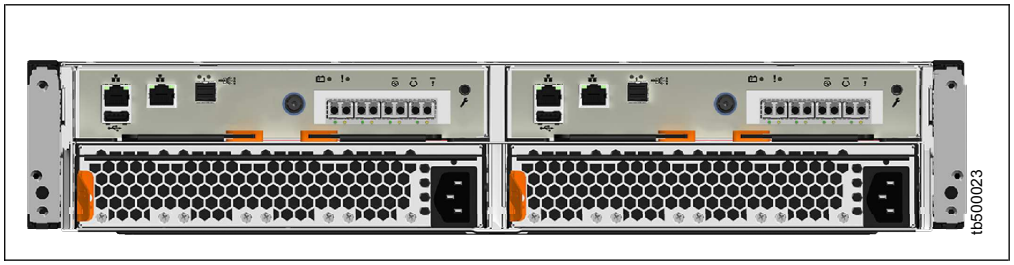


Figure 114. Example Storwize V5010 configuration with 10 Gbps iSCSI-FCoE 4-port host interface adapters

Figure 115 on page 135 shows an example of a Storwize V5020 configuration that uses 10 Gbps iSCSI-FCoE 4-port host interface adapters.

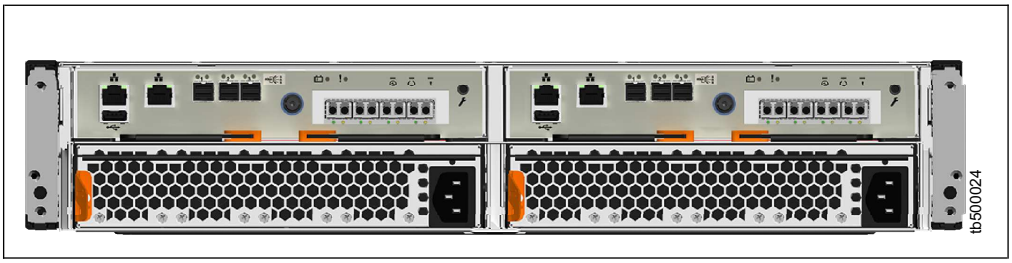


Figure 115. Example Storwize V5020 configuration with 10 Gbps iSCSI-FCoE 4-port host interface adapters

Figure 116 shows an example of a Storwize V5030 configuration that uses 10 Gbps iSCSI-FCoE 4-port host interface adapters.

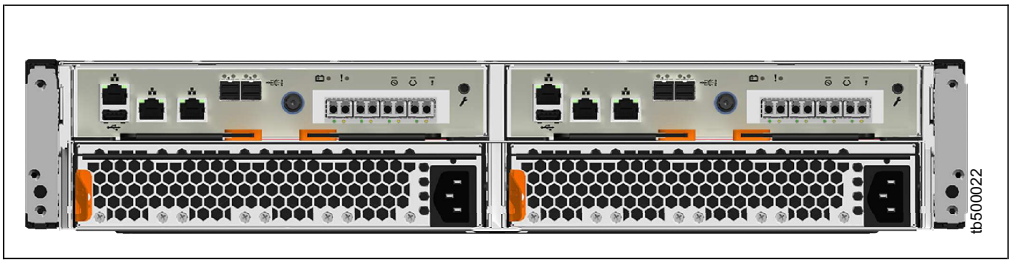


Figure 116. Example Storwize V5030 configuration with 10 Gbps iSCSI-FCoE 4-port host interface adapters

Connecting Fibre Channel cables to a Fibre Channel host interface adapter

If your Storwize V5000 Gen2 system has 16 Gbps Fibre Channel 4-port host interface adapters installed, you can use Fibre Channel cables to connect them to your Fibre Channel SAN.

Procedure

To install the cables, complete the following steps.

1. Connect the required number of Fibre Channel cables. Refer to the "Planning" section of the IBM Knowledge Center for instructions on determining the number of cables required.

   Note: Both canisters must have the same number of cables connected.

   Figure 117 shows an example Storwize V5020 system with two Fibre Channel cables connected to each canister.

