

IBM SAN Volume Controller

Hardware Installation Guide



Note

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

- The general information in [“Notices” on page 143](#)
- The information in the [“Safety and environmental notices” on page xv](#)
- The information in the *IBM Environmental Notices and User Guide* (provided on a DVD)

This edition applies to version 8, release 3, modification 1, and to all subsequent modifications until otherwise indicated in new editions.

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Safety and environmental notices

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

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

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

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



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



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

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

Safety notices and labels

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

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

www.adobe.com/support/downloads/main.html

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.

Caution notices for the system

Ensure that you understand the caution notices for the system.

Use the reference numbers in parentheses at the end of each notice (for example, D005) to find the matching translated notice in *IBM System Storage SAN Volume Controller 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:

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

svc01053

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: The doors and covers to the product are to be closed at all times except for service by trained service personnel. All covers must be replaced and doors closed at the conclusion of the service operation. (C013)



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:

- 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 notices for the system

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

Use the reference numbers in parentheses at the end of each notice (for example, D005) to find the matching translated notice in *IBM System Storage SAN Volume Controller 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)



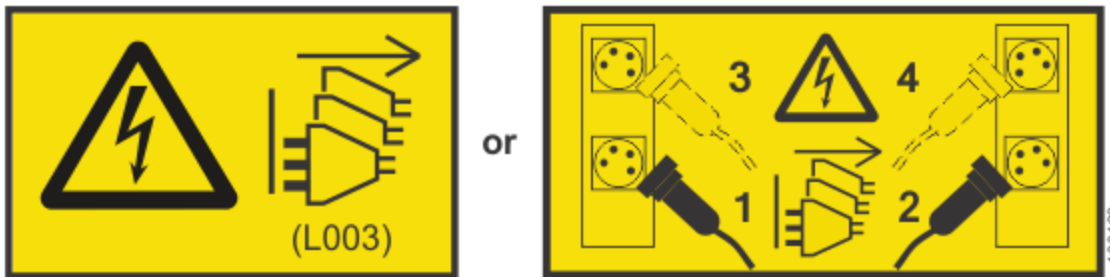
DANGER: Heavy equipment—personal injury or equipment damage might result if mishandled. (D006)



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



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)



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




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

DANGER:



Main Protective Earth (Ground):

This symbol is marked on the frame of the rack.

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

Special caution and safety notices

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

General safety

When you service the SAN Volume Controller, 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 service representatives and 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.

Electrical safety

Observe these rules when working on electrical equipment.



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:

- 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)

Important: Use only approved tools and test equipment. Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents. Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to decrease electrostatic discharges. Do not use this type of mat to protect yourself from electrical shock.

- Find the room emergency power-off (EPO) switch, disconnecting switch, or electrical outlet. If an electrical accident occurs, you can then operate the switch or unplug the power cord quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Disconnect all power before the following activities:
 - Performing a mechanical inspection
 - Working near power supplies
 - Removing or installing main units
- Before you start to work on the unit, unplug the power cord. If you cannot unplug it, ask the customer to power off the wall box that supplies power to the device and to lock the wall box in the off position.
- If you need to work on a device that has exposed electrical circuits, observe the following precautions:
 - Ensure that another person, familiar with the power-off controls, is near you.

Remember: Another person must be there to switch off the power, if necessary.

- Use only one hand when working with electrical equipment that has the power turned on; keep the other hand in your pocket or behind your back.

Remember: There must be a complete circuit to cause electrical shock. By observing the previous rule, you might prevent a current from passing through your body.

- When using testers, set the controls correctly and use the approved probe leads and accessories for that tester.
- Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.

Observe the special safety precautions when you work with very high voltages; these instructions are in the safety sections of maintenance information. Use extreme care when measuring high voltages.

- Regularly inspect and maintain your electrical hand tools for safe operational condition.
- Do not use worn or broken tools and testers.
- *Never assume* that power has been disconnected from a circuit. First, *check* that power has been powered off.
- Always look carefully for possible hazards in your work area. Examples of these hazards are moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the reflective surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and device damage.
- Do not service the following parts with the power on when they are removed from their normal operating places in a device. (This practice ensures correct grounding of the units.)
 - Power supply units
 - Pumps
 - Blowers and fans
 - Motor generators
 - And similar units
- If an electrical accident occurs:

- Use caution; do not become a victim yourself.
- Switch off power.
- Send another person to get medical aid.

Inspecting the system for unsafe conditions

Use caution when you are working in any potential safety hazardous situation that is not covered in the safety checks. If unsafe conditions are present, determine how serious the hazards are and whether you can continue before you correct the problem.

Before you begin

Before you start the safety inspection, make sure that the power is off, and that the power cord is disconnected.

About this task

Each device has the required safety items that are installed to protect users and support personnel from injury. Only those items are addressed.

Important: Good judgment must also be used to identify potential safety hazards due to the attachment of non-IBM features or options that are not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard might be and whether you can continue without first correcting the problem. For example, consider the following conditions and their potential safety hazards:

Electrical hazards (especially primary power)

Primary voltage on the frame can cause serious or lethal electrical shock.

Explosive hazards

A damaged CRT face or a bulging capacitor can cause serious injury.

Mechanical hazards

Loose or missing items (for example, nuts and screws) can cause serious injury.

To inspect each node for unsafe conditions, use the following steps. If necessary, see any suitable safety publications.

Procedure

1. Turn off the system and disconnect the power cord.
2. Check the frame for damage (loose, broken, or sharp edges).
3. Check the power cables by using the following steps:
 - a) Ensure that the third-wire ground connector is in good condition. Use a meter to check that the third-wire ground continuity is 0.1 ohm or less between the external ground pin and the frame ground.
 - b) Ensure that the power cord is the appropriate type, as specified in the parts listings.
 - c) Ensure that the insulation is not worn or damaged.
4. Check for any obvious nonstandard changes, both inside and outside the unit. Use good judgment about the safety of any such changes.
5. Check inside the node for any obvious unsafe conditions, such as metal particles, contamination, water or other fluids, or marks of overheating, fire, or smoke damage.
6. Check for worn, damaged, or pinched cables.
7. Ensure that the voltage that is specified on the product-information label matches the specified voltage of the electrical power outlet. If necessary, verify the voltage.
8. Inspect the power-supply assemblies and check that the fasteners (screws or rivets) in the cover of the power-supply unit are not removed or disturbed.

9. Check the grounding of the network switch before you connect the system to the storage area network (SAN).

Checking external devices

Ensure that you complete an external device check before you install or service the system.

Procedure

To conduct an external device check, complete the following steps.

1. Verify that all external covers are present and are not damaged.
2. Ensure that all latches and hinges are in the correct operating condition.
3. Check the power cords for damage.
4. Check the external signal cables for damage.
5. Check the cover for sharp edges, damage, or alterations that expose the internal parts of the device.
6. Correct any problems that you find.

Checking internal devices

Ensure that you complete an internal device check before you install or service your system.

About this task

To conduct the internal device check, use the following steps.

Procedure

1. Check for any non-IBM changes that were made to the device. If any are present, obtain the “Non-IBM Alteration Attachment Survey,” form number R009, from the IBM branch office. Complete the form and return it to the branch office.
2. Check the condition of the inside of the device for any metal or other contaminants, or any indications of water, other fluid, fire, or smoke damage.
3. Check for any obvious mechanical problems, such as loose components.
4. Check any exposed cables and connectors for wear, cracks, or pinching.

Checking the grounding of a system

Ensure that you understand how to check the grounding of a system.

About this task

To test the grounding of a system, follow the steps for the system configuration that you are using. Before you start, confirm that you know the system model type. Determine the location of the signal cables that are attached to the system.

When you are asked to test the grounding continuity, use your local procedures to initiate the test. The test is successful if the measured resistance is 0.1 ohm or less.



Attention: Some electrical circuits can be damaged if the external signal cables are present at the node while it is undergoing a grounding test.

Procedure

1. Ensure that the node is powered off. See MAP 5350: Powering off a SAN Volume Controller node in the *IBM SAN Volume Controller Troubleshooting Guide*.
2. Disconnect all signal cables from the node, which includes the following cables:
 - The Fibre Channel cables.

- The Ethernet cable or cables.
- 3. Disconnect the power cable from the site power-distribution unit.
- 4. Disconnect **both** input power leads from the site power distribution units.
- 5. Test the grounding continuity between a conductive area on the system frame and the ground pin on the plug of each input-power cable.
- 6. Initiate one of the following procedures after you complete testing the grounding continuity, depending on the outcome of the test.
 - If the test is successful, reconnect any cables that were removed, and power on any system nodes that were powered off.
 - If the test was not successful, ensure that all cables are securely connected. If the test still fails, test the individual system components. Before you test the individual components, remove all cables from the components. If any component test fails, replace the component. After you test each component and replace any failing ones, repeat the complete system test by returning to step “1” on [page xxv](#).
 - Test the system node, from the frame to the ground pin of the input power receptacle.

Emergency power-off shutdown

The system supports emergency power-off (EPO) shutdowns.

Handling static-sensitive devices

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



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

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

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

Environmental notices

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

The [IBM Systems Environmental Notices](#) information 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 guide describes the SAN Volume Controller 2145-SV1 or 2147-SV1 node and the SAN Volume Controller 2145-24F or 2147-24F and 2145-12F or 2147-12F and 2145-92F or 2147-92F expansion enclosures, and provides detailed installation instructions.

The SAN Volume Controller 2147-SV1 is physically identical to the 2145-SV1, but includes three-year Enterprise Class Support and warranty. The SAN Volume Controller 2145-SV1 comes with a one-year warranty; you can purchase additional maintenance agreements for the device.

For the purposes of this guide, references to 2145-SV1 also apply to the 2147-SV1 model.

Use this guide to perform the following tasks:

- Install a new SAN Volume Controller system or extend an existing system.
- Install one or more SAN Volume Controller nodes and SAN Volume Controller expansion enclosures.
- Connect SAN Volume Controller components to a SAN.
- Manage connections to an Ethernet network.
- Verify the completeness of a SAN Volume Controller installation.

The topics within this book provide conceptual, planning, and installation information for the SAN Volume Controller hardware model that was ordered.

Who should use this guide

The intended audience for this guide is the IBM service representative.

This guide should be read by the IBM service representative who is responsible for the initial installation of the SAN Volume Controller.

After the IBM service representative has installed the SAN Volume Controller hardware, use the initialization GUI presented in a web browser of any computer that is directly connected to the technician port to configure the system.

Emphasis

Different typefaces are used in this guide to show emphasis.

The following typefaces are used to show emphasis.

Emphasis	Meaning
Boldface	Text in boldface represents menu items.
Bold monospace	Text in bold monospace represents command names.
<i>Italics</i>	Text in <i>italics</i> is used to emphasize a word. In command syntax, it is used for variables for which you supply actual values, such as a default directory or the name of a system.
Monospace	Text in monospace identifies the data or commands that you type, samples of command output, examples of program code or messages from the system, or names of command flags, parameters, arguments, and name-value pairs.

Publications and related libraries

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

IBM Knowledge Center for SAN Volume Controller

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

[Knowledge Center](#)

SAN Volume Controller library

IBM websites for help, services, and information

Table 1 on page xxviii 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 SAN Volume Controller and other products	http://www.ibm.com/support
IBM Redbooks® publications	http://www.redbooks.ibm.com

Publications in the IBM Knowledge Center

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

Table 2. SAN Volume Controller library		
Title	Description	Link to PDF file
<i>IBM SAN Volume Controller Model SA2 and Model SV2 Quick Start Guide</i>	The guide provides the instructions that the IBM service representative uses to install the hardware for your SAN Volume Controller model.	Hardware Installation Guide [PDF]

Table 2. SAN Volume Controller library (continued)

Title	Description	Link to PDF file
<p><i>IBM Spectrum Virtualize Software Command-Line Interface User's Guide</i></p> <p><i>For IBM Spectrum Virtualize as Software Only, IBM Spectrum Virtualize for Public Cloud, IBM SAN Volume Controller, IBM Storwize V7000, IBM Storwize V5000, IBM Storwize V5000E, IBM Storwize V5100, IBM FlashSystem 5000, IBM FlashSystem 5100, IBM FlashSystem 7200, IBM FlashSystem V9000, IBM FlashSystem 9100, and IBM FlashSystem 9200</i></p>	<p>The guide describes the commands that you can use from the SAN Volume Controller command-line interface (CLI).</p>	<p>Command-Line Interface User's Guide [PDF]</p>

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

Related websites

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

Type of information	Website
SAN Volume Controller support	www.ibm.com/support
Technical support for IBM storage products	www.ibm.com/support
IBM Electronic Support registration	www-01.ibm.com/support/electronicssupport/

Sending your comments

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

To submit any comments, send your comments by email to ibmdocs@us.ibm.com. Include the following information in your email.

- Exact publication title and version
- Page, table, or illustration numbers on which you are commenting
- A detailed description of any information to change

How to get information, help, and technical assistance

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

Information

IBM maintains pages on the web where you can get information about IBM products and fee services, product implementation and usage assistance, break and fix service support, and the latest technical information. For more information, refer to this table.

Table 3. IBM websites for help, services, and information	
Website	Address
IBM home page	http://www.ibm.com
Directory of worldwide contacts	http://www.ibm.com/planetwide
Support for products	www.ibm.com/support

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

Help and service

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

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

If you call from somewhere other than the US or Canada, you must choose the **software** or **hardware** option when you call for assistance. Choose the **software** option if you are uncertain if the problem involves the SAN Volume Controller software or hardware. Choose the **hardware** option only if you are certain the problem solely involves the SAN Volume Controller hardware. When you call IBM to service the product, follow these guidelines for the **software** and **hardware** option:

Software option

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

Hardware option

Provide the serial number and appropriate 4-digit machine type. For SAN Volume Controller, the machine type is 2145.

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

Getting help online

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

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

Before you call

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

- Check all cables to make sure that they are connected.
- Check all power switches to make sure that the system and optional devices are turned on.
- Use the troubleshooting information in your system documentation. The troubleshooting section of IBM Knowledge Center contains procedures to help you diagnose problems.
- Write down the machine type and model (MTM) and the serial number of the machine with the problem. IBM uses this information to engage the appropriate support team.
- Go to the IBM Support website at www.ibm.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

Using the documentation

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

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

Sign up for the Support Line Offering

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

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

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

SAN Volume Controller initial installation overview

The installation and configuration of a SAN Volume Controller system requires the completion of various tasks, some of which are normally completed by an IBM service representative.

Use the installation and configuration procedures in the documents that are listed here. Additional publications are included with some of the hardware components.

When planning, installing, and configuring, have the following SAN Volume Controller information or publications available:

- Information center "Planning" section
- Information center "Configuring" section

See the "Support for SAN Volume Controller (2145)" website for access to SAN Volume Controller publications:

www.ibm.com/support

Planning tasks to complete before installing the SAN Volume Controller

Before you install the SAN Volume Controller, you must complete the following planning tasks or have them completed by an IBM service representative or IBM Business Partner:

1. **Verify that all the system installation requirements have been met.**

Ensure that space and power requirements are met before you begin the installation.

2. **Review SAN fabric and zoning guidelines and develop your system, host systems, and storage controllers plan.**

This task helps to assure a seamless configuration.

3. **Complete all physical planning charts.**

Use the following charts and tables:

- Hardware location chart
- Cable connection table
- Configuration data table

The SAN Volume Controller charts and tables are available at the Support for SAN Volume Controller (2145) website:

www.ibm.com/support

You can save, edit, and share the charts and tables between members of the installation team.

Hardware installation tasks that an IBM service representative performs

To install the SAN Volume Controller hardware, an IBM service representative must complete the following tasks:

1. **Verify that you have all of the required parts for the installation.**

Chapters 2, 3, and 4 of the *IBM SAN Volume Controller Model 2145-SV1 Hardware Installation Guide* include lists of all the parts that are required for installation. The lists include the SAN Volume Controller nodes, optional SAN Volume Controller expansion enclosures, and associated parts.

2. **Install the hardware.**

Chapters 2, 3, and 4 describe the procedures for installing the SAN Volume Controller nodes and optional expansion enclosures.

Configuration tasks

To configure a SAN Volume Controller system, you must complete the following tasks or have them completed by an IBM service representative or IBM Business Partner:

1. Register your product.

To receive product support notifications from IBM, you must register your product. To register your product, click **Register** at this website:

www.ibm.com/support

2. Create a system.

Use the System Initialization GUI presented in a web browser of a computer that is directly connected to the technician port for this procedure, which is completed in two phases:

- a. Use the Create Cluster action on the System Initialization GUI accessed via the technician port of one of the SAN Volume Controller nodes that you have installed to create the system.

This procedure is usually performed by an IBM representative or IBM Business Partner using information that the customer provides.

- b. Follow the Setup wizard in the management GUI to perform the initial system configuration.

Chapter 1. Preparing to install the system

Before installing the system, you must meet the hardware, software, and environmental requirements (including a suitable rack cabinet physical location). Learning about the controls, indicators, operator-information panel, and connectors prepare you for the installation procedures.

The system combines software and hardware into a comprehensive, modular appliance that uses symmetric virtualization.

Symmetric virtualization is achieved by creating a pool of managed disks (MDisks) from the attached storage systems and optional SAS expansion enclosures. Volumes can be created in a pool for use by attached host systems. System administrators can view and access a common pool of storage on the storage area network (SAN) or local area network (LAN). This functionality helps administrators to use storage resources more efficiently and provides a common base for advanced functions.

Each node is an individual server in a SAN Volume Controller clustered system on which the SAN Volume Controller software runs.

The nodes are always installed in pairs; a minimum of one pair and a maximum of four pairs of nodes constitute a *system*. Each pair of nodes is known as an *I/O group*.

Applicable machine types and models

The following machine types and models apply to the SAN Volume Controller .

Table 4. Machine types and models		
Machine type / model	Description	Height in rack units
2145-SV1	SAN Volume Controller node	2U
2147-SV1	SAN Volume Controller node with three-year warranty and Enterprise Class Support	2U
2145-12F	SAN Volume Controller SAS expansion enclosure with one-year warranty for up to 12 3.5-inch SAS drives	2U
2147-12F	SAN Volume Controller SAS expansion enclosure with three-year warranty and Enterprise Class Support for up to 12 3.5-inch SAS drives	2U
2145-24F	SAN Volume Controller SAS expansion enclosure with one-year warranty for up to 24 2.5-inch SAS drives	2U
2147-24F	SAN Volume Controller SAS expansion enclosure with three-year warranty and Enterprise Class Support for up to 24 2.5-inch SAS drives	2U

Table 4. Machine types and models (continued)		
Machine type / model	Description	Height in rack units
2145-92F ,	SAN Volume Controller high-density SAS expansion enclosure with one-year warranty for up to 92 SAS drives	5U
2147-92F	SAN Volume Controller high-density SAS expansion enclosure with three-year warranty and Enterprise Class Support for up to 92 SAS drives	5U

System operating environment requirements

To use the system, you must meet the minimum hardware and software requirements and ensure that other operating environment criteria are met.

Minimum requirements

You must set up your operating environment according to the following requirements:

- At least one pair of system nodes
- A 19-inch rack in which to mount the enclosures

SAN Volume Controller 2145-SV1 node features

The SAN Volume Controller 2145-SV1 system contains:

- At least one Fibre Channel adapter or one 10 Gbps Ethernet adapter
- Optional second, third, and fourth Fibre Channel adapters
- 64 - 256 GB memory
- Two 8-core processors
- Dual redundant power supplies
- Up to 20 expansion enclosures to house optional SAS drives
- iSCSI host attachment 10 Gbps Ethernet electrical and optional 10 or 25 Gbps Ethernet optical
- Support for optional IBM Real-time Compression

Rack cabinet physical location

Before you install the system components, you must ensure that a suitable rack cabinet location is available.

When you plan the rack location and configuration for your system, consider the following key points:

- Plan for the system nodes to be installed in a cabinet above any existing system components.
- Do not place less deep units between deeper ones.
- Allow spare rack unit space for cable runs and service access.

SAN Volume Controller 2145-SV1 front panel controls and indicators

The controls and indicators on the front panel are used for power and to indicate information such as system activity, node failures, and node identification.

Figure 1 on page 3 shows the controls and indicators on the front panel of the SAN Volume Controller 2145-SV1 .

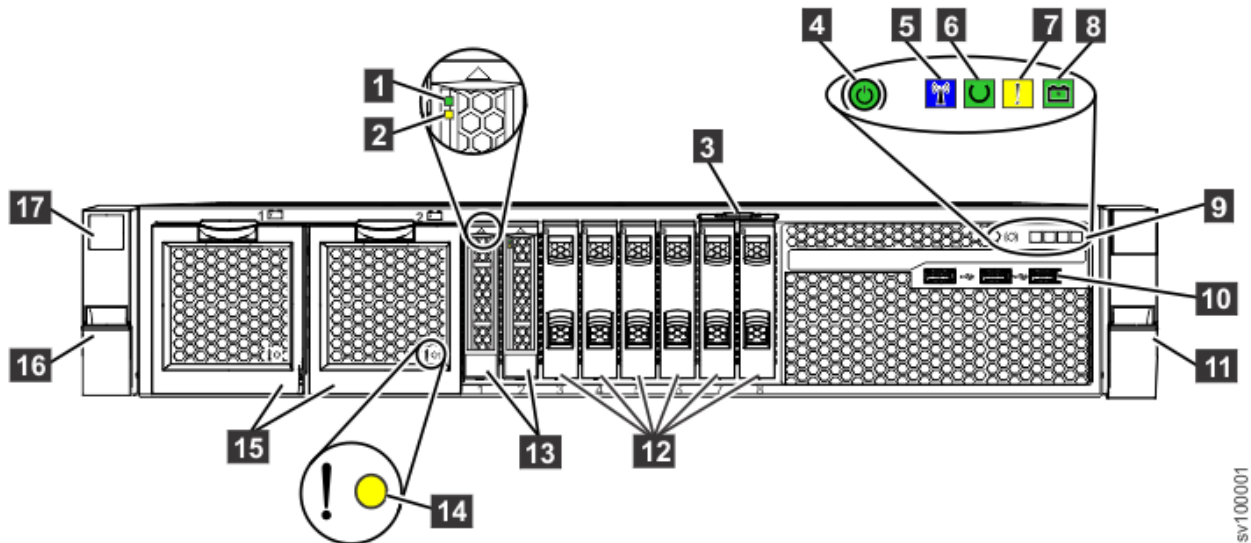


Figure 1. SAN Volume Controller 2145-SV1 front panel

- 1** Boot drive activity LED
- 2** Boot drive status LED
- 3** Pullout tab showing 11S serial number
- 4** Power-control button and power-on LED
- 5** Identify LED
- 6** Node status LED
- 7** Node fault LED
- 8** Battery status LED
- 9** Operator-information panel
- 10** Front USB ports 1-3
- 11** Right side latch (releases chassis to slide out on rails)
- 12** Drive slot fillers (no empty slots can be used)
- 13** Boot drives
- 14** Battery fault LED
- 15** Batteries
- 16** Left side latch (releases chassis to slide out on rails)
- 17** Machine type and model (MTM) and serial number

Boot drive activity LED

The green drive activity LED indicates one of the following conditions.

Off

The drive is not ready for use.

Flashing

The drive is in use.

On

The drive is ready for use, but is not in use.

Boot drive status LED

The amber drive status LED indicates one of the following conditions.

Off

The drive is in a good state or has no power.

Flashing

The drive is being identified.

On

The drive failed.

Battery fault LED

The amber Battery fault LED indicates one of the following conditions.

Off

The battery is functioning normally.

Flashing

The battery is being identified.

On

The battery failed.

SAN Volume Controller 2145-SV1 operator-information panel

The operator-information panel contains buttons and indicators such as the power-control button, and LEDs that provide node information.

Figure 2 on page 4 shows the operator-information panel for the SAN Volume Controller 2145-SV1 .

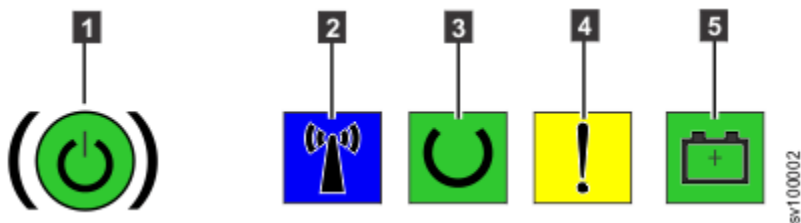


Figure 2. SAN Volume Controller 2145-SV1 operator-information panel

- 1** Power-control button and power-on LED
- 2** Identify LED
- 3** Node status LED
- 4** Node fault LED
- 5** Battery status LED

Power LED

The green power LED indicates one of the following power conditions.

Off

One or more of the following are true:

- No power is present at the power supply input.
- The power supply has failed.

- The LED has failed.

On

The node is turned on.

Blinking

The node is turned off, but is still connected to a power source.

Power button

The power button turns main power on or off for the SAN Volume Controller .

- To turn on the power, press and release the power button.
- To turn off the power, press and release the power button. For more information about what to check before you turn off the SAN Volume Controller node, see "MAP 5350: Powering off a node."



Attention: When the node is operational and you press and immediately release the power button, the SAN Volume Controller writes its control data to its internal disk and then turns off. This process can take up to 5 minutes.

Identify LED

This LED blinks if the Identify button on the back of node is pressed. The Identify LED blinks on both the front and rear panels. Use this feature to find a specific node in the data center. After the SAN Volume Controller system is initialized and initial setup is completed, you can use the Management GUI to identify a node by making the Identify LED on the node blink.

Node status LED

The green Node status LED has the following states:

Off

The SAN Volume Controller software is not running or cannot communicate with this LED.

On

This node is active in a SAN Volume Controller system.

Slow blink

This node is not active. It has Candidate or Service status.

Fast blink

The node is dumping cache and state data to the local disk in anticipation of a system reboot from a pending power-off action or other controlled restart sequence.

Node fault LED

The yellow Node fault LED has the following states:

Off

No warning or critical error is shown in the baseboard management controller (BMC) event log, and no fatal node error is reported by the SAN Volume Controller software.

On

The SAN Volume Controller software indicates a fatal node error.

Blinking

A warning or critical error is shown in the BMC event log.

Battery status LED

The green battery status LED has the following states:

Off

Hardened data is not saved if there is power loss or the SAN Volume Controller software is not running.

On

Battery charge level is sufficient for the hardened data to be saved twice if power to the node is lost.

Slow blink

Battery charge level is sufficient for the hardened data to be saved once if power to the node is lost.

Fast blink

Battery charge level is too low for the hardened data to be saved if power to the node is lost. Batteries are charging.

SAN Volume Controller 2145-SV1 rear-panel indicators

The rear-panel indicators consist of LEDs that indicate the status of the Fibre Channel ports, Ethernet connection and activity, power, and electrical current.

Figure 3 on page 6 shows the rear-panel indicators on the SAN Volume Controller 2145-SV1 back-panel assembly.

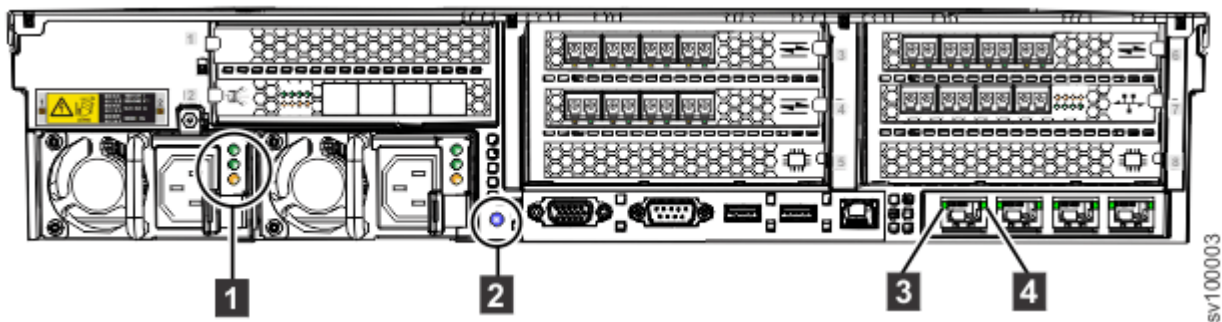


Figure 3. SAN Volume Controller 2145-SV1 rear-panel indicators

- 1 AC, DC, and power-supply fault LEDs
- 2 Identify button and LED
- 3 Ethernet-link LED
- 4 Ethernet-activity LED

Fibre Channel LEDs

The Fibre Channel LEDs indicate the status of the Fibre Channel ports on the SAN Volume Controller 2145-SV1 node.

The SAN Volume Controller 2145-SV1 uses two LEDs per Fibre Channel port, which are located directly under the port. The following figure shows the location of the LEDs.

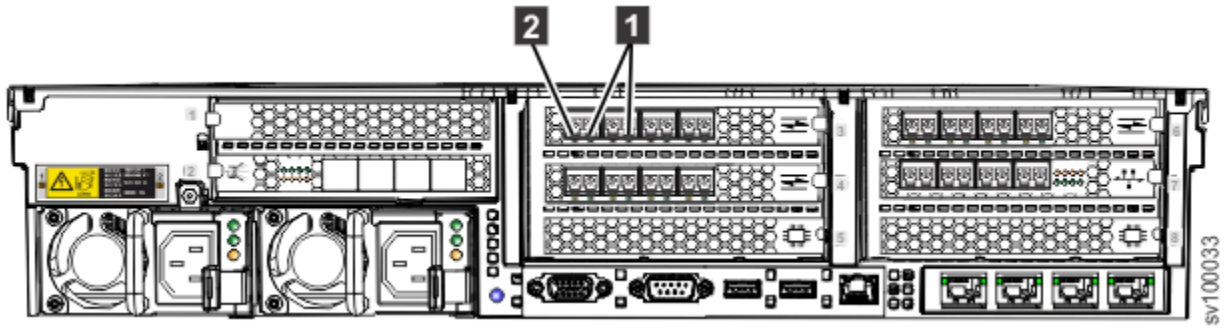


Figure 4. Fibre Channel LEDs

- 1 Green LEDs
- 2 Amber LEDs

The following table lists the link status values for the Fibre Channel LEDs.

Table 5. Link status values for Fibre Channel LEDs		
Green LED	Amber LED	Meaning
Off	Off	One of the following situations is in effect: <ul style="list-style-type: none"> The port is not configured in flex hardware. The port is not active in the current profile. For example, in a 2 x 16 Gb profile, 2 ports are inactive.
Off	On	The port is configured, but the link is not detected at the transport layer. This situation is the result of the port not being connected or of a failed link negotiation with the switch.
On	Off	The link is up and running at the expected port speed. This display does not necessarily imply logical connectivity, that is, completion of FLOGI or FIP.
On	On	The link is up, but running at a degraded speed.

SAS port LEDs

LEDs on the rear of the SAN Volume Controller 2145-SV1 node indicate the status of the SAS port.

The SAN Volume Controller 2145-SV1 uses two rows of LEDs on the optional 12 Gbps SAS adapter to show the status of the SAS port. The LEDs are arranged in the same order as the ports. Those four ports are immediately to the right of the LEDs and are numbered from left to right. The following figure shows the location of the LEDs.

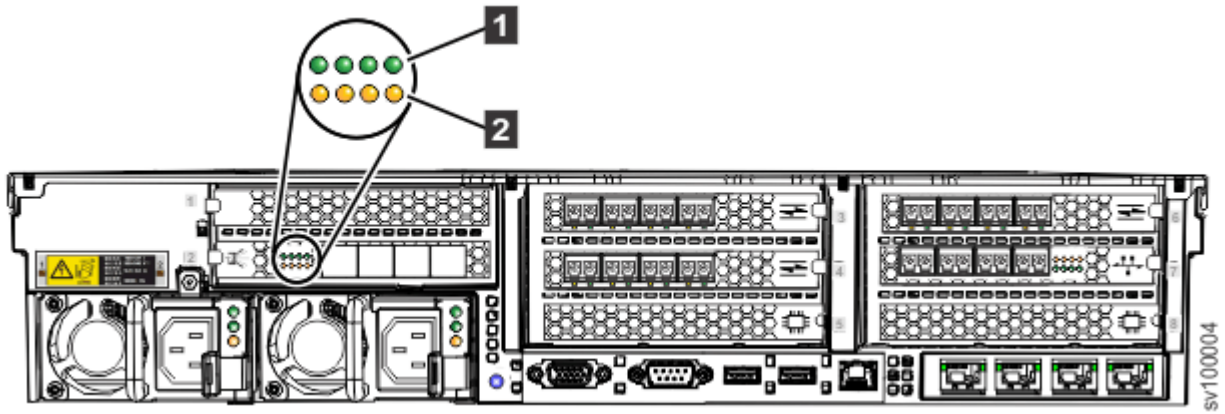


Figure 5. SAS port LEDs

- 1** Link LEDs
- 2** Fault LEDs

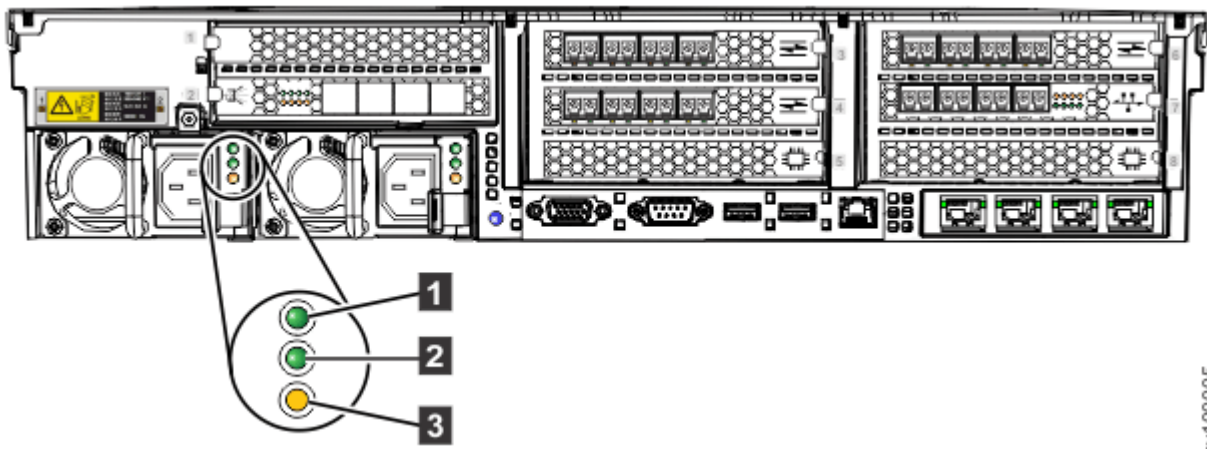
The following table lists the states and meanings for these LEDs.

Table 6. States and meanings for SAS LEDs			
Name	Color	State	Meaning
Link	Green	Off	No link connection on any phy.
		On	A connection exists on at least one phy.
Fault	Amber	Off	No fault. All four phys have a link connection.
		On	One of the following error conditions occurred: <ul style="list-style-type: none"> • 1, 2, or 3 lanes are connected, but not all 4. • Not all four lanes are running at the same speed. • Not all 4 all lanes are connected to the same remote port. • An unsupported device is connected to the port.

AC, DC, and power-supply error LEDs

The AC, DC, and power-supply error LEDs indicate whether the node is receiving electrical current.

The following figure shows the location of the SAN Volume Controller 2145-SV1 AC, DC, and power-supply error LEDs.



sv100005

Figure 6. SAN Volume Controller 2145-SV1 AC, DC, and power-error LEDs

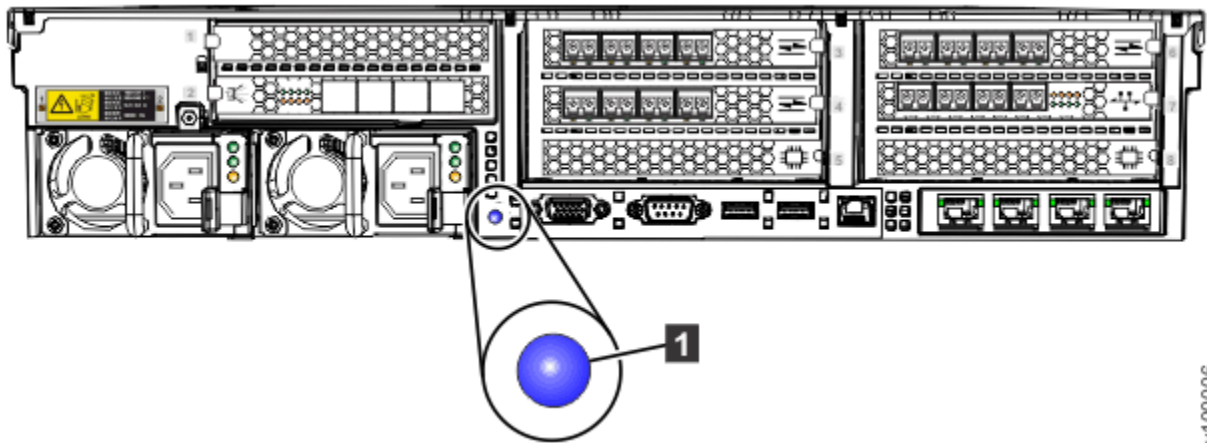
Each of the two power supplies has its own set of LEDs.

- 1** AC input is working properly.
- 2** DC output is working properly.
- 3** A power supply fault occurred in this unit.

Identify button and LED

Identify LEDs are on both the front and the rear of the SAN Volume Controller . An Identify button is on the rear.

The following figure shows the location of the button and LED.



sv100006

Figure 7. Identify button and LED

Press the Identify button on the rear panel to trigger flashing in the Identify LEDs on both the front and rear of the system. Use the flashing to distinguish a particular node when you move from the rear of the rack to the front. You can also trigger flashing from the management GUI by selecting **Monitoring > System**. On the **System -- Detail** page, select the directional arrow next to the node that you want to identify. Select **Node Actions > Identify**.

SAN Volume Controller 2145-SV1 Ethernet port LEDs

Ethernet link and activity LEDs indicate the status of each Ethernet port.

- An Ethernet-link LED indicates that the node is communicating on the network that is connected to the port.
- An Ethernet-activity LED indicates an active connection on the port.

Ethernet ports on the system board

The operator-information panel LEDs refer to the Ethernet ports that are mounted on the system board (Figure 8 on page 10).

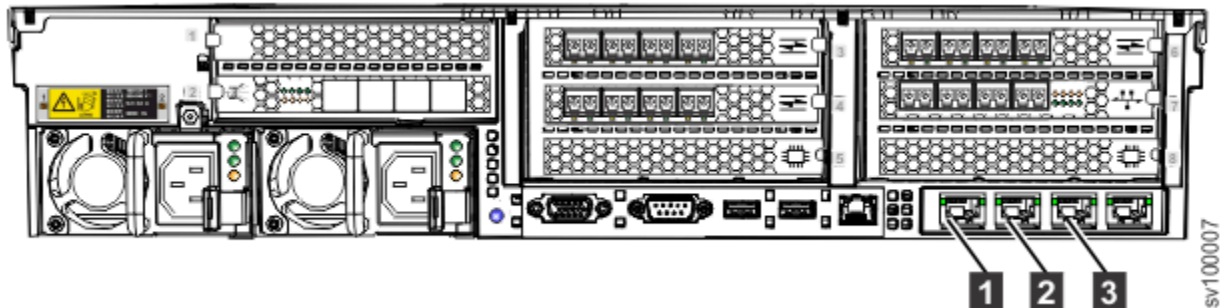


Figure 8. Ethernet ports on the system board

- 1 10 Gbps Ethernet port 1
- 2 10 Gbps Ethernet port 2
- 3 10 Gbps Ethernet port 3

The status of these ports is also indicated by LEDs next to each port (Figure 9 on page 10).

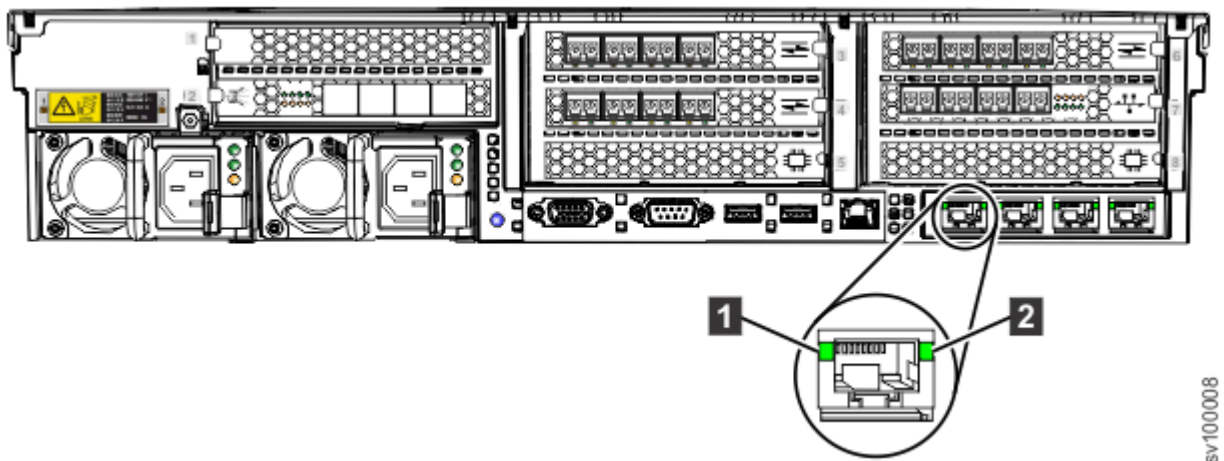


Figure 9. Ethernet port LEDs on the system board

- 1 Ethernet link LED
- 2 Ethernet activity LED

The Ethernet-link LED indicates that the node is communicating on the network that is connected to the port. The Ethernet-activity LED indicates an active connection on the port.

Ethernet ports on a 10 Gbps Ethernet adapter

If the SAN Volume Controller 2145-SV1 is equipped with a 10 Gbps Ethernet adapter, the port activity is not reflected on the activity LEDs of the operator-information panel. The activity of those ports is

indicated by LEDs on the adapter itself, which are visible from the rear of the SAN Volume Controller 2145-SV1 (as shown in Figure 10 on page 11). The adapter has two LEDs per port, arranged above the other. These pairs of LEDs are arranged in the same order as the ports.