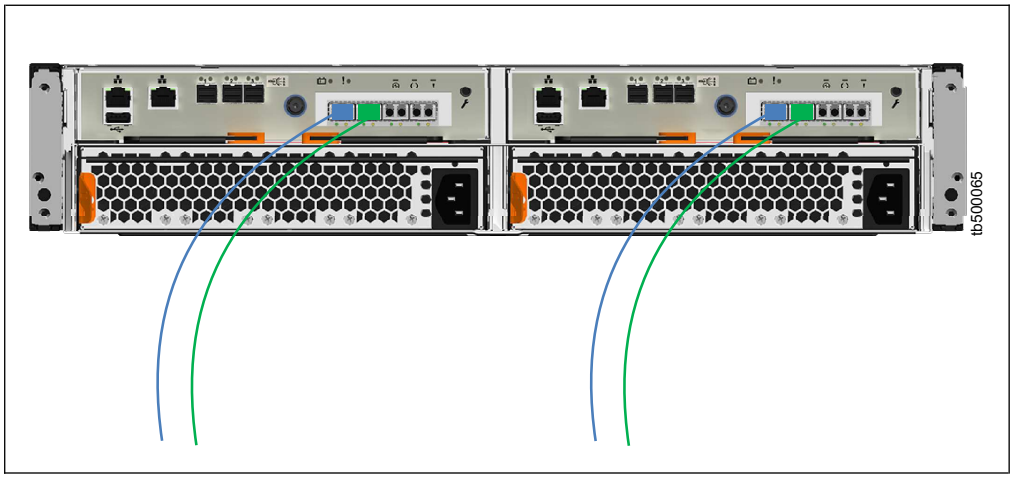


Figure 117. Example Storwize V5000 Gen2 configuration with two Fibre Channel cables per canister

2. If you want to connect additional Fibre Channel cables, make sure to connect the same number of cables to each canister. Figure 118 on page 137 shows an example Storwize V5020 configuration with four Fibre Channel cables connected to each canister.

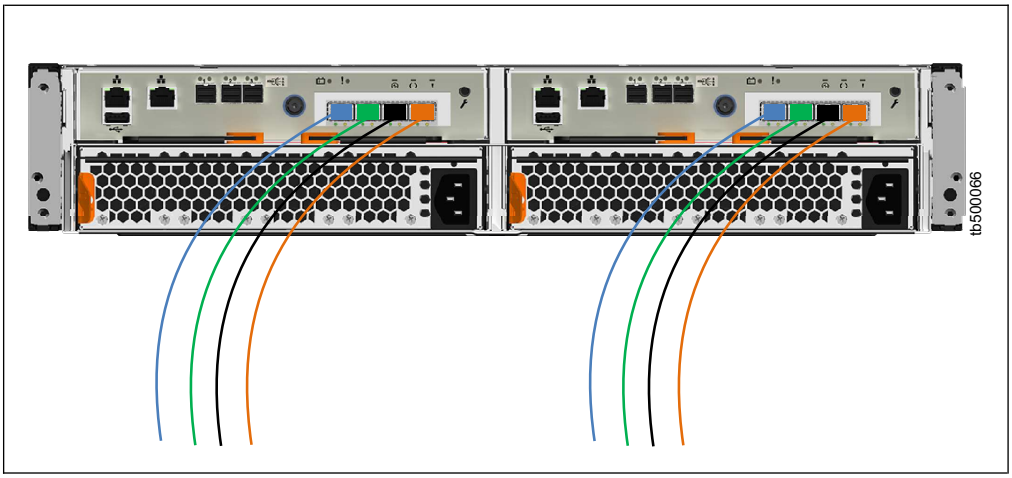


Figure 118. Example Storwize V5020 configuration with four Fibre Channel cables per canister

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 with onboard SAS connectors

When installing a control enclosure, you can connect it to a host with SAS cables. On Storwize V5020 systems, you can use the 12 Gbps onboard host SAS ports or an optional 4-port 12 Gbps SAS host interface adapter. Onboard SAS host ports are not available on Storwize V5010 or Storwize V5030 systems.