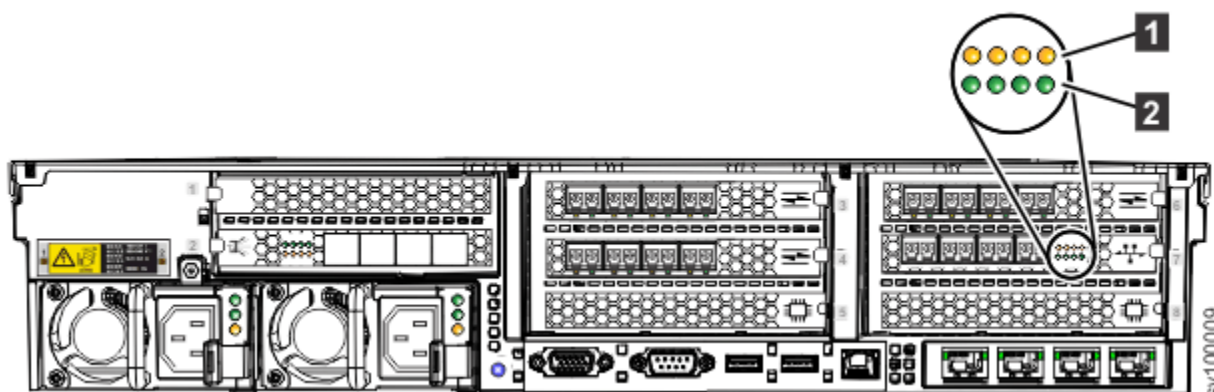


Figure 10. Ethernet port LEDs on a 10 Gbps Ethernet adapter

- 1 10 Gbps Ethernet fault LEDs.
- 2 10 Gbps Ethernet link LEDs.

Ethernet ports on a 25 Gbps Ethernet adapter

The SAN Volume Controller 2145-SV1 node can support optional 2-port 25 Gbps Ethernet adapters. The system can support RoCE and iWARP networking adapters only for 25 Gbps iSCSI connectivity. LEDs indicate the activity on the ports on each adapter; however, the location and meaning of the LEDs differs, depending on the type of 25 Gbps card that is installed.

Figure 11 on page 11 shows an example of the RoCE networking adapter. Each port on the 2-port 25 Gbps Ethernet adapter has one bi-color LED that indicates the status of the link.



Figure 11. 25 Gbps Ethernet host interface adapter ports and LEDs (RoCE)

Table 7 on page 11 summarizes the possible values of the LEDs.

Table 7. LED indicators for 25 Gbps Ethernet host interface adapter (RoCE)		
Color	State	Meaning
None	Off	The port is not active.
Green	Solid	The port has a valid link with no active traffic.
Green	Flashing	The port has a valid link with active traffic.
Yellow	Flashing	Indicates a problem with the link.

Figure 12 on page 12 shows the 25 Gbps Ethernet host interface adapter (iWARP). Each port has a single LED that indicates the status of the port and link.



Figure 12. 25 Gbps Ethernet host interface adapter ports and LEDs (iWARP)

Table 8 on page 12 summarizes the possible values of the LEDs on the 25 Gbps Ethernet host interface adapter (iWARP).

Table 8. LED indicators for 25 Gbps Ethernet host interface adapter (iWARP)		
Color	State	Meaning
Off	Off	The ports and links are not active.
Green	Solid	The ports have a valid link.

SAN Volume Controller 2145-SV1 connectors

The SAN Volume Controller 2145-SV1 includes multiple external connectors for data, video, and power.

Figure 13 on page 12 shows the external connectors on the SAN Volume Controller 2145-SV1 back panel assembly.

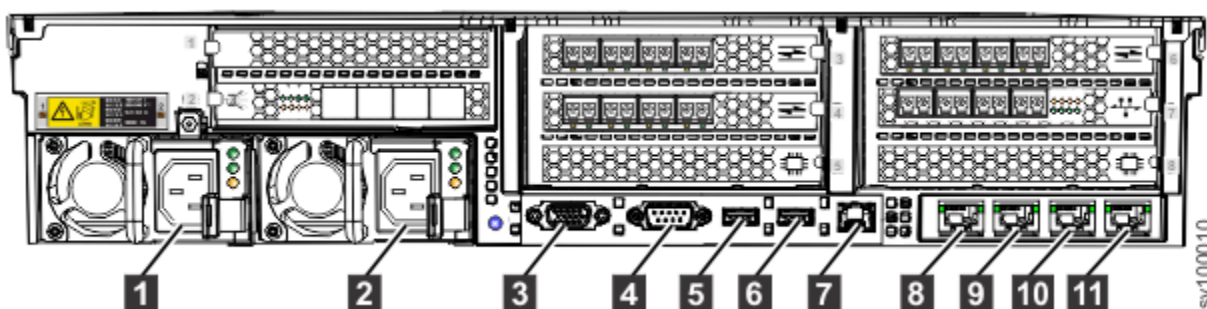


Figure 13. Connectors on the rear of the SAN Volume Controller 2145-SV1

- 1** Power supply 1
- 2** Power supply 2
- 3** Video port
- 4** Serial port (not used)
- 5** Rear USB port 1
- 6** Rear USB port 2
- 7** Unused Ethernet port
- 8** 10 Gbps Ethernet port 1
- 9** 10 Gbps Ethernet port 2
- 10** 10 Gbps Ethernet port 3
- 11** Technician port (Ethernet)

Figure 14 on page 13 shows the type of connector that is on each power-supply assembly.

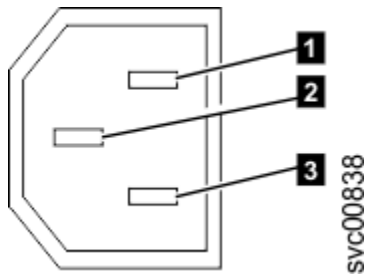


Figure 14. Power connector

- 1 Neutral
- 2 Ground
- 3 Live

Note: Optional host interface adapters provide extra connectors for 10 Gbps Ethernet, Fibre Channel, or SAS.

SAN Volume Controller 2145-SV1 ports used during service procedures

The SAN Volume Controller 2145-SV1 contains a number of ports that are used during service procedures.

The following figure shows ports that are used during service procedures.

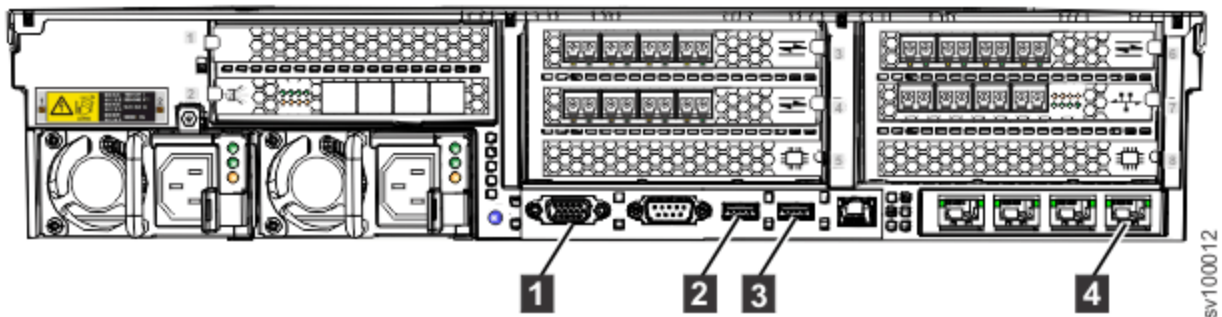


Figure 15. SAN Volume Controller 2145-SV1 service ports

- 1 VGA port
- 2 Rear USB port 1
- 3 Rear USB port 2
- 4 Technician port (Ethernet)

Any of these ports other than the Technician port can be used during normal operation. Connect a device to the Technician port only when you are directed to do so by a service procedure or by your IBM service representative.

SAN Volume Controller 2145-SV1 unused ports

The SAN Volume Controller 2145-SV1 includes one Ethernet port and one serial port that are not used.

The following figure shows the Ethernet port that is not used during service procedures or normal operation. This port is disabled in software to make the port inactive.

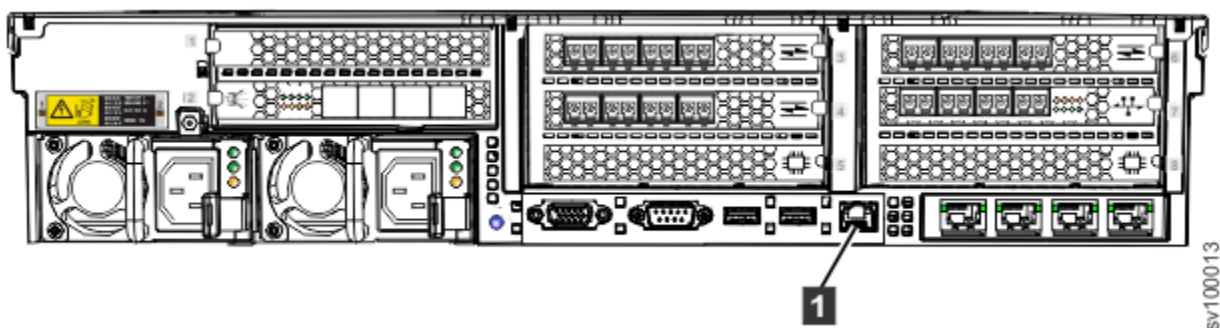


Figure 16. SAN Volume Controller 2145-SV1 unused Ethernet port

1 Unused Ethernet port

Although not disabled, the serial port is also not used in normal operation.

SAN Volume Controller 2145-SV1 Fibre Channel and Ethernet port numbers

Fibre Channel port numbers for the SAN Volume Controller 2145-SV1 vary, depending on how many network adapters are installed, and in which slots. Port numbers also depend on the number and configuration of the Ethernet adapters.

Table 9 on page 14 lists the SAN Volume Controller 2145-SV1 expansion slots and the adapters that can be installed.

Table 9. PCIe expansion slots in which an adapter can be used	
PCIe expansion slot number	Adapter
1	Not used
2	12 Gbps SAS adapter
3	16 Gbps Fibre Channel adapter, 10 Gbps Ethernet adapter, or 25 Gbps Ethernet adapter*
4	16 Gbps Fibre Channel adapter, 10 Gbps Ethernet adapter, or 25 Gbps Ethernet adapter
5	Compression Accelerator
6	16 Gbps Fibre Channel adapter, 10 Gbps Ethernet adapter, or 25 Gbps Ethernet adapter
7	16 Gbps Fibre Channel adapter, 10 Gbps Ethernet adapter, or 25 Gbps Ethernet adapter
8	Compression Accelerator
1. Slots 3, 4, 6, and 7 can contain a 10 Gbps Ethernet adapter, but only one 10 Gbps Ethernet adapter is supported. 2. Slots 3, 4, 6, and 7 can contain a 25 Gbps Ethernet adapter; however, the system only supports three 25 Gbps Ethernet adapters.	

Figure 17 on page 15 shows the physical Fibre Channel (FC) port numbers when the 10 Gbps Optical Ethernet adapter is configured for Fibre Channel over Ethernet (FCoE) communications.

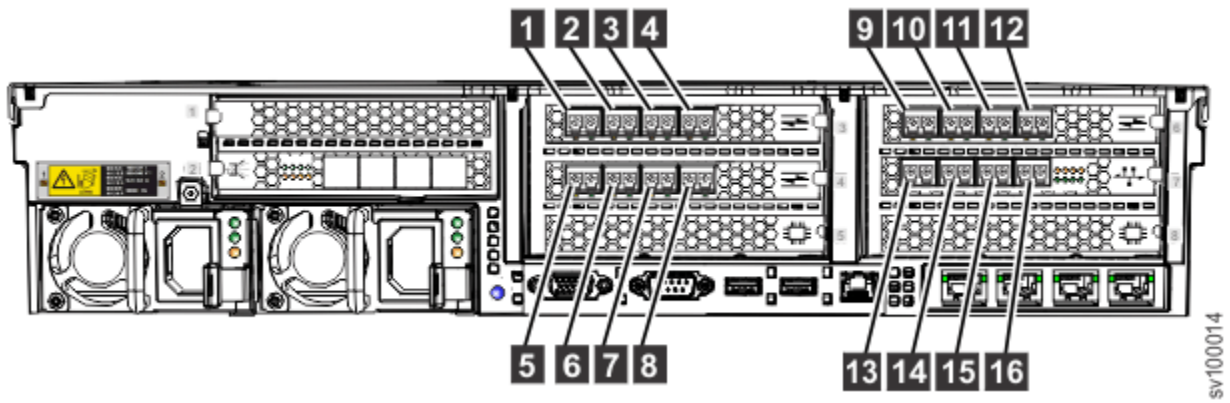


Figure 17. Fibre Channel port numbers in a typical configuration

1 - 16 Fibre Channel ports 1-16

Figure 18 on page 15 shows the Ethernet port numbers for the SAN Volume Controller 2145-SV1 when the 10 Gbps Optical Ethernet adapter is configured for iSCSI communications.

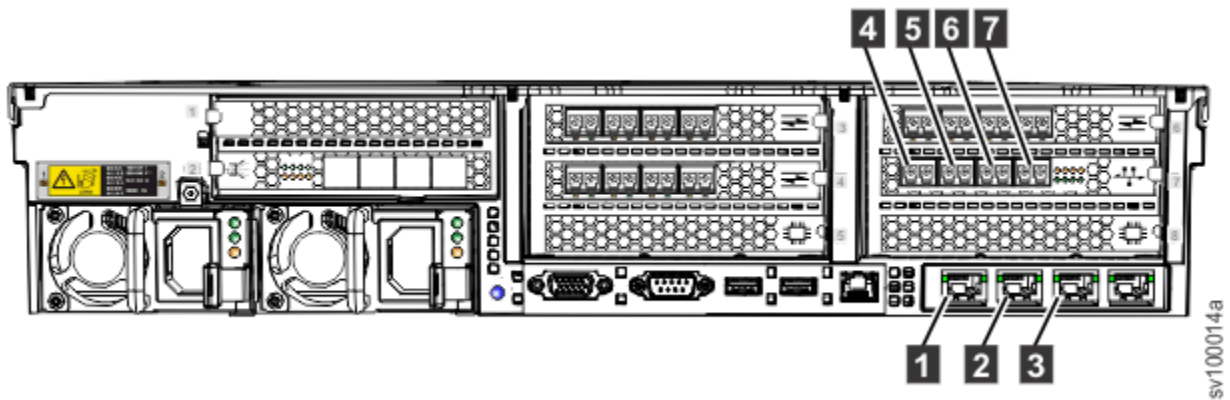


Figure 18. Ethernet port numbers for iSCSI communication (10 Gbps Ethernet adapter)

1 - 3 10 Gbps Ethernet ports 1-3 (onboard)

4 - 7 10 Gbps optical Ethernet ports 4-7

Figure 19 on page 15 shows the Ethernet port numbers for the SAN Volume Controller 2145-SV1 when two 2-port 25 Gbps Optical Ethernet (RoCE) adapters are configured. Ethernet ports 4 and 5 are located in the Ethernet adapter that is installed in the lowest PCIe expansion slot number.

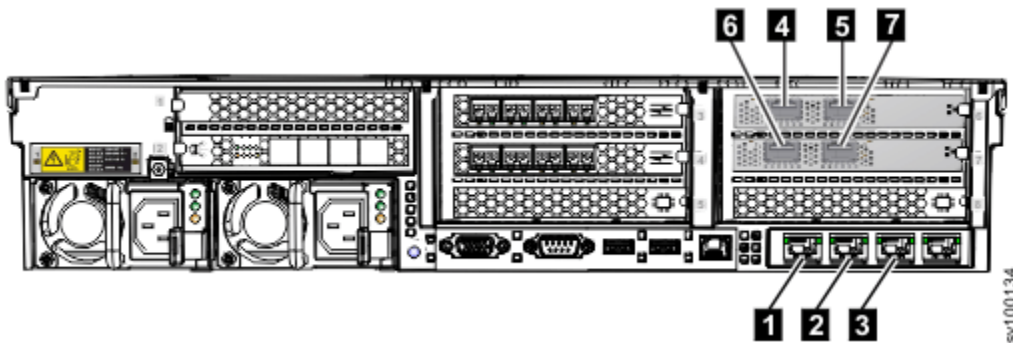


Figure 19. Ethernet port numbers for 25 Gbps adapter

1 - 3 10 Gbps Ethernet ports 1-3 (onboard)

4 - 7 25 Gbps optical Ethernet ports 4-7

Chapter 2. Installing the SAN Volume Controller 2145-SV1 hardware

There are several steps that you must complete to prepare, and then install the system hardware.

Before you begin

Note: If you are adding a new I/O group to an existing system, there is no need to turn off the existing, operating system nodes.

Procedure

To install the system hardware, complete the following steps.

1. Prepare for the hardware installation by confirming that you have all the planning information and parts that you require.
2. Install the support rails for the nodes.
3. Install the cable-management arms for the nodes.
4. Install the nodes.
5. Optionally install the expansion enclosures.
6. Connect the Fibre Channel and Ethernet cables to the nodes.
7. Optionally connect the nodes to the expansion enclosures.
8. Verify that the nodes are operational.

Results

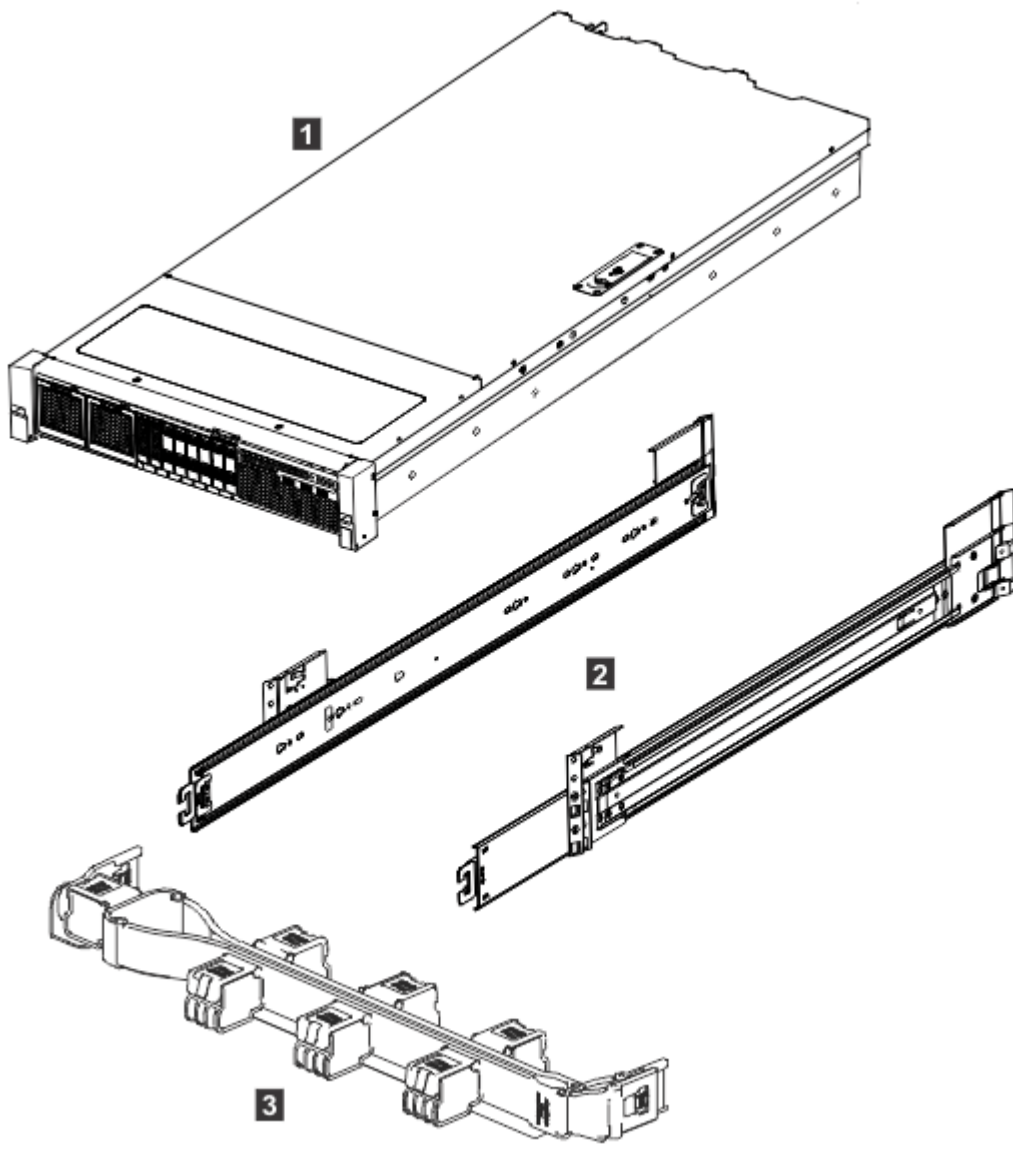
After you finish these steps, the hardware installation is complete. The customer is responsible for all configuration tasks.

Preparing for the SAN Volume Controller 2145-SV1 hardware installation

You must prepare for the installation of the SAN Volume Controller .

Before you begin

[Figure 20 on page 18](#) shows the major hardware components required.



sv100015

Figure 20. Parts provided for SAN Volume Controller 2145-SV1 hardware installation in a rack

- 1 SAN Volume Controller 2145-SV1 node
- 2 SAN Volume Controller 2145-SV1 support rails
- 3 SAN Volume Controller 2145-SV1 cable-management arm assembly

Country-specific power cables come with the SAN Volume Controller node. These cables are intended for your country-specific power sockets.

Before you start the installation, verify that all the parts that were ordered have been received and that all the optional features are fitted. Verify that you know the quantity of nodes and optional features that were ordered.

A label on the main shipping box indicates the features that were shipped.

Note: You must install at least two SAN Volume Controller nodes.

Procedure

To prepare for installation, complete the following steps.

1. Ensure that you have everything you need for installation, including the planning tables and charts.

You can obtain the planning tables and charts from www.ibm.com/support. The planning information provides guidelines for completing the planning tables and charts. These tables include the location of hardware, cable connection, and configuration data information that you need to complete the installation procedures. Go no further with these instructions until you are satisfied that all the information is correct and valid.

2. The label on the main shipping box indicates features that were shipped. Make sure that the contents and quantity match the order.

The following feature codes are included:

- Each of the following:
 - Feature code 3001: initial SAN Volume Controller 2145-SV1 node, quantity 1
 - Feature code 3002: additional SAN Volume Controller 2145-SV1 node, quantity 1
 - Optional feature code 3003: spare SAN Volume Controller 2145-SV1 node.
 - Optional features as listed in "Optional features" in the documentation.
 - One of the following country-specific SAN Volume Controller 2145-SV1 power cable feature codes: 9716, 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9725, 9726, 9731, 9732, 9733, 9734, 9735, 9736, or 9737.
3. Check that the correct part set has been shipped for the feature codes. Unless otherwise stated, the feature code contents are in the main box.
 - Feature codes 3001 and 3002 ship the same parts. Verify that you have the listed parts:
 - SAN Volume Controller 2145-SV1 node
 - Part number 01EJ334: SAN Volume Controller 2145-SV1 rail kit, quantity 1
 - Part number 01EJ335: SAN Volume Controller 2145-SV1 Cable-management arm assembly, quantity 1
 - The support rail kit contains a number of components within its box. Verify that you have the following items:
 - One left side rail
 - One right side rail
 - Four M6 screws
 - Feature codes 9716, 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9725, 9726, 9731, 9732, 9733, 9734, 9735, 9736, and 9737 each ship a single power cable. Use the power plug that is appropriate to your location unless you are connecting to a rack-mounted power distribution unit.
 - SAN Volume Controller publications: ship group (one box of publications per pair of 2145-SV1 nodes):
 - SAN Volume Controller Publications CD
 - *SAN Volume Controller Read First*
 - *IBM Systems Safety Notices* CD
 - *IBM SAN Volume Controller Model 2145-SV1 Hardware Installation Guide*
 - *SAN Volume Controller License Information for SAN Volume Controller* CD
 - *SAN Volume Controller Statement of Limited Warranty* flyer
 - *Environmental Notices* CD
 - IBM license information for machine code
 - Other miscellaneous flyers

If feature codes 5305, or 5325 are not ordered for Fibre Channel connection, you must supply your own fiber-optic Fibre Channel cables. Make sure that four cables per adapter are available.

If feature code AH12 is ordered, and feature codes 5305 and 5325 or ACSS are not ordered for Ethernet connection, the customer must supply their own OM2 or OM3 fiber-optic cables. Make sure that four cables per node are available.

At least one network adapter feature code AH14 or AH12 is fitted in each 2145-SV1 .

Note: Part numbers and feature codes are subject to change between SAN Volume Controller releases. The numbers that are listed here might not always reflect what you receive.

Installing the SAN Volume Controller 2145-SV1

You must complete several tasks to install SAN Volume Controller 2145-SV1 node.

About this task

Installing a SAN Volume Controller 2145-SV1 node consists of the following tasks:

1. Spitting the support rails, attaching one part to the node and the other to the rack.
2. Installing the node in the rack, rejoining the support rails.
3. Installing the cable-management arm in the rack cabinet.

Installation guidelines

Before you install the support rails for the node, review the following guidelines.

- Do not install a unit in a rack where the internal-rack ambient temperature exceeds the maximum manufacturer-recommended ambient temperature for *any* of 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.
- Ensure that the equipment is connected properly to the supply circuit so that the circuits do not overload and compromise the supply wiring or overcurrent protection.
- Plan the device installation by starting at the bottom of the rack cabinet to ensure that the rack is stable and cannot tip over.
- Install the heaviest device in the bottom of the rack cabinet.

Installing the support rails: 2145-SV1

You must install the support rails before you install the enclosure in a rack.

Procedure

To install the support rails, complete the following steps.

1. Locate the hardware that is used to install the rails, including the rail-mounting pins, M5 screws, and M5 washers.
Set the hardware aside for use later in the installation process.
2. Select an available 2U space (depending on the node you are installing) in your rack to install your node, as shown in [Figure 21 on page 21](#).

Note: When you install the enclosure, be sure to install the slide rails in the bottom U of the 2U area in the rack.

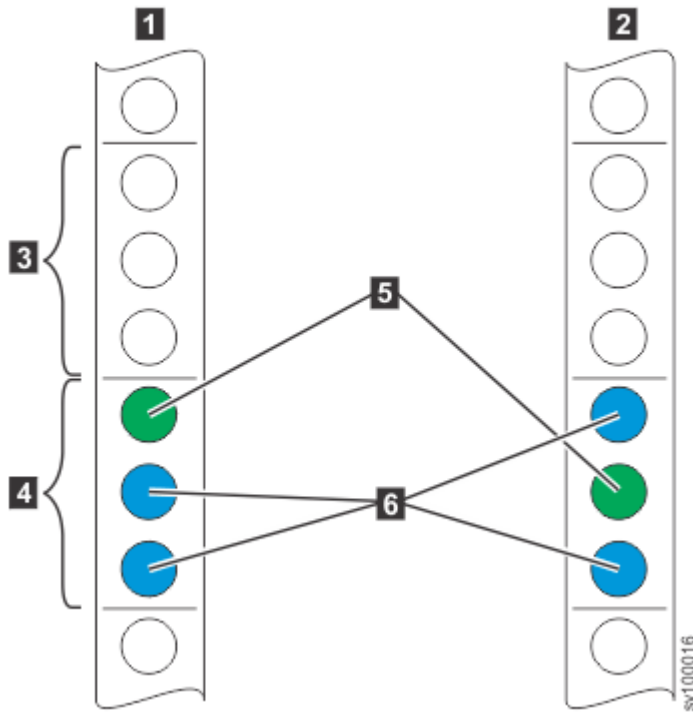


Figure 21. Identifying rack space

- 1** Front
- 2** Rear
- 3** Upper U (for 2U system)
- 4** Lower U
- 5** Location of optional screws for securing enclosure to rack
- 6** Location of rail-mounting pins

3. Detach the inner section of one 3-part rail, as shown in [Figure 22 on page 21](#).

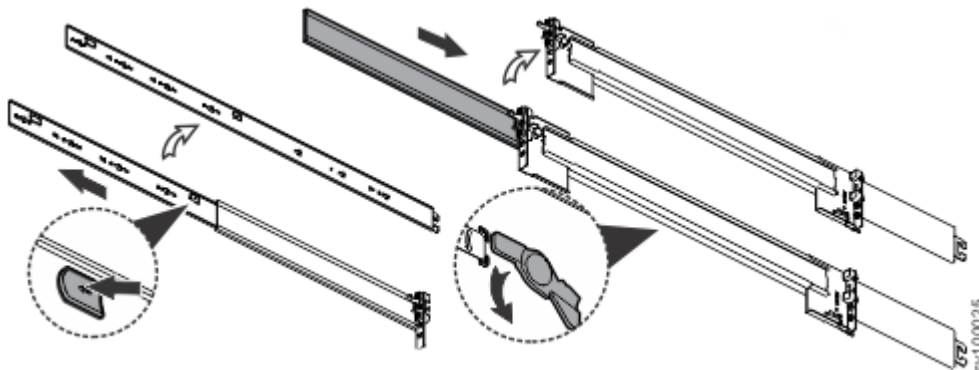


Figure 22. Detaching the inner rail section

- a) Pull the tab forward.
 - b) Turn the rotation plate upward.
 - c) Slide the middle section back.
4. Install the inner section of the rail onto the chassis.

No screws are required. Fit the holes in the inner rail section over the heads of the pins on the side of the appliance, then slide the rail toward the rear of the appliance to lock, as shown in [Figure 23 on page 22](#).

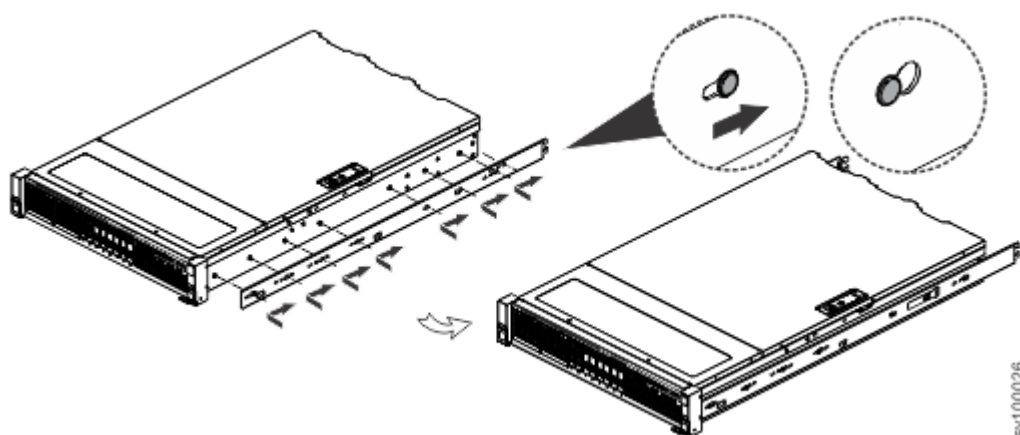


Figure 23. Attach inner rail section to chassis

5. Repeat steps “3” on page 21-“4” on page 21 for the opposite rail.
6. Install the outer section of the rail to the front frame, as shown in the following figure.

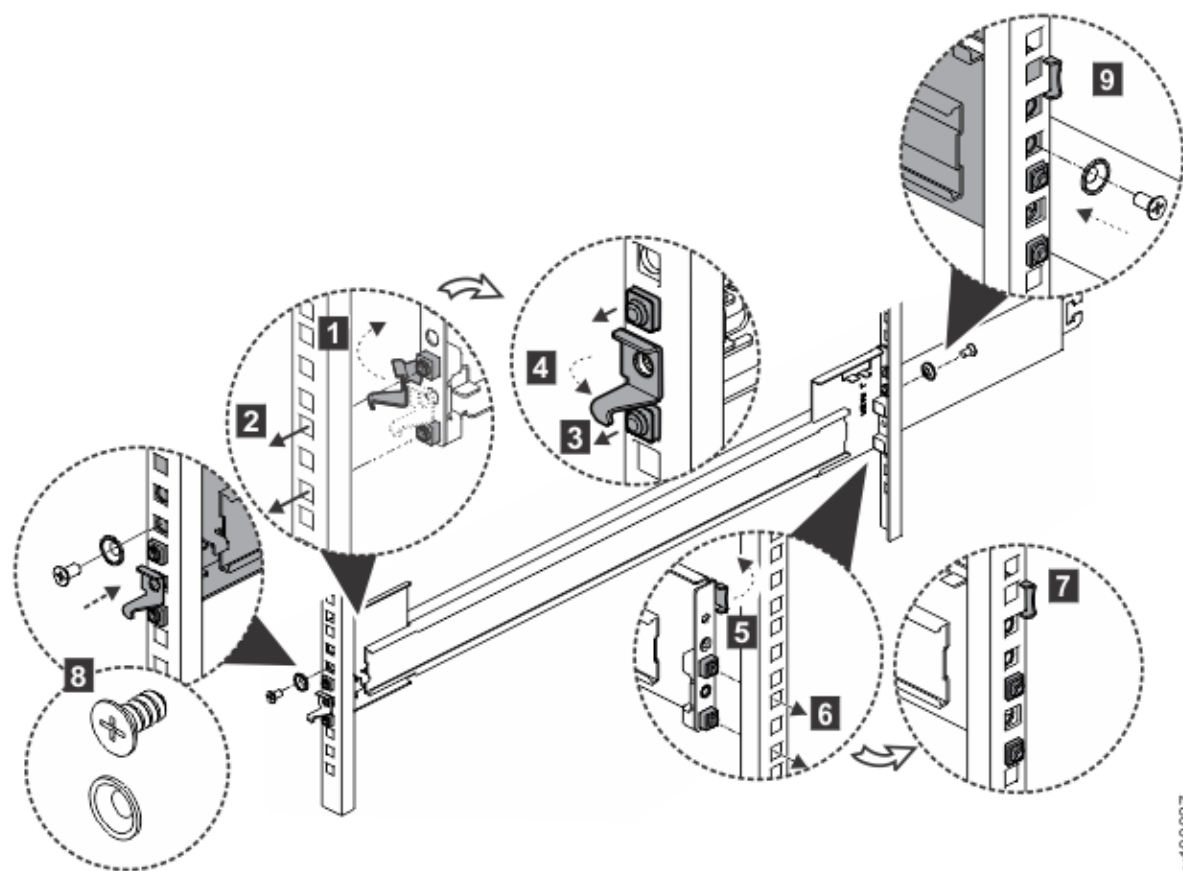


Figure 24. Install the bracket assembly to the frame

- a) Open the front latch hook (1).
- b) Fit the tool-less rail-mounting pin to the front rack post (2).
- c) Click the rail-mounting pin into place (3).
- d) Close the front latch hook (4).
7. Install the outer section of the rail to the rear frame, as shown in Figure 24 on page 22.
 - a) Open the rear latch hook (5).

- b) Click the rear bracket into place on the rear frame (6).
- c) Close the rear latch hook (7).
8. Using an M5 x 10 mm screw and M5 washer, anchor the front bracket to the front frame (8).
9. Using an M5 x 10 mm screw and M5 washer, anchor the rear bracket to the rear frame (9).
10. Repeat steps “6” on page 22-“9” on page 23 for the opposite rail.

Installing the enclosure in a rack

After you install the support rails, you can install the enclosure in the rack.

Before you begin



CAUTION: To avoid any hazard from the rack tipping forward when devices are installed, observe all safety precautions for the rack into which you are installing the device.



CAUTION: The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb). It takes two persons to safely lift this part or unit. (C009)

Procedure

To install the enclosure in the rack, complete the following steps.

1. Fully extend the middle section of the rail from the outer section on both sides and lock it in place.

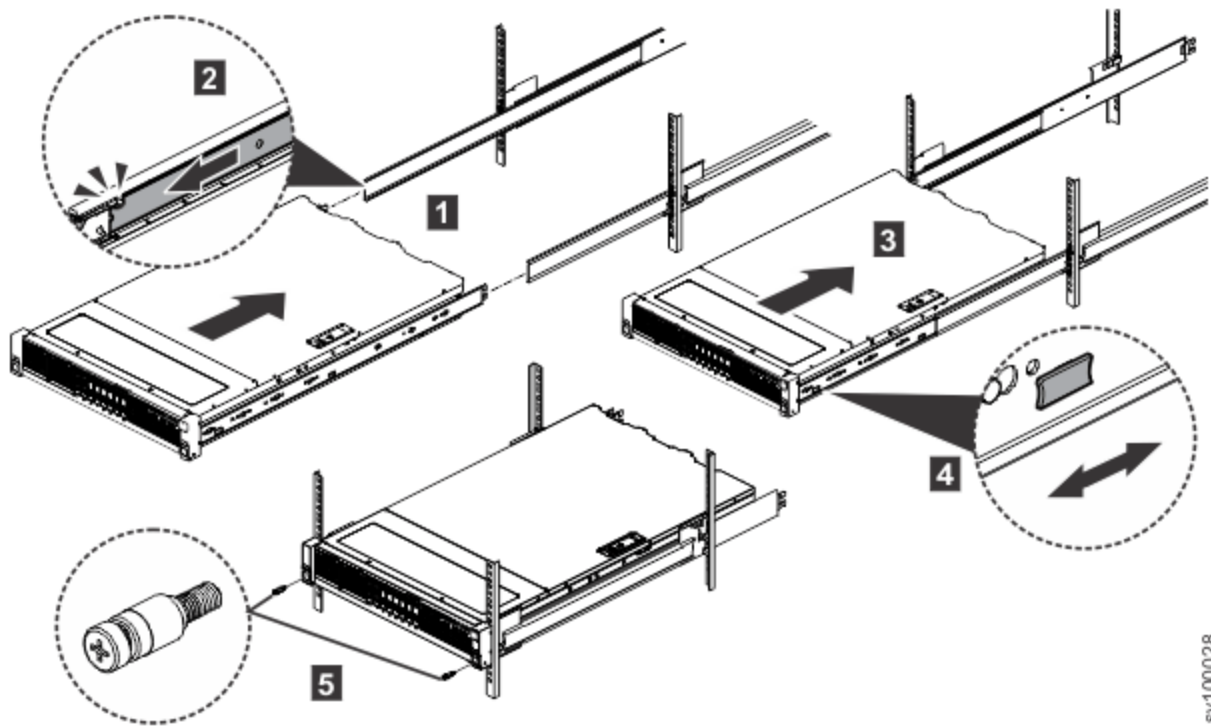


Figure 25. Insert the chassis into the rack

2. Make sure that the ball bearing retainer is located at the front of the middle section of the rail.
3. With the help of multiple persons, lift the chassis until the inner section of the rail (attached to the chassis) is aligned with the middle section (1).
4. Insert the chassis and inner member into the middle section of the rail until it stops (2, 3).
5. Pull or push the release tab to unlock (4), and then retract the chassis into the rack.
6. If you ship the rack with the chassis attached, tighten the shipping screws in the front of the chassis before you ship the rack (5).

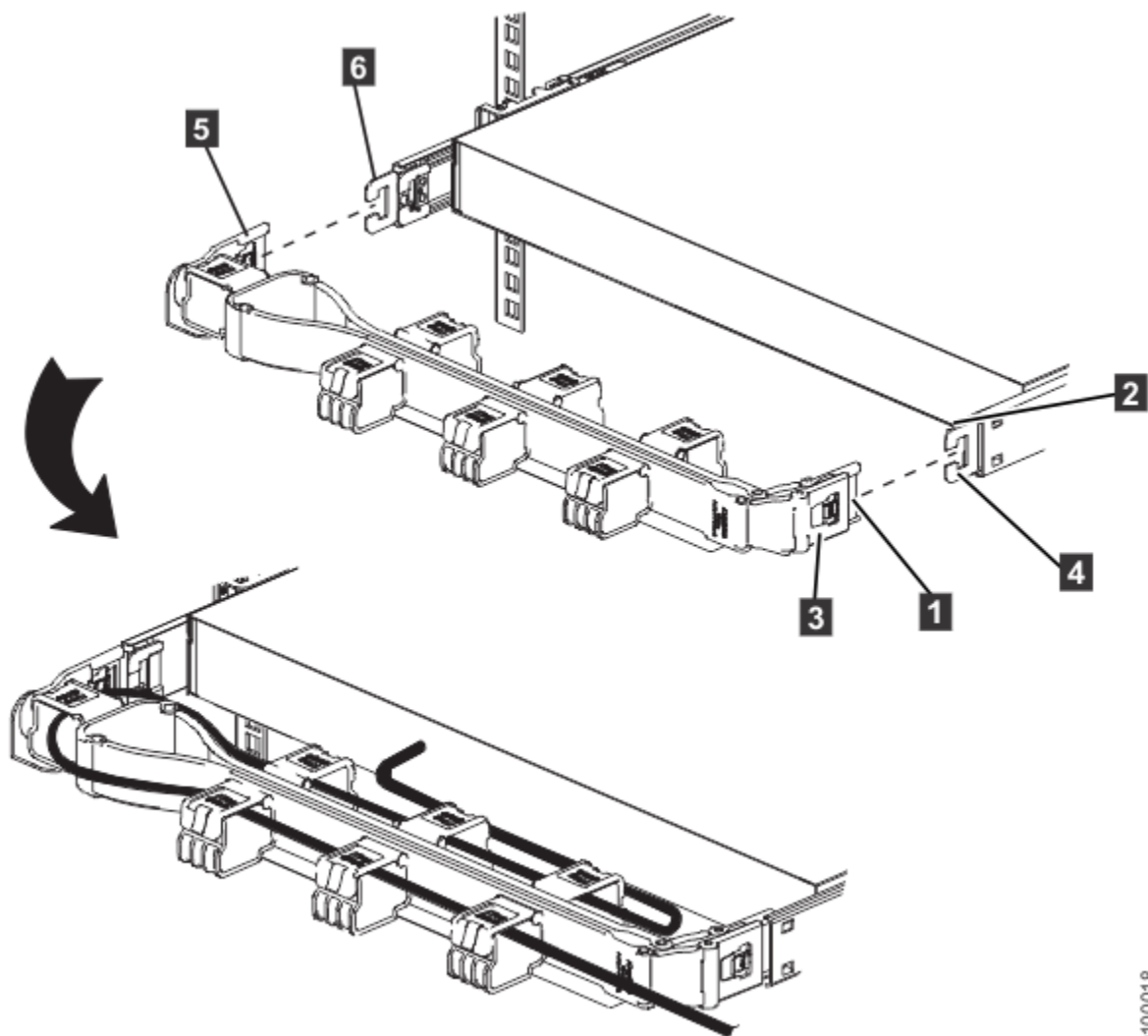
Installing the cable management arm assembly

The enclosure uses a cable management arm (CMA) assembly to route and secure power and data cables.