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 119 on page 138)

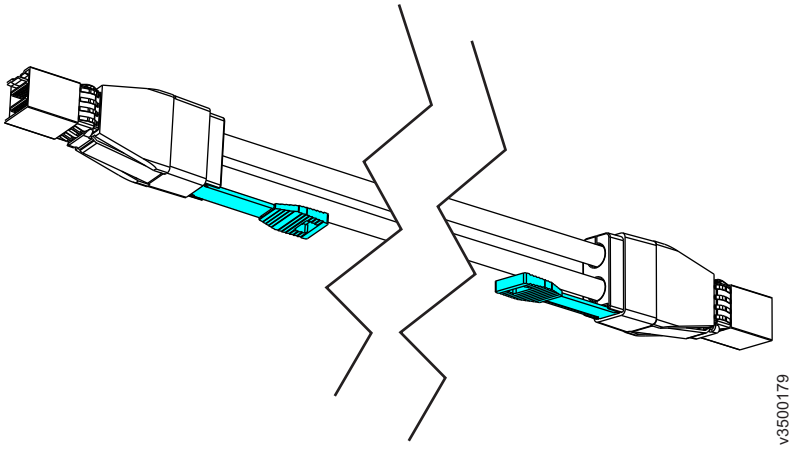


Figure 119. Mini SAS HD to Mini SAS HD cable

- Mini SAS HD to Mini SAS (Figure 120)

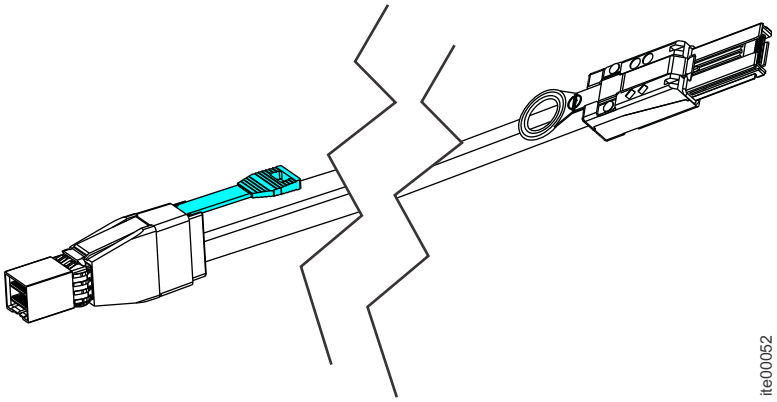


Figure 120. Mini SAS HD to Mini SAS cable

Note: When inserting SAS cables, make sure that the connector is oriented correctly.

- When connecting to the SAS ports on the left side of the node canister, 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.

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.

   Note: When connecting to the SAS ports on the left side of the node canister, each host must be connected to **both** canisters. Both canisters must have the **same** number of cables connected.
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 using two or more people.

Results

Figure 121 shows the location of the onboard 12 Gbps SAS ports on a Storwize V5020 system. In this example, the optional 4 port 12 Gbps SAS host adapter is also installed.