About this task

- The CMA assembly can be installed on either side of the node.
- The inner rail of the CMA assembly must be on top to work correctly.

Figure 26 on page 24 shows the parts that are used to install the CMA assembly.



sv100018

Figure 26. Parts for installing the CMA assembly

- 1 CMA inner connector
- 2 CMA connector base on inner member
- 3 CMA outer connector
- 4 CMA connector base on outer member
- 5 CMA connector beside the center body
- 6 CMA connector base on outer member



CAUTION: The loop strap must be tied to the CMA crossbar for transportation. Remove the loop strap after the system arrives at its final destination.

Procedure

To install the CMA assembly, complete the following steps.

1. Optional: You might need to reverse the left-right orientation of the CMA to accommodate the routing of cables that lead to the node. To reverse the orientation of the arm, complete the following steps:
 - a) Press the button marked "PUSH" in [Figure 27](#) on page 25.

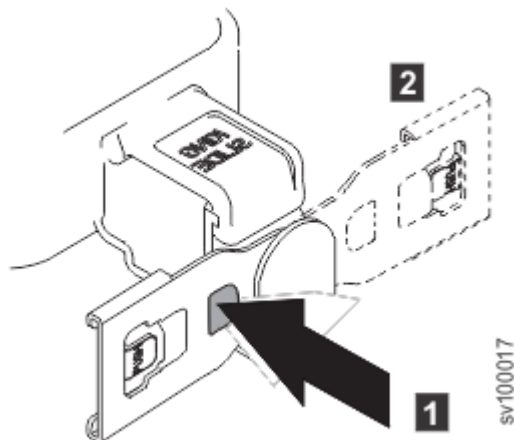


Figure 27. Reversing the orientation of the assembly

- b) Turn the connector 180 degrees.
2. Install the CMA inner connector (1) onto the CMA connector base on the inner member (2) as in the following figure.

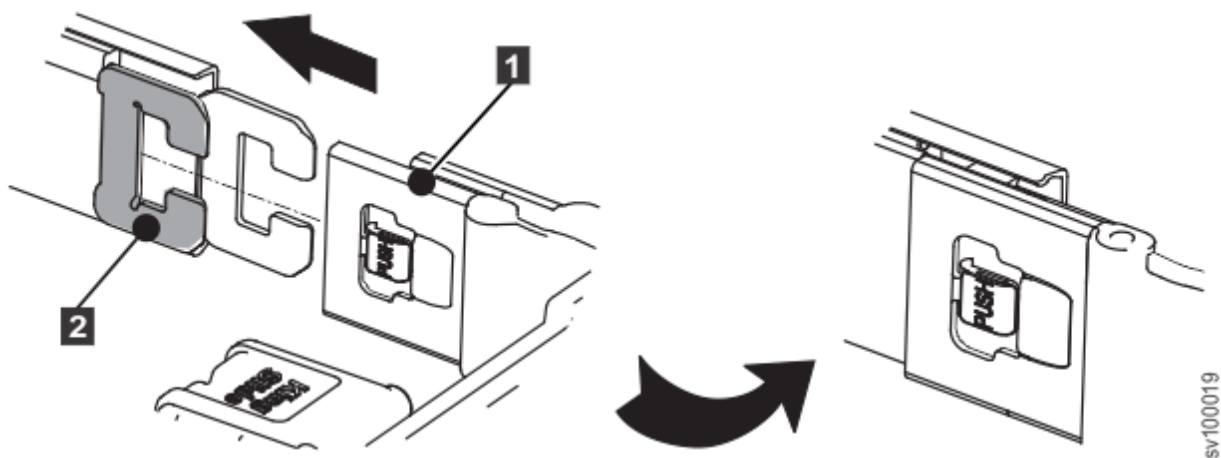


Figure 28. Install the inner member

3. Install the CMA outer connector (3) onto the CMA connector base on the outer member (4), as shown in the following figure.

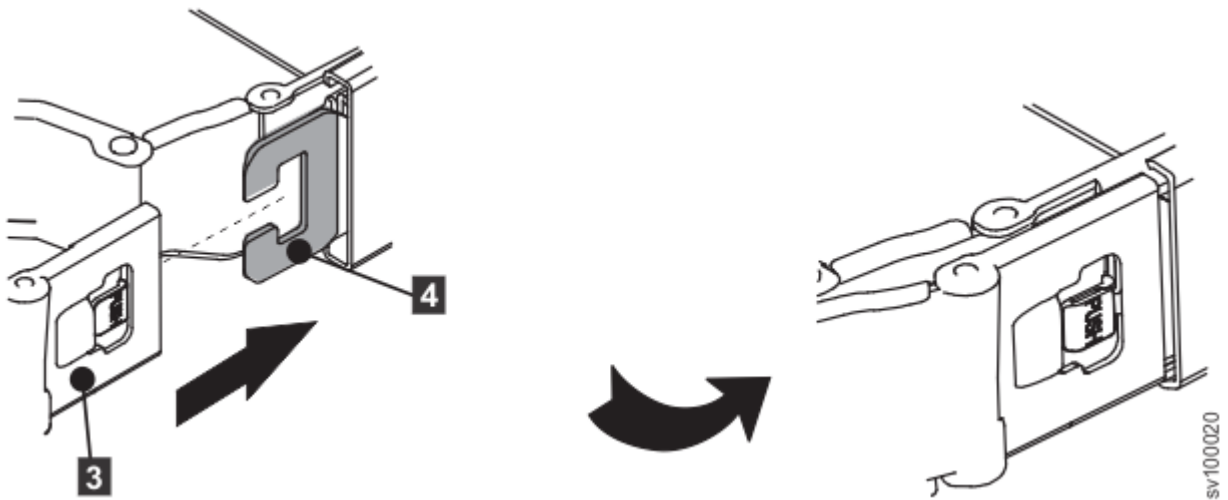


Figure 29. Install the outer member

4. Install the opposite CMA connector (5) to the opposite outer CMA connector base (6) as shown in the following figure.

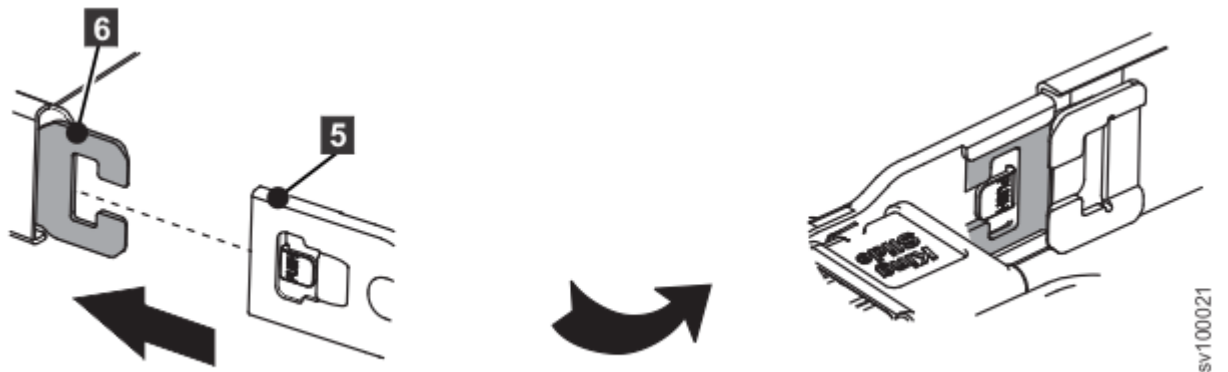


Figure 30. Install the other outer member

5. Connect and route the cables.
- Connect the power cords and other cables to the rear of the node.
 - Route the cables and power cords on the CMA and secure them with cable ties or hook-and-loop fasteners.

Note:

- The location of the cable straps can vary in different systems.
- 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 cables to avoid tension in the cables as the CMA moves.

Connecting the SAN Volume Controller 2145-SV1 to the SAN and to the Ethernet network

Before you connect the SAN Volume Controller 2145-SV1 to the SAN, you must connect the Ethernet and Fibre Channel cables.

Before you begin

Refer to the cable-connection table to find out where to connect the Ethernet and Fibre Channel cables.

Up to three electrical Ethernet cables can be connected to the SAN Volume Controller 2145-SV1. The cable connection table indicates the number of cables to connect. Connect to the ports in numerical order, beginning with Ethernet port 1.

Procedure

To connect the SAN Volume Controller 2145-SV1 to the SAN and to the Ethernet network, complete the following steps.

1. Connect the Ethernet cables to the Ethernet ports on the rear of the SAN Volume Controller 2145-SV1.

Ports 1-3 are standard. If you have 10 Gbps or 25 Gbps Optical Ethernet adapters that you want to connect to an Ethernet switch for iSCSI communications, 11 Ethernet ports might be available. [Figure 31 on page 27](#) shows one of the possible node configurations.

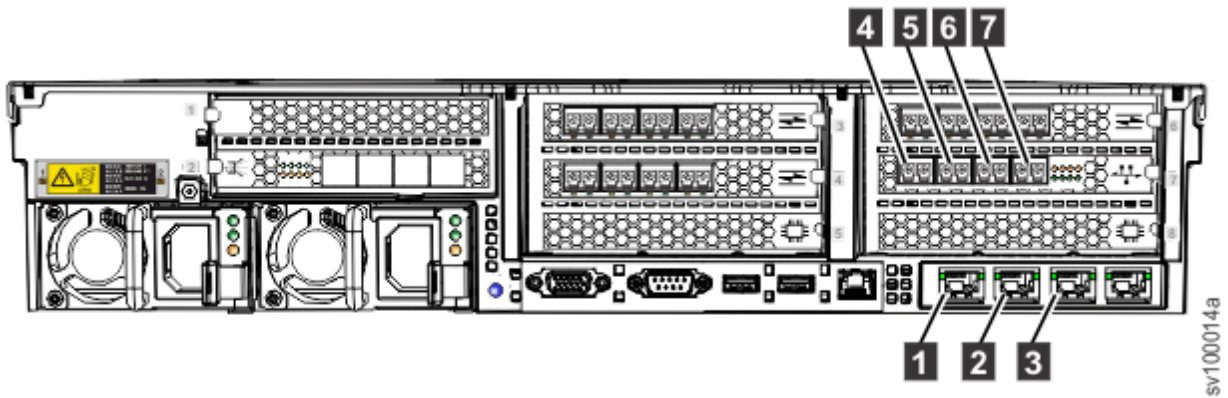


Figure 31. Ethernet ports on the rear of the SAN Volume Controller 2145-SV1

- 1 - 3 10 Gbps Ethernet ports 1-3
- 4 - 7 10 Gbps optical Ethernet ports 4-7

2. Connect the other end of the Ethernet cable to the proper connector on the Ethernet hub or switch.
3. Optional: If the Fibre Channel feature is installed, you can connect Fibre Channel cables to the Fibre Channel ports as required by your configuration.

[Figure 32 on page 27](#) shows an example of the device with 16 Gbps Fibre Channel adapters that are installed in slots 3, 4, and 6. A 10 Gbps Optical Ethernet adapter is used for Fibre Channel over Ethernet (FCoE) communications and is installed in slot 7, providing additional Fibre Channel ports.

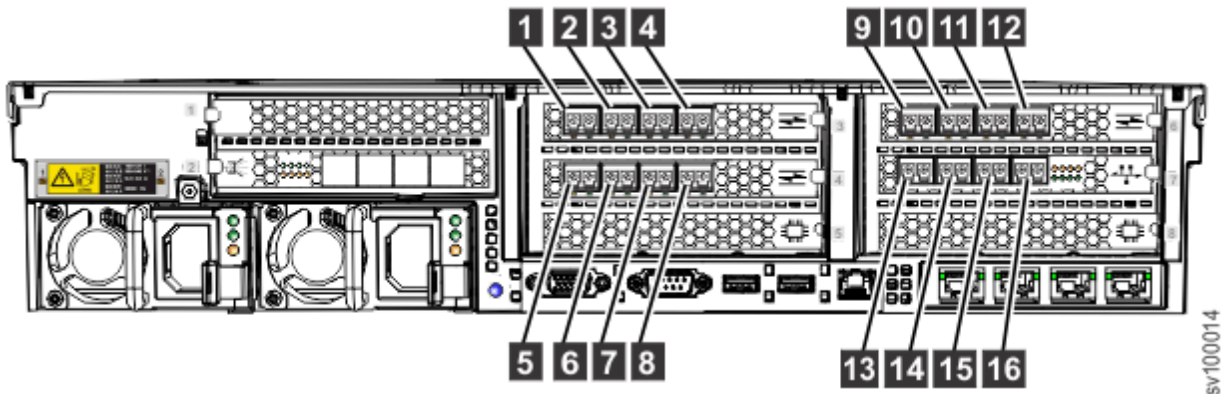


Figure 32. Fibre Channel ports

- 1 - 16 Fibre Channel ports 1-16

Note: If you are installing a hot-spare node, the Fibre Channel cabling must be identical for all nodes of the system. In other words, port 1 on every node must be connected to the same fabric, port 2 on every node must be connected to the same fabric, and so on.



Attention: When routing the Fibre Channel cables, do not tighten the cable straps or bend the cables to a radius smaller than 76 mm (3 in.).

4. Connect the other ends of the Fibre Channel cables to the proper connectors of the Fibre Channel switches.

Verifying the SAN Volume Controller 2145-SV1 installation

You must verify the installation after the installation has completed.

Before you begin

This task shows you how to verify the installation after you install the system in the rack and connect it to the storage area network (SAN) and the Ethernet.

Note: If at any point the system does not operate as described, see MAP 5000: in the *IBM SAN Volume Controller Troubleshooting Guide*, unless a different maintenance analysis procedure (MAP) is specified.

Procedure

To verify the installation, complete the following steps.

1. Connect power supply 1 and power supply 2 to a live AC supply. The SAN Volume Controller node begins to power on. The Power LED should be solidly on after a few seconds, but if it continues to flash after 1 minute, press the power-control button. If the LED is not illuminated, see MAP 5000 in the *IBM SAN Volume Controller Troubleshooting Guide* to repair the problem.

Note: You do not need to install any software. The node boots automatically.

The SAN Volume Controller 2145-SV1 runs an extended series of power-on self-tests. The node might appear to be idle for up to 5 minutes after it powers on.

Figure 33 on page 28 shows the controls and indicators on the front panel that verify the installation. Figure 34 on page 29 is a close-up view of the operator-information panel.

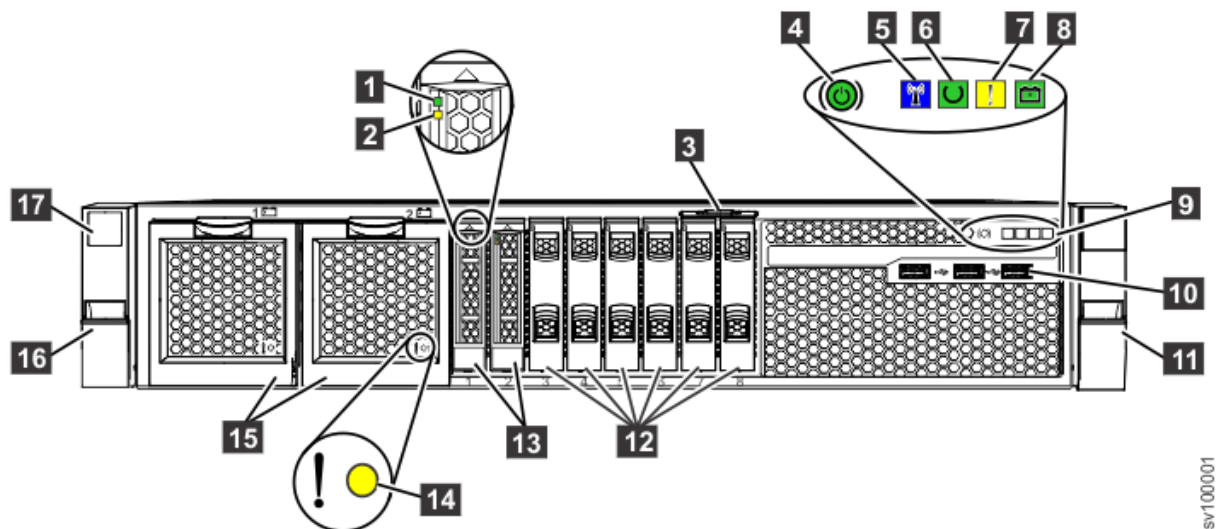


Figure 33. SAN Volume Controller 2145-SV1 front panel

- 1 Boot drive activity LED
- 2 Boot drive status LED
- 3 Pullout tab that shows 11s serial number
- 4 Power-control button and power-on LED
- 5 Identify LED
- 6 Node status LED

- 7** Node fault LED
- 8** Battery status LED
- 9** Operator-information panel
- 10** Front USB ports 1-3
- 11** Right side latch (releases chassis to slide out on rails)
- 12** Drive slot fillers (no empty slots permitted)
- 13** Boot drives
- 14** Battery fault LED
- 15** Batteries
- 16** Left side latch (releases chassis to slide out on rails)
- 17** Machine type and model (MTM) and serial number

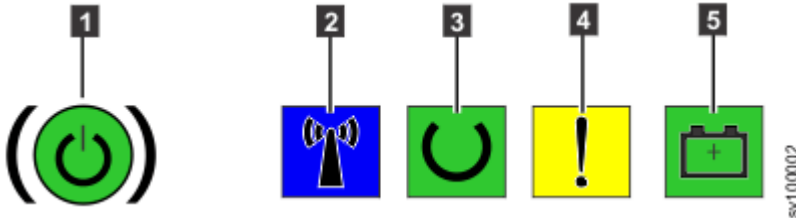


Figure 34. SAN Volume Controller 2145-SV1 operator-information panel

- 1** Power-control button and power-on LED
- 2** Identify LED
- 3** Node status LED
- 4** Node fault LED
- 5** Battery status LED

2. Verify that the node boots without error.

The Node status LED should slowly flash and the Node fault LED should be off. If the node fault LED is lit, see the "Troubleshooting" section of the documentation. When the battery charge is low, the battery status LED flashes. When the batteries are fully charged, the battery status LED is on. The battery fault LEDs should be off.

Results

The installation of the SAN Volume Controller hardware is now complete. No software installation is required.

What to do next

Continue with the instructions in [“Installing the optional 2U SAS expansion enclosure into the rack \(SAN Volume Controller 2145-SV1 and SAN Volume Controller 2145-DH8 only\)”](#) on page 35 followed by Chapter 5, [“Initializing the system,”](#) on page 127.

Chapter 3. Installing an optional 2U SAS expansion enclosure

Up to 20 optional SAS expansion enclosures can be connected to each I/O group in the system. To install a 5U SAS expansion enclosure, see the following chapter.

Installing an optional SAS expansion enclosure requires the following steps:

1. Installing support rails for an SAS expansion enclosure
2. Installing the optional SAS expansion enclosure into the rack
3. Connecting the optional SAS expansion enclosures to the 2145-SV1

Installing support rails for 2U SAS expansion enclosures (SAN Volume Controller 2145-SV1 and SAN Volume Controller 2145-DH8 only)

Before you install 2U SAS expansion enclosures, you must first install support rails.

Before you begin

Note: Up to 20 optional SAS expansion enclosures can be connected to each I/O group in the system. Refer to the planning worksheet completed by the customer.

Procedure

To install the support rails, complete the following steps.

1. Locate the expansion enclosure rails (Figure 35 on page 31).
The rail assembly consists of two rails that must be installed in the rack cabinet.

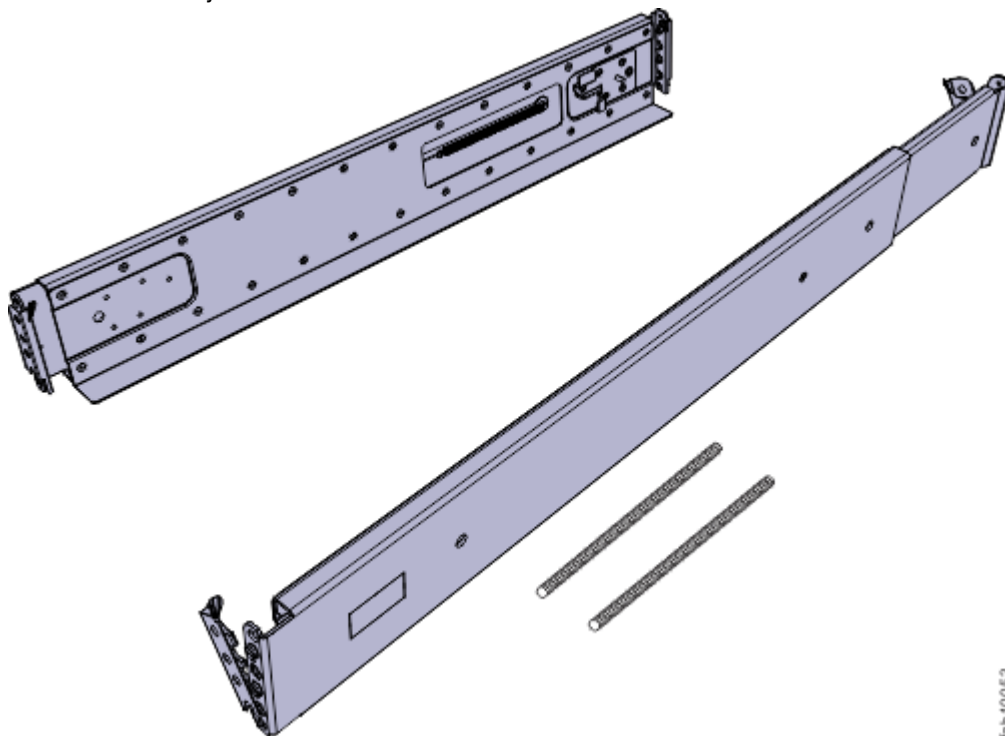


Figure 35. Expansion enclosure support rails

2. Locate the hardware that is used to install the rails, including two rail springs, two sets of eight bracket pins, and two M5 screws.

Set the hardware aside for use later in the installation process.

3. 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 36 on page 32.](#))

Note: Some models of rail have the studs on the outside of the rail.

- c) Stretch the spring slightly and push the other looped end of the spring onto the other stud on the inside of the rail.

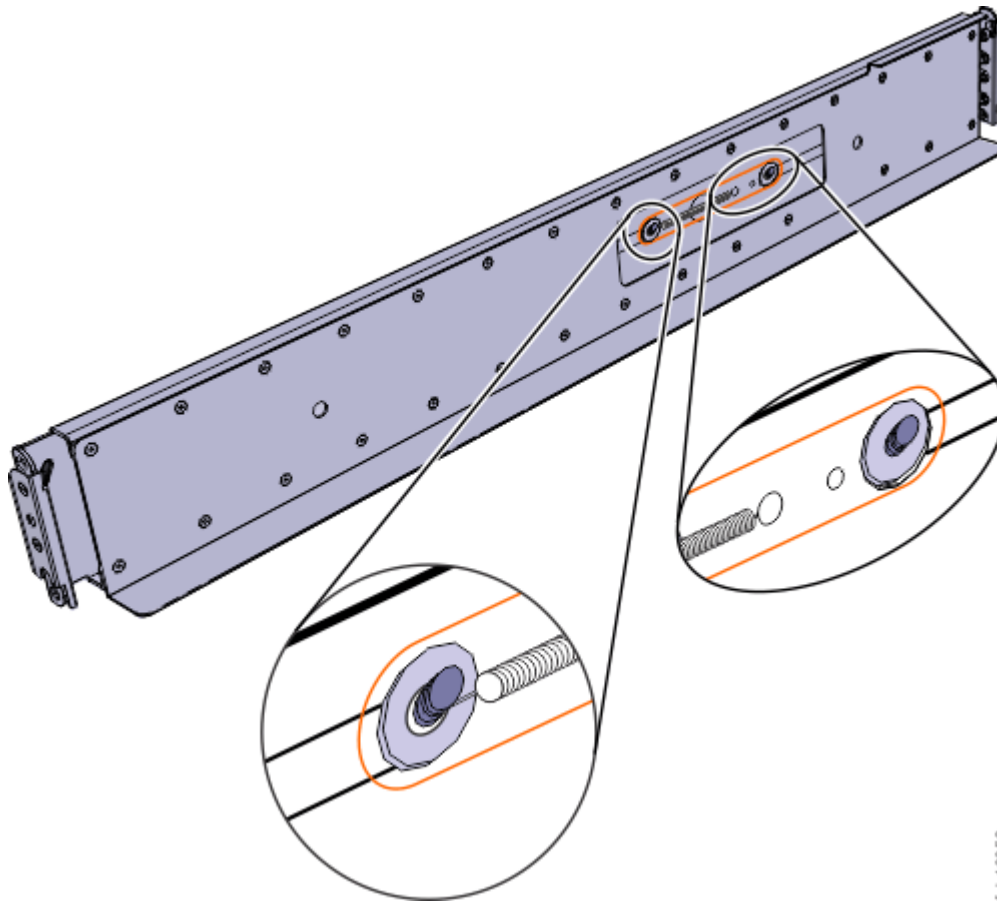


Figure 36. Installing the rail spring

4. 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 37 on page 33](#) shows two rack units with the front mounting holes identified.

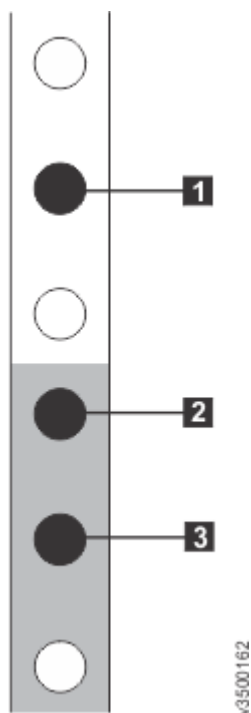


Figure 37. Hole locations in the front of the rack

- **1** Upper rail mounting bracket pin
 - **2** Lower rail mounting bracket pin
 - **3** Rack mounting screw hole
5. 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 10 on page 33](#)).

Table 10. 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 that are supplied with the rails.
Square	Unscrew the medium pins and replace with the large pins that are supplied with the rails.

6. At each end of the rail, grasp the tab **1** and pull *firmly* to open the hinge bracket (see [Figure 38 on page 34](#)).

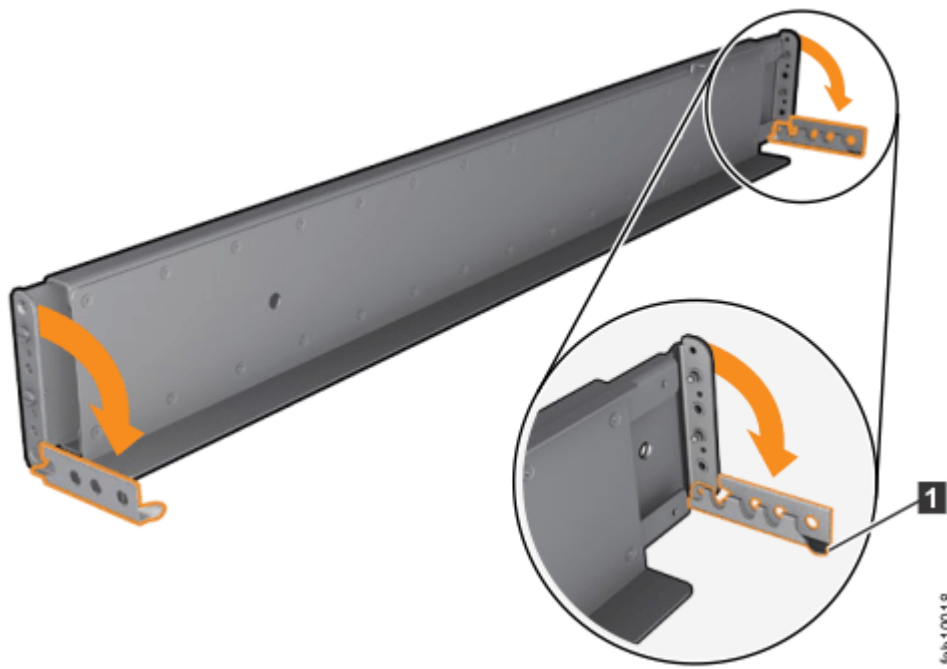


Figure 38. Opening the hinge brackets

7. 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.
8. On the rear of the rail, press the two bracket pins into the holes in the rack flanges.
9. Close the rear hinge bracket to secure the rail to the rack cabinet flange.
(See [Figure 39 on page 34.](#))

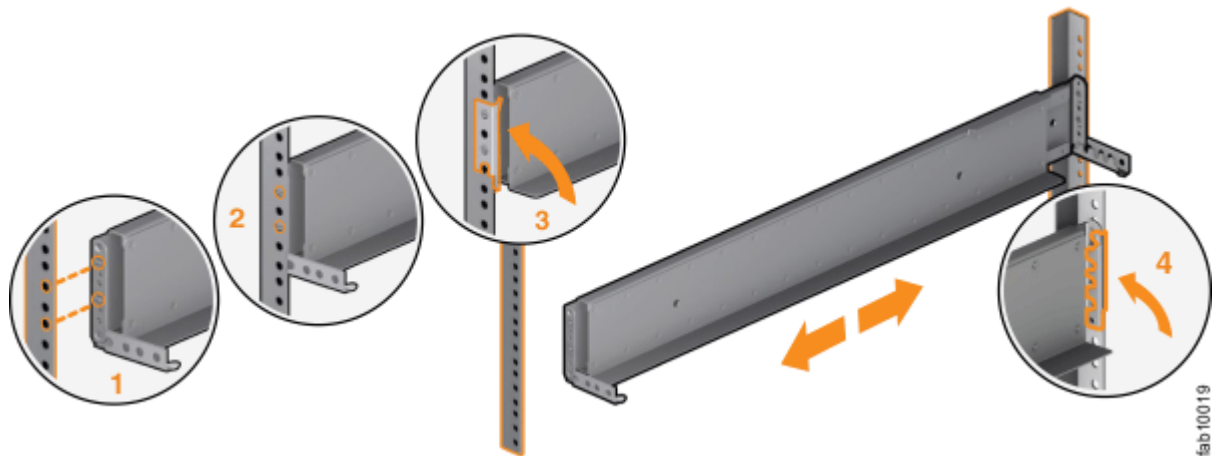


Figure 39. Closing the hinge brackets

10. On the front of the rail, press the two bracket pins into the holes in the rack flanges.
11. Close the front hinge bracket to secure the rail to the rack cabinet flange.
(See [Figure 39 on page 34.](#))
12. Secure the rear of the rail to the rear rack flange with an M5 screw that is provided with the rack kit.
13. Repeat the steps to secure the opposite rail to the rack cabinet.
14. Repeat the procedure to install rails for each additional expansion enclosure.

Installing the optional 2U SAS expansion enclosure into the rack (SAN Volume Controller 2145-SV1 and SAN Volume Controller 2145-DH8 only)

The 2145-12F or 2145-24F SAS expansion enclosures can be installed in a separate rack or in the same rack as the system nodes.

About this task

Note: Up to 20 optional SAS expansion enclosures can be connected to each pair of system nodes (I/O group).



CAUTION:

- To lift and install the SAS expansion enclosure into the rack requires at least two people.
- Install a SAS expansion enclosure only onto the rails that are supplied with the enclosure.
- Load the rack from the bottom up to ensure rack stability. Empty the rack from the top down.

Procedure

To install an optional SAS expansion 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 40](#) on page 35.)

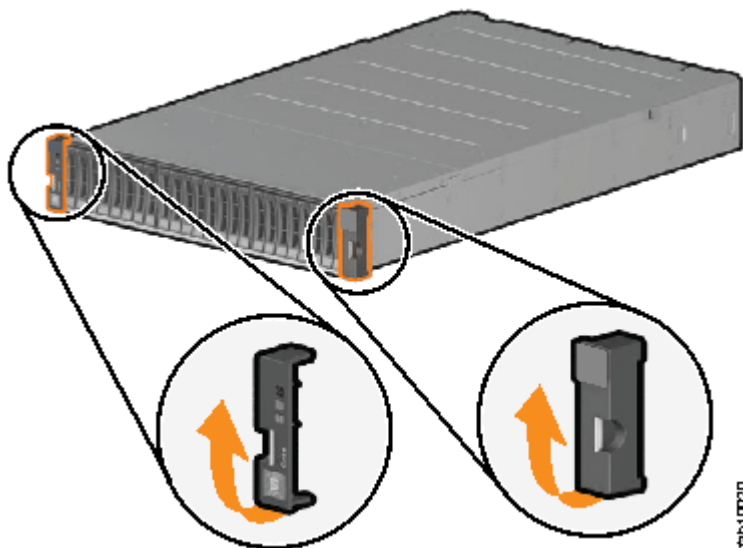


Figure 40. Removing enclosure end caps

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 41](#) on page 36).

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

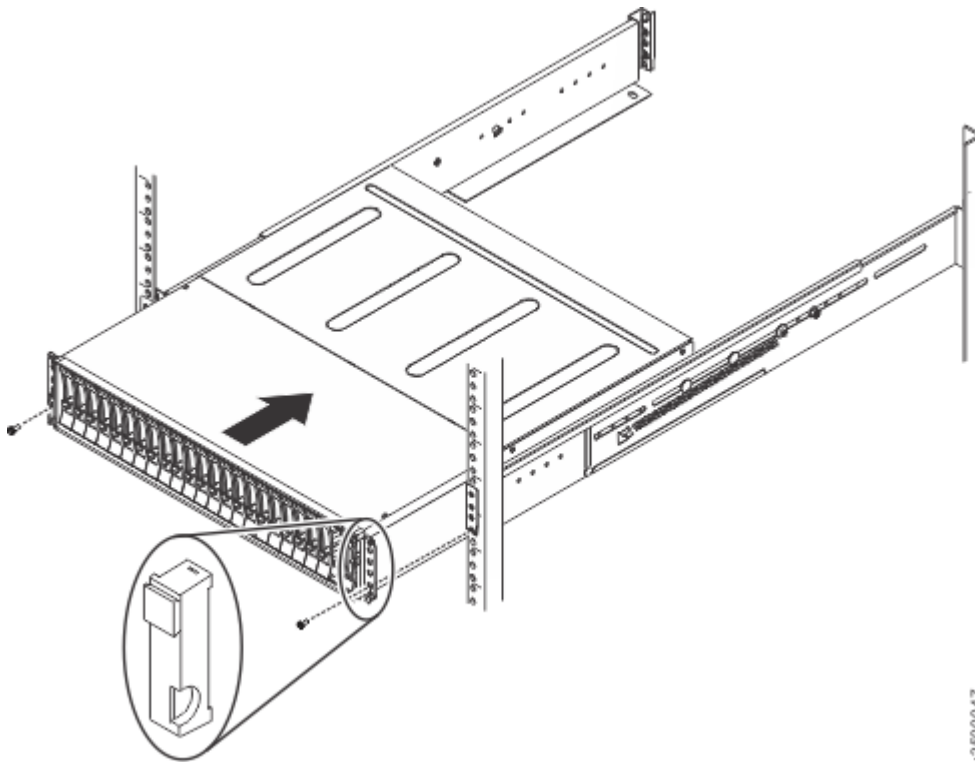


Figure 41. Inserting the enclosure into the rack

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

See Figure 41 on page 36. 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.
6. If you are installing extra SAS expansion enclosures, repeat the previous steps to complete the installation.

Connecting the optional 2U SAS expansion enclosures to the 2145-SV1

After you install the SAS expansion enclosures into the rack, you must connect them to each 2145-SV1 node in the IO group that will use them.

About this task

This task applies if you are installing a expansion enclosure. Each pair of nodes in the system can manage up to 20 expansion enclosures.

Note: When you insert SAS cables, ensure that the connector is oriented correctly.

- When you connect an expansion enclosure, the blue pull tab must be below the cable (1 in Figure 42 on page 37).
- When you connect a 2145-SV1 , the blue pull tab must be above the connector (2 in Figure 42 on page 37).

- 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.

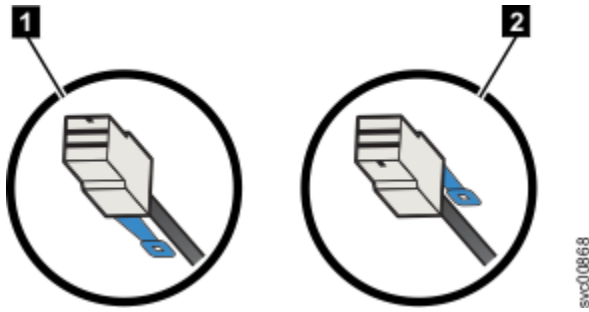


Figure 42. SAS cable connector orientation

- 1** Correct orientation for 2145-24F or 2145-12F SAS expansion enclosure
- 2** Correct orientation for 2145-SV1 node or 2145-92F , SAS expansion enclosure

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 avoid the risk of disconnecting the nodes from their flash drive arrays. This step also helps to protect the SAS cables from getting damaged if the node is slid out on its rails while attached to the enclosure.
- 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 the following figure. Note: this illustration is provided to show the cable connections between the SAS enclosures and each 2145-SV1 . It does not imply or represent the precise racking order for the devices in a cabinet/rack.

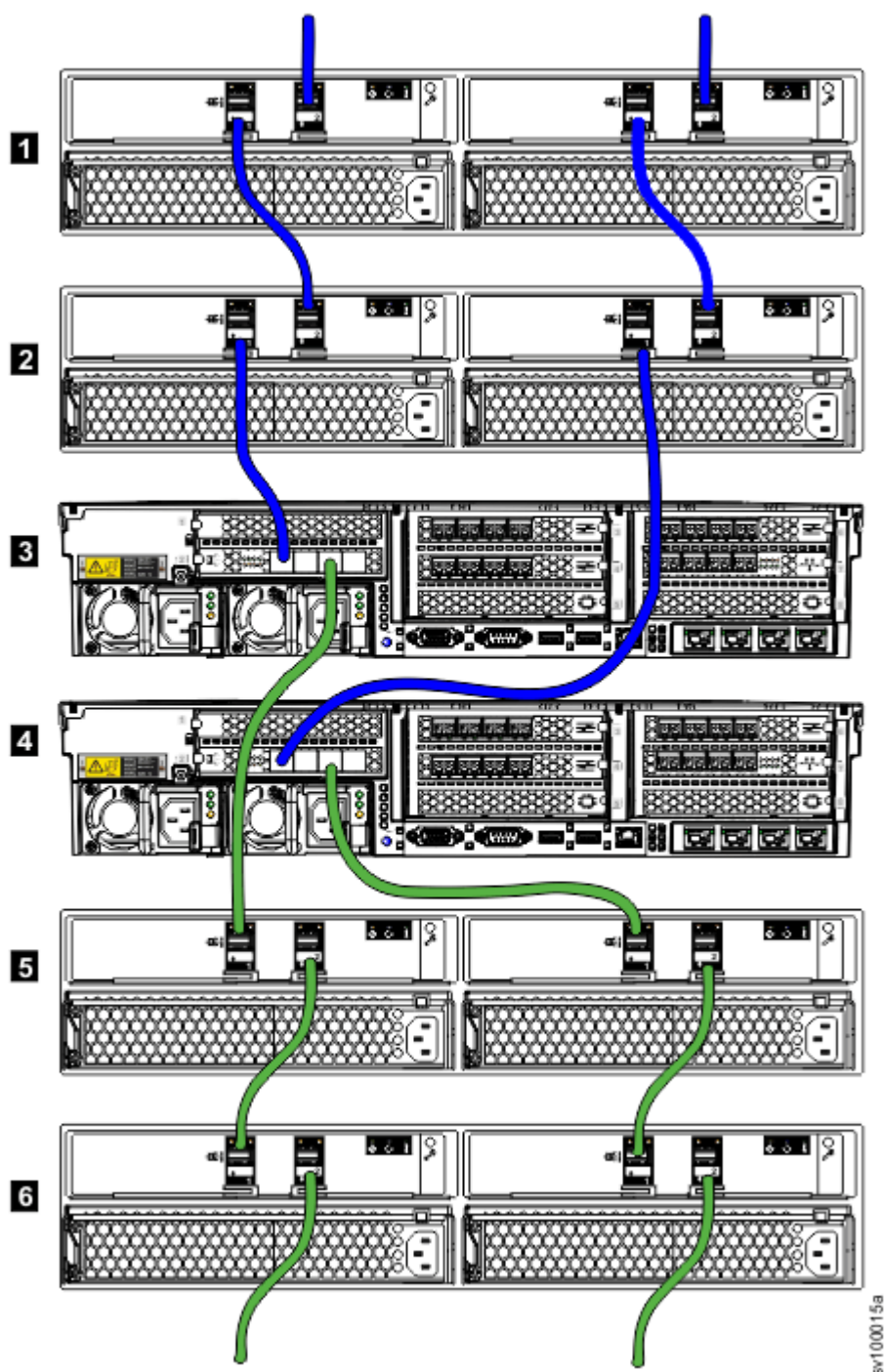


Figure 43. Connecting the SAS cables

- 1** 2145-24F or 2145-12F SAS expansion enclosure
 - 2** 2145-24F or 2145-12F SAS expansion enclosure
 - 3** 2145-SV1 with SAS adapter in PCIe expansion slot 2
 - 4** 2145-SV1 with SAS adapter in PCIe expansion slot 2
 - 5** 2145-24F or 2145-12F SAS expansion enclosure
 - 6** 2145-24F or 2145-12F SAS expansion enclosure
2. If more I/O groups are configured, repeat the cabling procedure for the other I/O groups. The system supports up to four I/O groups with a total of 80 expansion enclosures per system.

Combining 2U and 5U expansion enclosures

About this task

You can combine 2145-24F , 2145-12F , and 2145-92F , enclosures in an 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:

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

Example

Table 11. Examples of supported SAS chain combinations			
Number of 2145-12F	Number of 2145-24F	Number of 2145-92F ,	Combined chain weight
2	0	3	9.5
2	3	2	10
0	7	1	9.5

Chapter 4. Installing an optional 5U SAS expansion enclosure

Up to eight optional high-density SAS expansion enclosures can be connected to each I/O group in the system. To install a 2U SAS expansion enclosure, see the previous chapter.

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 2145-SV1 .

For more detailed information on these steps, see [“Checklist: Unpacking and installing the 5U expansion enclosure” on page 51](#)

Safety notices and considerations

Before you install, service, or move a 5U expansion enclosure, always read and follow the safety notices and guidelines.