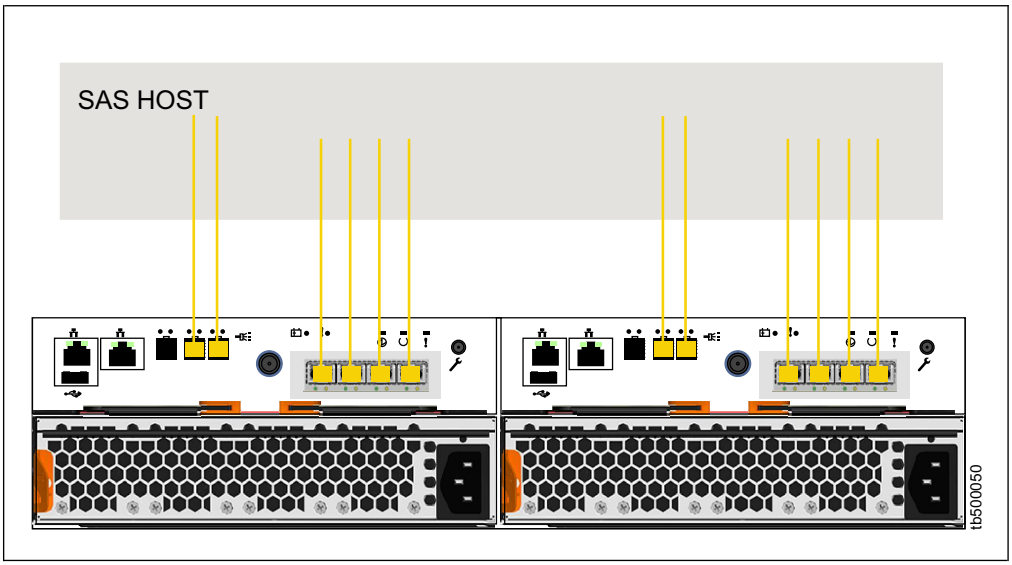


Figure 121. Location of available SAS ports on a Storwize V5020 system

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.

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

Open bays or slots disrupt the internal air flow, causing the drives to receive insufficient cooling.

Procedure

To power on the system, complete the following steps.

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 122).

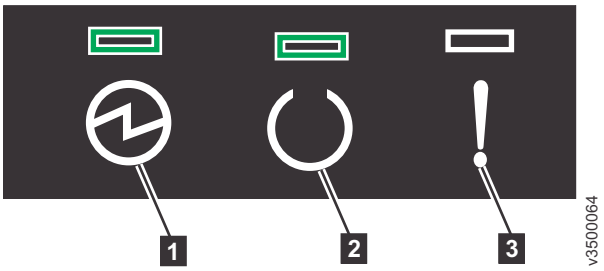


Figure 122. Expansion canister LEDs

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.

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

5. From the rear of the control enclosure, check the LEDs on each node canister (see Figure 123).

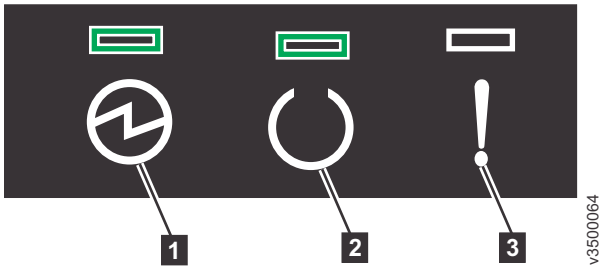


Figure 123. Node canister LEDs

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".

Chapter 3. Configuring the system

After initializing the system, you will use the Storwize management GUI to complete the configuration procedures.

- The management GUI requires a supported web browser (see "Checking your web browser settings for the management GUI").
- To configure a new system, you will log on to the management GUI with the default user name and password (see "User name and password for system initialization").

Checking your web browser settings for the management GUI

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

Before you begin

The GUI supports the following web browsers:

- Mozilla Firefox 49
- Mozilla Firefox Extended Support Release (ESR) 45
- Microsoft Internet Explorer (IE) 11 and Microsoft Edge
- Google Chrome 54

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:

   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:

a. In Internet Explorer, click **Tools** > **Internet Options**.
b. Click **Security**.
c. Click **Trusted sites**.
d. On the **Trusted sites** dialog, 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** dialog.
f. Click **Close** on the **Trusted sites** dialog.
g. Click **OK**.
h. Refresh your browser.

For Google Chrome:

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:

   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:

   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:

   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 10 and 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.

   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:
   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.
5. Enable TLS 1.1/1.2 (Microsoft Internet Explorer 9 and 10 only).

   For Microsoft Internet Explorer:
   a. Open Internet Explorer.
   b. Select **Tools** > **Internet Options**.
   c. Select the **Advanced** tab.
   d. Scroll to the **Security** section.
   e. Check the **Use TLS 1.1** and **Use TLS 1.2** checkboxes.

   Note: IE 11 and later and Microsoft Edge enable TLS 1.1/1.2 by default.

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.

Table 26. Default user name and password for the initialization GUI

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 personal computer to the technician port on the rear of a node canister and run the initialization tool.

Before you begin

You require 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 140.
2. Configure an Ethernet port on the personal computer to enable Dynamic Host Configuration Protocol (DHCP) configuration of its IP address and DNS settings.

   If you do not have DHCP, you must manually configure the personal computer. 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 the node canister.

   On Storwize V5010 and Storwize V5020 systems, the second onboard 1 Gbps Ethernet port is initially used as the technician port. Figure 124 and Figure 125 on page 147 show the location of the technician port (**T**) on each model.