Safety notices

Use the reference numbers in parentheses at the end of each notice (for example, D005) to find the matching translated notice in *IBM System Storage SAN Volume Controller 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:

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

swc01053

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



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



CAUTION: CAUTION regarding IBM provided VENDOR LIFT TOOL:

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

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



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

Weight considerations: 5U expansion enclosure

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

Safety notices and considerations

Important: Always read and follow the safety notices and instructions before you install, move, or service the expansion enclosure and its parts. See [“Safety notices and considerations” on page 41](#) for information.

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

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

Weight of expansion enclosure parts

Table 12 on page 46 summarizes the weight and quantity of the parts (FRUs) that are shipped with the 5U expansion enclosure.

<i>Table 12. Weight of expansion enclosure parts</i>					
FRU description	Weight per unit		Quantity shipped	Total weight	
	kg	lbs		kg	lb
Enclosure FRU	42.5	93.696	1	42.500	93.696
Rail kit	9.231	20.351	1	9.231	20.351
Front fascia (4U front cover)	0.303	0.668	1	0.303	0.668
Display panel assembly	0.020	0.044	1	0.020	0.044
PSU fascia (1U cover)	0.010	0.022	1	0.010	0.022
Power supply unit (PSU)	3.335	7.352	2	6.670	14.705
Secondary expansion module	0.826	1.821	2	1.652	3.642
Fan module	0.890	1.962	4	3.560	7.848
Expansion canister	1.588	3.501	2	3.176	7.002
Cable management arm (lower and upper arms)	1.373	3.027	1	1.373	3.027
Top cover	3.720	8.201	1	3.720	8.201
Fan interface board	0.118	0.260	1	0.236	0.260

Weight of expansion enclosure SAS drives

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

Table 13 on page 46 summarizes the weight of the drives that are supported in the 5U expansion enclosure.

<i>Table 13. Weight of expansion enclosure drives</i>		
FRU description	Approximate weight per unit	
	kg	lb
1.6 TB 2.5-inch tier 0 flash drive	0.224	0.494
3.2 TB 2.5-inch tier 0 flash drive	0.224	0.494
1.92 TB 2.5-inch tier 1 flash drive	0.224	0.494
3.84 TB 2.5-inch tier 1 flash drive	0.224	0.494

<i>Table 13. Weight of expansion enclosure drives (continued)</i>		
FRU description	Approximate weight per unit	
	kg	lb
7.68 TB 2.5-inch tier 1 flash drive	0.224	0.494
15.36 TB 2.5-inch tier 1 flash drive	0.224	0.494

Weight increases as FRUs are installed

The 5U expansion enclosure supports up to 92 SAS drives. As [Table 14 on page 47](#) shows, substantial weight is added to the enclosure when all drives are installed.

<i>Table 14. Weight of an enclosure with 92 SAS drives</i>					
FRU description	Approximate weigh per unit		Maximum supported	Approximate extra weight	
	kg	lb		kg	lb
2.5-inch tier 0 flash drive	0.224	0.494	92	20.608	45.433
2.5-inch tier 1 flash drive					
2.5-inch hard disk drive	0.304	0.670	92	27.968	61.659
3.5-inch Near-Line SAS hard disk drive	0.876	1.931	92	80.592	177.675

As you install or replace FRUs, the overall weight of the expansion enclosure increases. For example, [Table 15 on page 47](#) shows the weight progression as different combinations of FRUs are installed.

<i>Table 15. Enclosure weight as FRUs are installed</i>			
Enclosure assembly		Approximate weight	
FRUs installed	FRUs not installed	kg	lb
<ul style="list-style-type: none"> Enclosure 	<ul style="list-style-type: none"> Secondary expansion modules Fascia (1U and 4U) PSUs Expansion canisters Fan modules Fan interface board Display assembly Drives Cover 	42.5	93.7
<ul style="list-style-type: none"> Enclosure Secondary expansion modules 	<ul style="list-style-type: none"> Fascia (1U and 4U) PSUs Expansion canisters Fan modules Fan interface board Display assembly Drives Cover 	44.3	97.7

Table 15. Enclosure weight as FRUs are installed (continued)			
Enclosure assembly		Approximate weight	
FRUs installed	FRUs not installed	kg	lb
<ul style="list-style-type: none"> • Enclosure • Secondary expansion modules • Fascia (1U and 4U) • PSUs • Expansion canisters • Fan modules • Fan interface board • Display assembly 	<ul style="list-style-type: none"> • Drives • Cover 	58	127.9
<p>Note: The following FRUs are installed when the enclosure is initially shipped.</p> <ul style="list-style-type: none"> • Enclosure • Secondary expansion modules • PSUs • Expansion canisters • Fan modules • Fan interface board • Display assembly • Cover 	<ul style="list-style-type: none"> • Fascia (1U and 4U) • Drives 	61.5	135.4
<ul style="list-style-type: none"> • Enclosure • Secondary expansion modules • Fascia (1U and 4U) • PSUs • Expansion canisters • Fan modules • Fan interface boards • 92 2.5-inch tier 1 flash drives 	<ul style="list-style-type: none"> • Cover 	78.6	173.3
<ul style="list-style-type: none"> • Enclosure • Secondary expansion modules • Fascia • PSUs • Expansion canisters • Fan modules • Fan interface board • 92 2.5-inch hard disk drives 	<ul style="list-style-type: none"> • Cover 	86	189.6

Table 15. Enclosure weight as FRUs are installed (continued)			
Enclosure assembly		Approximate weight	
FRUs installed	FRUs not installed	kg	lb
<ul style="list-style-type: none"> • Enclosure • Secondary expansion modules • Fascia • PSUs • Expansion canisters • Fan modules • Fan interface board • 92 3.5-inch Near-Line SAS hard disk drives 	<ul style="list-style-type: none"> • 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 5U expansion enclosure is heavy. Depending on the number of parts that remain, you might need four persons or a mechanical lift to support the weight of the expansion enclosure.

Identify the hardware components

You should become familiar with the external components of the 5U expansion enclosure.

Components on the front of the enclosure

Figure 44 on page 49 shows the front of the 5U expansion enclosure. In the figure, all parts are installed in the enclosure.

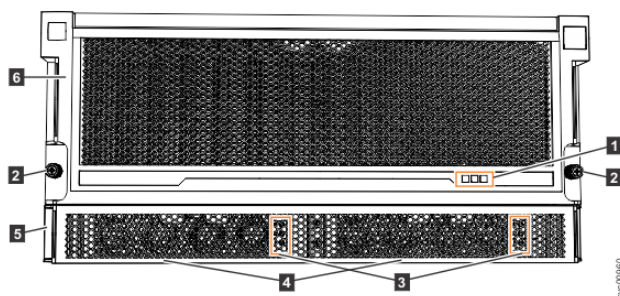


Figure 44. Features on the front of the 5U expansion enclosure

- 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 45 on page 50 shows, the 4U and 1U fascias are packaged separately. You must attach them to the front of the 5U expansion enclosure as part of the initial installation process.

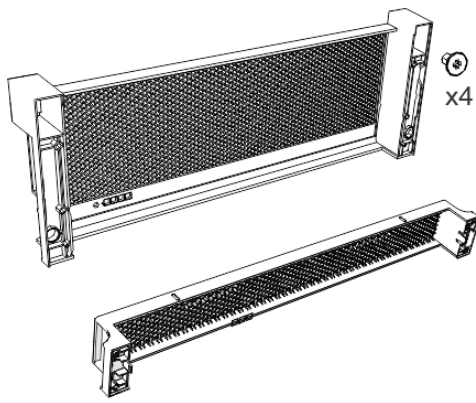


Figure 45. Front fascia of the 5U expansion enclosure

Components on the rear of the enclosure

Figure 46 on page 50 shows the components on the rear of the 5U expansion enclosure. Four fan modules and two expansion enclosures are accessible from the back of the enclosure.

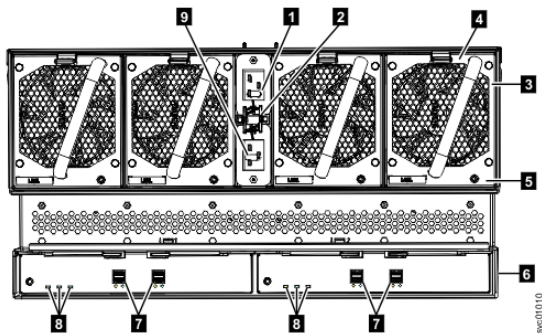


Figure 46. Features on the rear of the 5U expansion enclosure

- 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 47 on page 51 shows the support rails for the expansion enclosure. The support rails are packaged separately from the expansion enclosure.

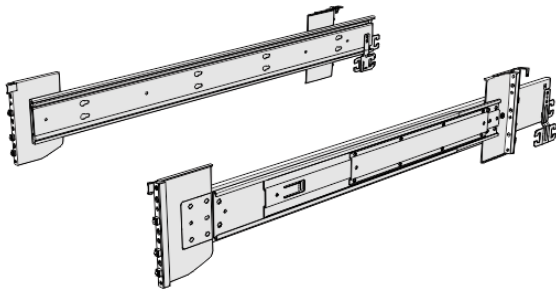


Figure 47. Support rails

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 48 on page 51](#) shows, each CMA assembly is attached to the rear end of the support rails.

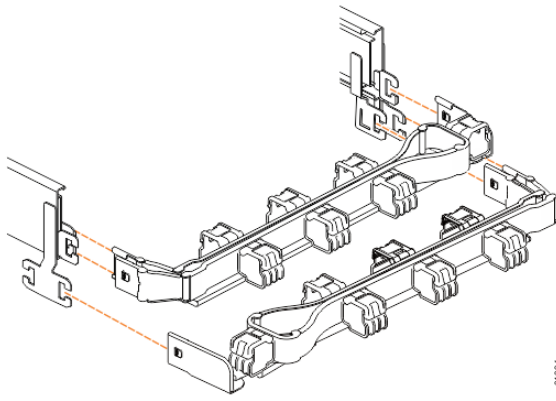


Figure 48. CMA assemblies

Checklist: Unpacking and installing the 5U expansion enclosure

Before you unpack and install the 5U expansion enclosure, ensure that you review and follow the installation checklist and safety notices.

Before you begin



CAUTION:

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

svc01053

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 5U expansion enclosure and its parts, always complete the following tasks:

- Read and follow the safety notices and instructions, as described in [“Safety notices and considerations” on page 41](#).

- Read and follow the guidelines that are described in [“Weight considerations: 5U expansion enclosure”](#) on page 45.
- Ensure that a suitably rated mechanical lift is available to support the weight of the expansion enclosure as it is inserted into the rack for installation.

About this task

The 5U expansion enclosure and most parts are shipped together in one large box. A tray on the top of the enclosure contains the front fascia (1U and 4U pieces), the cable management arm (CMA), and the slide rail kit; you must install these parts. [Figure 49 on page 52](#) shows how the enclosure is packaged for shipment.

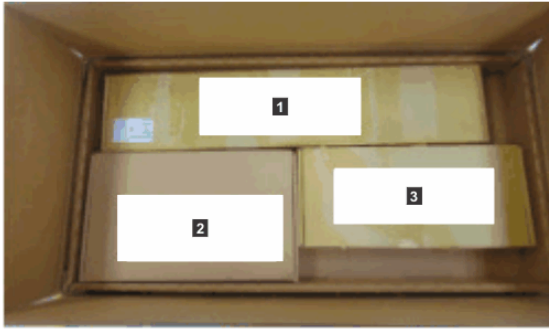


Figure 49. Tray containing expansion enclosure parts

- 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 the cardboard box in which the expansion enclosure was shipped.
2. Remove the foam end pieces from the top of the 5U 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 50 on page 52](#).

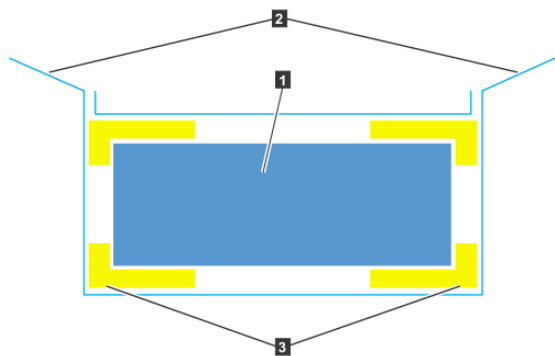


Figure 50. Packaging materials

- 1** Enclosure

- 2** Top of shipping box, folded back.
- 3** Foam protectors
- 4. Remove the top cover, as described in [“Removing the top cover”](#) on page 54.
- 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 49](#) on page 52).
- 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 55 through [“5”](#) on page 55 in [“Installing the support rails”](#) on page 54.
- 8. Attach the remaining sections of the support rails to the rack, as described in step [“6”](#) on page 56 in [“Installing the support rails”](#) on page 54.
- 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 57 in [“Installing or replacing a 5U expansion enclosure in a rack”](#) on page 57.
- 11. Remove the 4U and 1U fascia from the boxes in which they were shipped, as shown in [Figure 51](#) on page 53.



Figure 51. 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”](#) on page 73.
- 13. Install the drives, as described in [“Installing or replacing a drive”](#) on page 67.
- 14. Replace the top cover, as described in [“Installing or replacing the top cover”](#) on page 66.
- 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 [“4”](#) on page 58 through [“6”](#) on page 58 in [“Installing or replacing a 5U expansion enclosure in a rack”](#) on page 57.
- 17. Remove the cable management arm assembly from its packaging (**2** in [Figure 49](#) on page 52).
- 18. Attach the cable management arm, as described in [“Installing or replacing the cable-management arm”](#) on page 63.
- 19. Connect the SAS cables, as described in [“Removing and installing a SAS cable”](#) on page 79.
- 20. Connect the power cables.

Removing the top cover

To complete some service tasks, you might need to remove the top cover from a 5U expansion enclosure.

Before you begin

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

Procedure

1. Slide the release latch (1) in the direction that is shown in [Figure 52 on page 54](#).

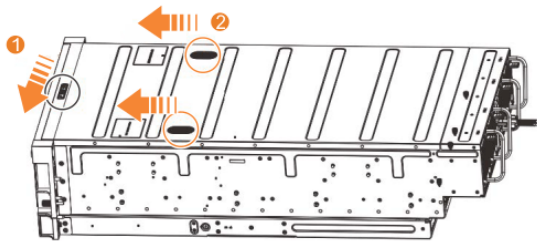


Figure 52. Releasing the 5U expansion enclosure cover

2. Slide the cover toward the front of the expansion enclosure (2), as shown in [Figure 52 on page 54](#).
3. Carefully lift the cover up, as shown in [Figure 53 on page 54](#).

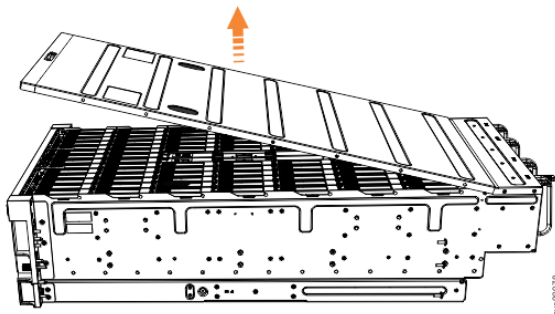


Figure 53. Removing the 5U expansion enclosure cover

4. Place the cover in a safe location.

Replace the cover

5. To reinstall the cover, or replace it with one from FRU stock, follow the procedure in [“Installing or replacing the top cover” on page 66](#).

Installing the support rails

You must install the support rails before you can install a 5U 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 54 on page 55](#), aside for use later in the installation process.

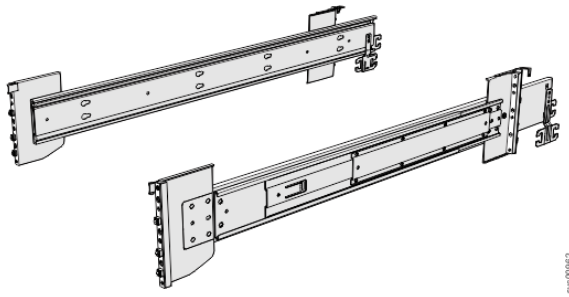


Figure 54. Support rails

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

Important notes:

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

3. Remove the inner member of the rail. Push the tab (a) and slide the middle rail member back, as shown in Figure 55 on page 55.

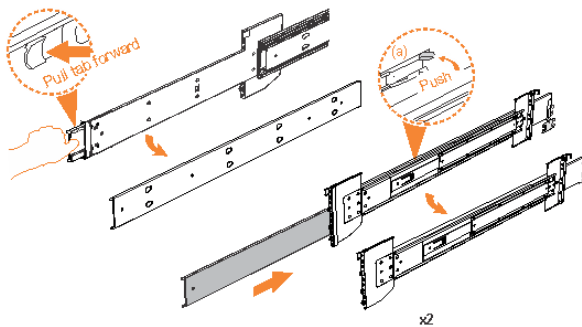


Figure 55. Detaching the inner rail section

4. Use four M4 screws to attach the inner rail to the side of the enclosure. Figure 56 on page 55 shows the screw locations.

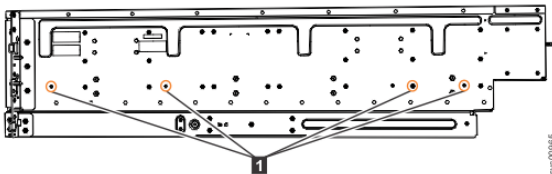


Figure 56. Screw locations to attach the inner rail to the enclosure

5. Install the inner section of the rail onto each side of the expansion enclosure, as shown in Figure 57 on page 56.

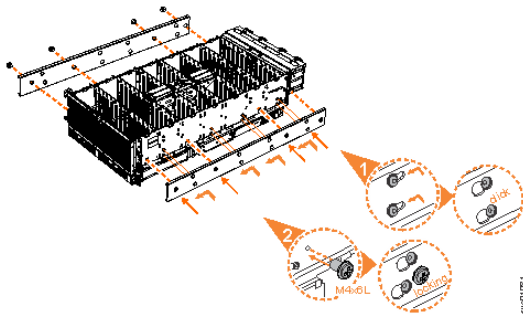


Figure 57. Attaching the inner rail section to the enclosure

6. Use the M5 screws to install the outer rail member and bracket assembly to the rack, as shown in Figure 58 on page 56.

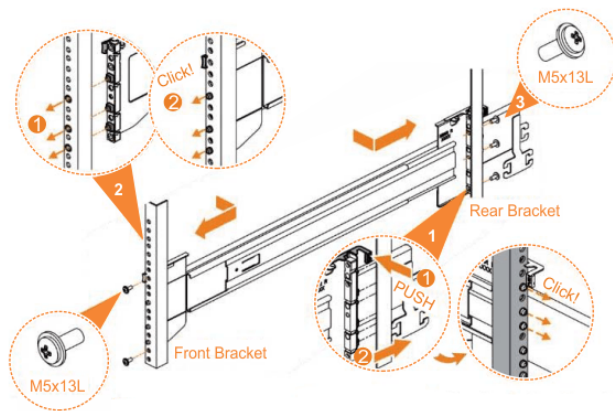


Figure 58. Installing the rail assembly to the rack frame

For example, Figure 59 on page 56 shows the front of the rail that is attached to the frame.

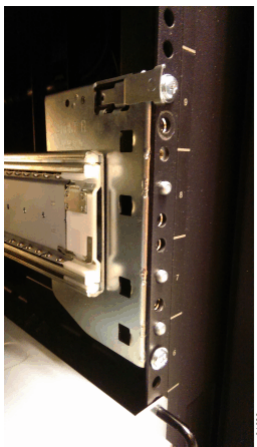


Figure 59. Example of the required rack space

7. Repeat steps “5” on page 55 through “6” on page 56 to install the opposite rail.
8. Install the expansion enclosure in the rack, as described in [“Installing or replacing a 5U expansion enclosure in a rack”](#) on page 57.

Installing or replacing a 5U expansion enclosure in a rack

Use the following procedure to place a 5U expansion enclosure in a rack during the installation process. To complete some service tasks, you might also need to slide the enclosure back in to the rack.

About this task

Important: The 5U expansion enclosure is heavy. Before you install the expansion enclosure in the rack for the first time or replace it in the rack to complete a service task, review and implement the following tasks:

- Always use a suitably rated mechanical lift or four persons to raise the enclosure to install it in the rack. Even after the drives, power supply units, secondary expander modules, canisters, fans, and top cover are removed, the enclosure weighs 43 kg (95 lbs).
- Install the expansion enclosure in the lowest position in the rack. [Figure 60 on page 57](#) shows an example.

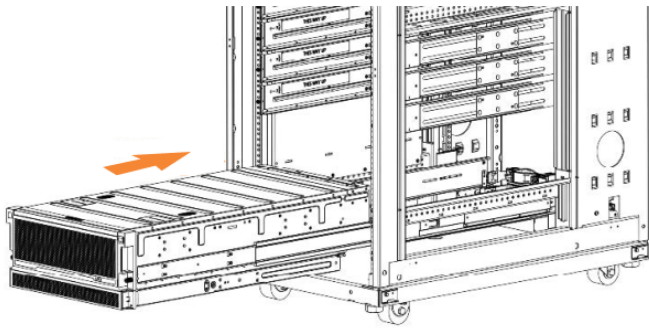


Figure 60. Example installation of the enclosure in the rack

- Ensure that the drives are easily accessible. Avoid installing the 5U 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 expander 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 61 on page 58](#)).