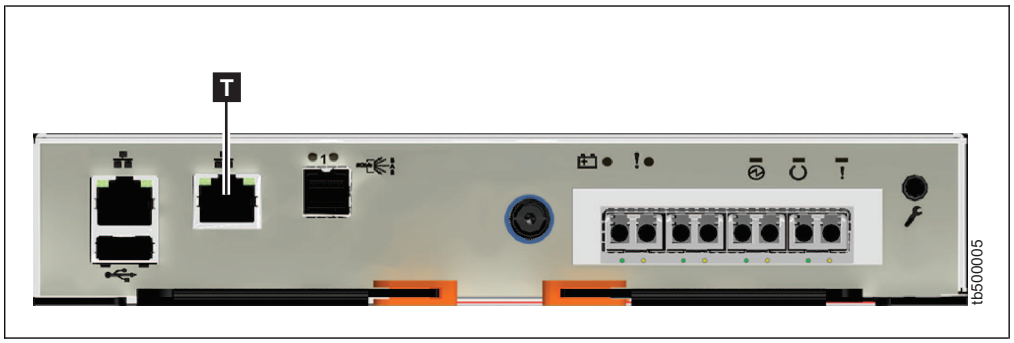


Figure 124. Storwize V5010 technician port

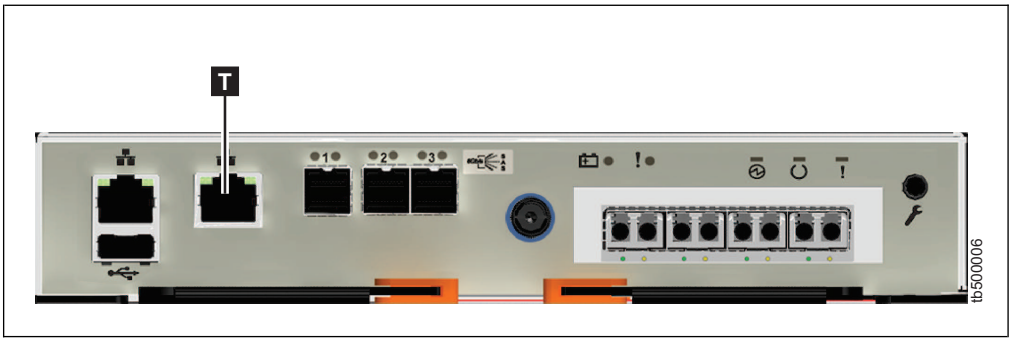


Figure 125. Storwize V5020 technician port

Storwize V5030 systems have a dedicated technician port. Figure 126 shows the location of the port (**T**).

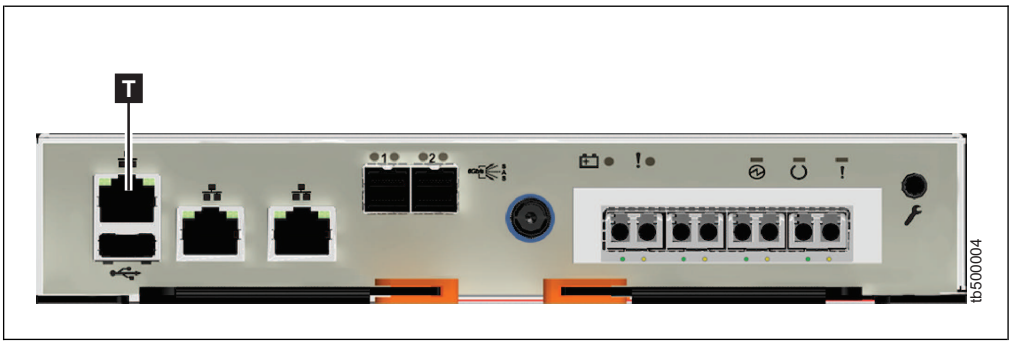


Figure 126. Storwize V5030 technician port

4. Connect an Ethernet cable between the port of the personal computer that is configured in step 2 on page 146 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 it is not available, the system will use the values you provided in step 2 on page 146.
5. After the Ethernet port of the personal computer is connected, open a supported browser and browse to address `http://install`. (If you do not have DCHP, 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.

What to do next

The system can now be reached by opening a supported web browser and pointing it to `http://`*`management_IP_address`*.

Configuring a Storwize V5000 Gen2 system to be NEBS-compliant

For operation in Network Equipment-Building System (NEBS) compliant installations, the Storwize V5000 Gen2 system can be configured to extend its operational temperature range to meet NEBS operating temperature requirements.

Note: The Storwize V5000 Gen2 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 Storwize V5000 Gen2 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 19.
2. For more information about Storwize V5000 Gen2 configuration guidelines and restrictions, see the following website: `http://www-01.ibm.com/support/docview.wss?uid=ssg1S1005422`
3. If a Storwize V5000 Gen2 system is clustered with a Storwize V5000 system, NEBS compliance cannot be enabled. NEBS compliance is not supported on Storwize V5000 systems.

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 143). For more information on installing a 5U expansion enclosure, see "Installing an optional 5U SAS expansion enclosure" on page 31.

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. On the System page, select **Actions** > **Add Enclosures**.
8. Continue to follow the on-screen instructions.

Adding a control enclosure to an existing Storwize V5030 system

A Storwize V5030 system may cluster with another Storwize V5030 system or with a Storwize V5000 system. To add a second control enclosure to an existing Storwize V5030 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 143).

Note: You cannot cluster a second control enclosure with a Storwize V5010 or Storwize V5020 system.

Procedure

To add a second control enclosure to an existing Storwize V5030 system, complete the following steps.

1. Install support rails for the new enclosure.
2. Install the new enclosure in the rack.
3. Connect the canisters to the storage area network.
4. Configure the zoning on the SAN switches. The correct zoning provides a way for the Fibre Channel or FCoE ports to connect to each other.
5. Start the management GUI.
6. Go to **Monitoring** > **System**.
7. On the System page, select **Actions** > **Add Enclosures**.
8. Continue to follow the on-screen instructions.

Appendix A. Accessibility features for Storwize V5000

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 Storwize V5000:

- You can use screen-reader software and a digital speech synthesizer to hear what is displayed on the screen. HTML documents have been tested 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 Storwize V5000 online documentation and its related publications are accessibility-enabled. The accessibility features of the online documentation are described in Viewing information in the information center .

Keyboard navigation

You can use keys or key combinations to perform operations and initiate menu actions that can also be done through mouse actions. You can navigate the Storwize V5000 online documentation from the keyboard by using the shortcut keys for your browser or screen-reader software. See your browser or screen-reader software Help for a list of shortcut keys 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.

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 V5000 IBM Knowledge Center.

The *Statement of Limited Warranty* is included (in hardcopy form) with your product. It can also be ordered from IBM (see Table 2 on page xx for the part number).

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914-499-1900

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IBM-Allee 1, 71139 Ehningen, Germany
Tele: +49 (0) 800 225 5423 or +49 (0) 180 331 3233
Email: halloibm@de.ibm.com

Germany Electromagnetic Compatibility Directive

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Japan Electronics and Information Technology Industries Association Statement

This statement explains the Japan JIS C 61000-3-2 product wattage compliance.

（一社）電子情報技術産業協会　高調波電流抑制対策実施
要領に基づく定格入力電力値：Knowledge Center を参照

This statement explains the Japan Electronics and Information Technology Industries Association (JEITA) statement for products less than or equal to 20 A per phase.

高周波電流規格 JIS C 61000-3-2 適合品

This statement explains the JEITA statement for products greater than 20 A, single phase.

高周波電流規格 JIS C 61000-3-2 準用品

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）
- 換算係数 ：0

This statement explains the JEITA statement for products greater than 20 A per phase, three-phase.

高周波電流規格 JIS C 61000-3-2 準用品

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 ：5（3相、ＰＦＣ回路付）
- 換算係数 ：0

Korean Communications Commission Class A Statement

This explains the Korean Communications Commission (KCC) statement.

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Russia Electromagnetic Interference Class A Statement

This statement explains the Russia Electromagnetic Interference (EMI) statement.

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

rusemi

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Printed in USA

GC27-8581-03