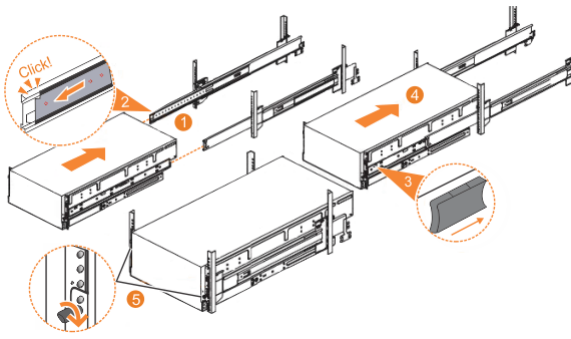


Figure 61. Replacing the 5U enclosure in the rack

2. Ensure that the ball bearing retainer clicks into place inside the front of the left and right drawer sections (2 in Figure 61 on page 58).

Reinstalling parts into the enclosure

3. Replace the top cover, as described in “Installing or replacing the top cover” on page 66.

Sliding the enclosure into the rack

4. 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 61 on page 58).
5. Push the enclosure firmly into the rack (4 in Figure 61 on page 58).
6. Tighten the locking thumb screws (5 in Figure 61 on page 58) to secure the enclosure in the rack.
7. Reconnect power to the expansion enclosure.

Installing or replacing an expansion canister

You can reinstall an expansion canister in a 5U 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 5U expansion enclosure and the system. The expansion enclosure contains two expansion canisters. Figure 62 on page 58 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.

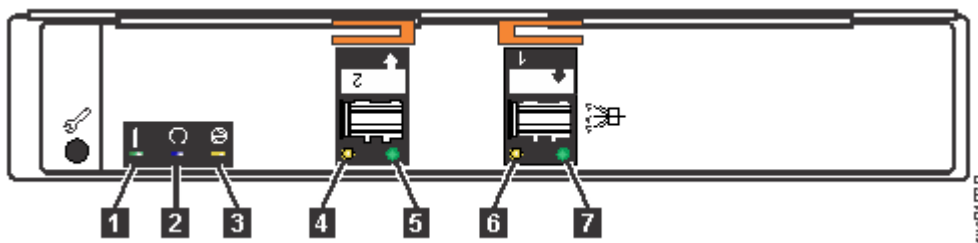


Figure 62. Expansion canister

- 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 63 on page 59](#).

Follow the procedure that is described in [“Moving the cable management arms” on page 62](#).

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 63 on page 59](#).

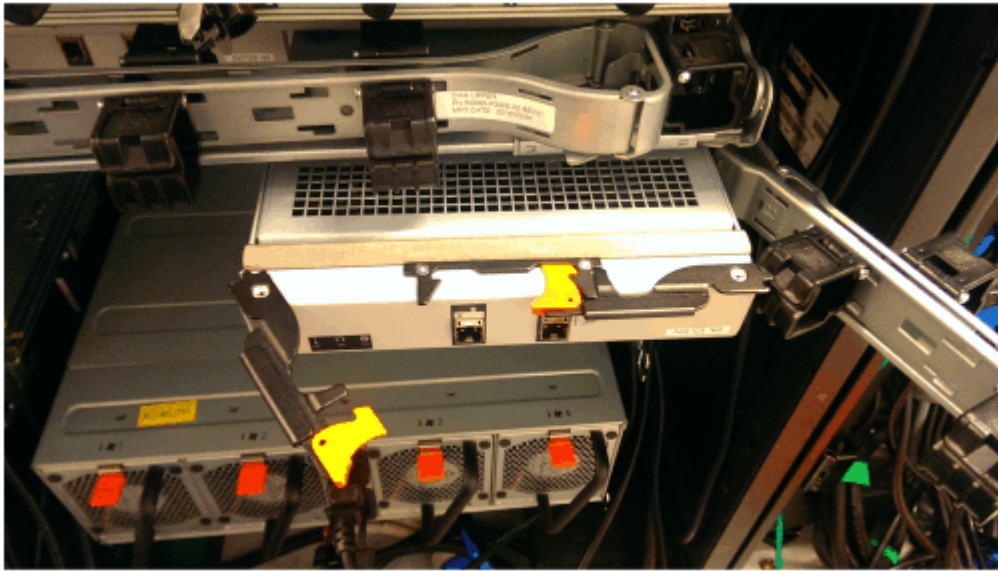


Figure 63. Install the expansion canister

5. Reconnect all the SAS cables to the appropriate SAS ports on the expansion canister, as described in [“Removing and installing a SAS cable” on page 79](#).
6. Reconnect the elbow of the lower cable management arm to the inner member of the slide rail.

Removing or moving the cable-management arm

You might need to move the cable-management arm (CMA) aside to complete service tasks. If needed, you can also remove the CMA from the 5U expansion enclosure.

About this task

The cable management arm (CMA) consists of an upper and lower arm assembly, as [Figure 64 on page 60](#) shows. The upper and lower are independent of each other. They can be installed, moved, or removed from the enclosure individually.

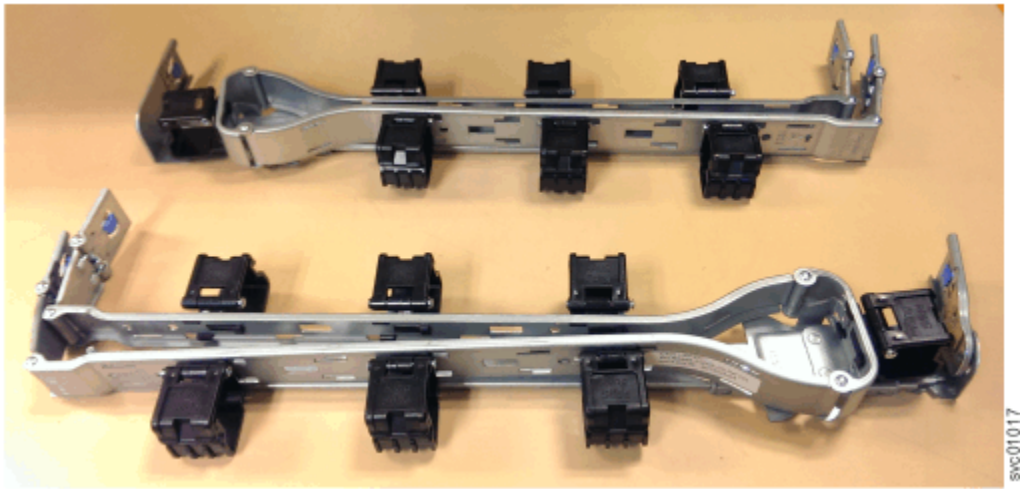


Figure 64. Upper and lower cable-management arms

To complete many service tasks, you can swing the CMA assemblies away from the expansion enclosure. You do not have to completely remove the CMA assemblies from the enclosure. For these service tasks, complete step “1” on page 62 through step “4” on page 63 in “Moving the cable management arms” on page 62.

However, you might need to remove a CMA assembly from the 5U expansion enclosures. To do so, complete step “1” on page 61 through step “8” on page 61 in following procedure.

Procedure

Remove the upper CMA assembly

The connectors of the CMA are installed on the rail hooks at the end of the support rails. [Figure 65 on page 60](#) shows the connectors on the upper CMA assembly.

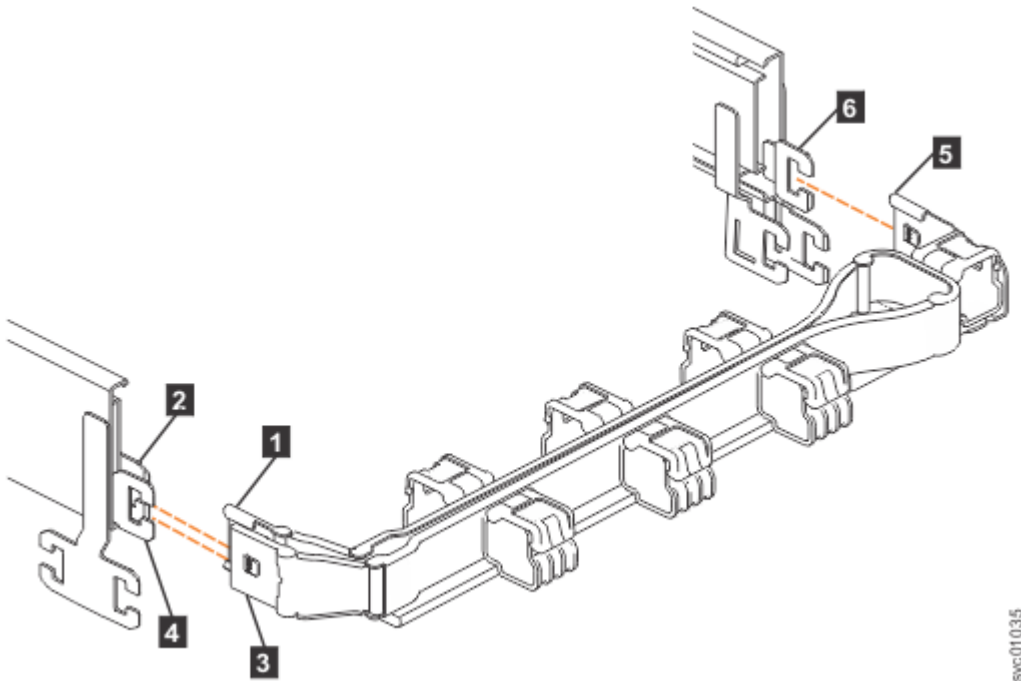


Figure 65. Connectors for the upper cable management arm

- 1 Inner connector on the upper CMA

- 2** Connector base on inner rail member
- 3** Outer connector on the upper CMA
- 4** Connector base on outer rail member
- 5** Support rail connector on the upper CMA
- 6** Connector base on outer rail member

1. Press the latch on the connector base on the upper CMA assembly (**5** in [Figure 65 on page 60](#)).
2. Pull the connector to remove it from the connector base on the right support rail (**6** in [Figure 65 on page 60](#)).
3. Press the latch on the outer connector of the upper CMA assembly (**3** in [Figure 65 on page 60](#)).
4. Remove the outer connector from the inner member of the left support rail (**4** in [Figure 65 on page 60](#)).
5. Remove the inner connector of the upper CMA assembly (**1**) from the inner member of the left support rail (**2**), as shown in [Figure 65 on page 60](#).

Remove the lower CMA assembly

Note: The procedure for removing the lower CMA assembly is the same as the procedure to remove the upper CMA assembly. However, the connector locations are reversed. For example, the connector base of the upper CMA (**5** in [Figure 65 on page 60](#)) connects to the right rail. The connector base of the lower CMA (**11** in [Figure 66 on page 61](#)) attaches to the left rail.

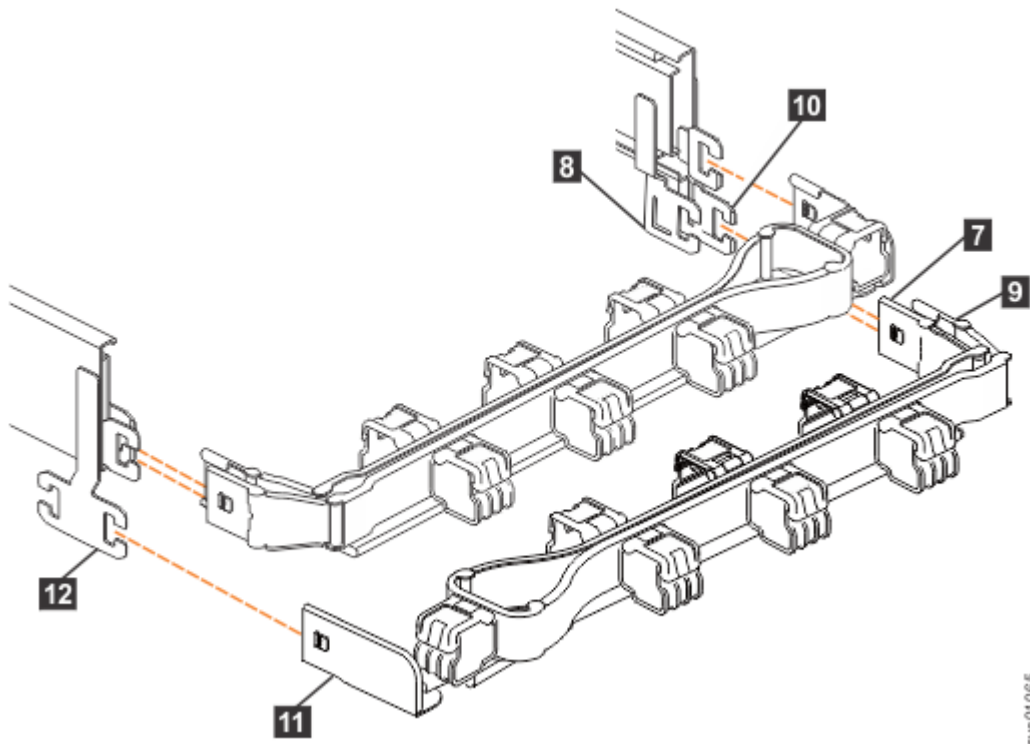


Figure 66. Components of the lower CMA assembly

6. Remove the connector base on the lower CMA assembly (**11**) from the connector on the left support rail (**12**), as [Figure 66 on page 61](#).
7. Remove the inner connector of the lower CMA assembly (**9**) from the outer member of the right support rail (**10**), as shown in [Figure 66 on page 61](#).
8. Remove the outer connector of the lower CMA assembly (**7**) from the inner member of the right support rail (**8**), as shown in [Figure 66 on page 61](#).

Replace the CMA assembly

9. To reinstall the CMA, or replace it with one from FRU stock, follow the procedure in [“Installing or replacing the cable-management arm” on page 63](#).

Moving the cable management arms

About this task

To complete most service tasks, you can swing the CMA assemblies out of the way. You can move each arm independently or you can move both arms. For example, [Figure 67 on page 62](#) shows that both of the CMA assemblies are swung away from the rear of the enclosure.

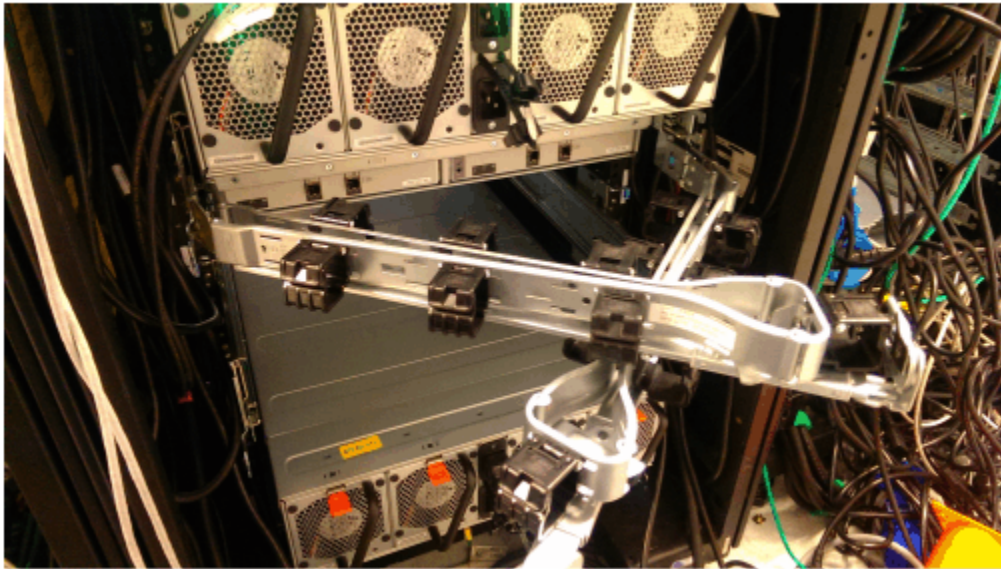


Figure 67. Upper and lower CMA assemblies moved aside

[Figure 68 on page 62](#) shows that the lower CMA assembly is swung away from the rear of the enclosure so that the expansion canister is accessible.

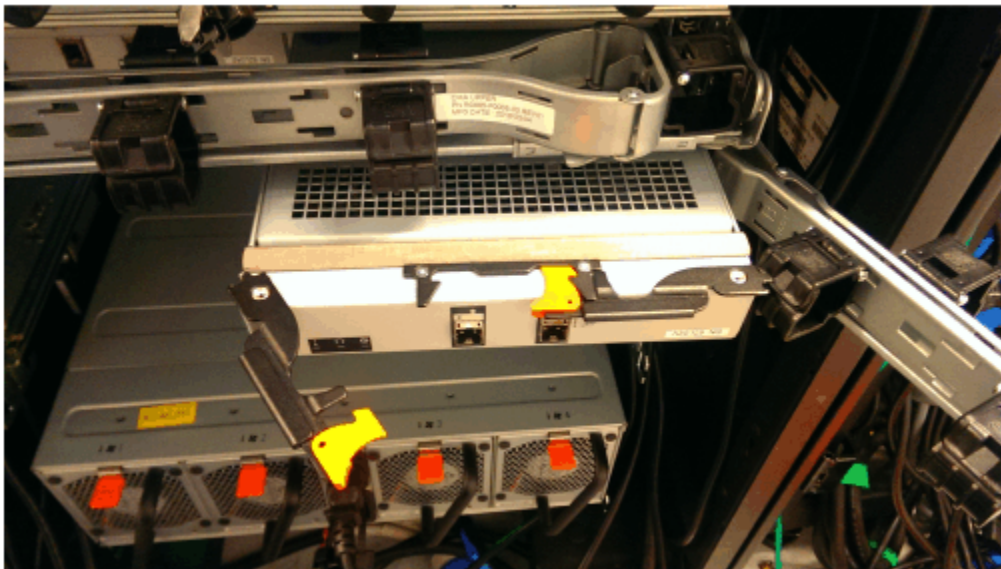


Figure 68. Lower CMA assembly moved

Procedure

1. To release the upper CMA, push the latch on the support rail connector **5** to release it from the connector base **6** on the right rail.

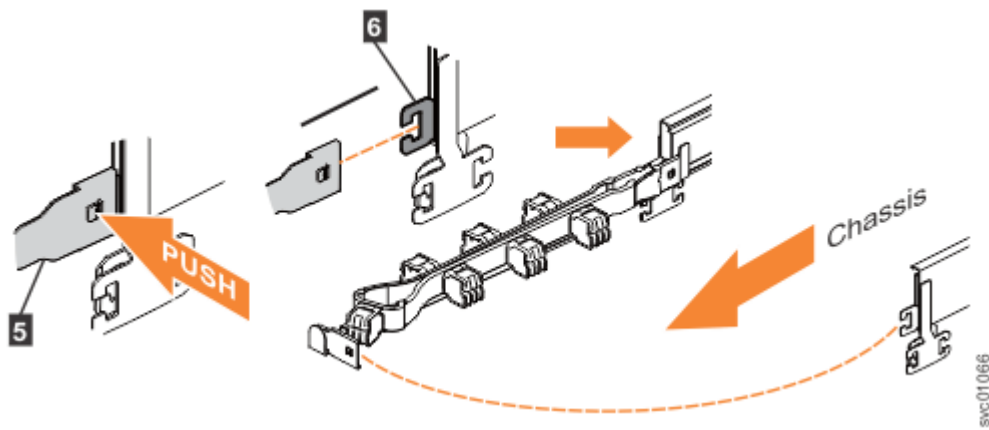


Figure 69. Release the upper CMA assembly

2. Move the upper CMA to the left to swing it out of the way.
 - a) To reattach the upper CMA to the rail, reverse the procedure.
3. To release the lower CMA, push the latch on the support rail connector **11** to release it from the connector base **12** on the left rail.

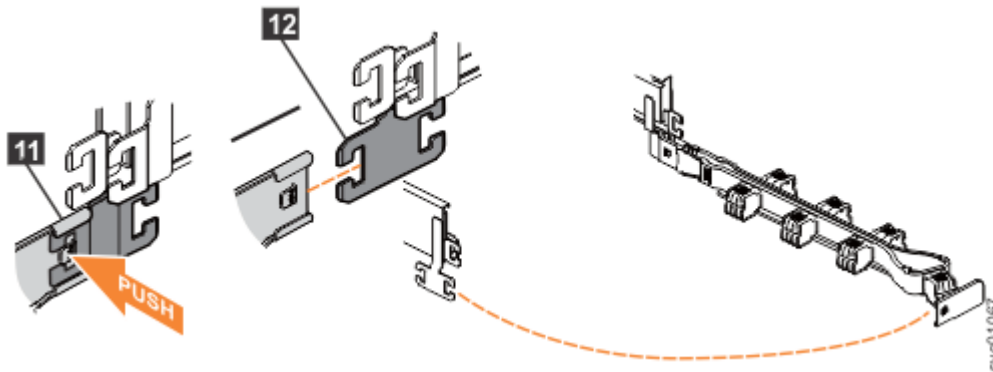


Figure 70. Release the lower CMA assembly

4. Move the lower CMA to the right to swing it out of the way.
 - a) To reattach the lower CMA to the rail, reverse the procedure.

Installing or replacing the cable-management arm

Use these procedures to install the cable-management arm (CMA) for the 5U expansion enclosure. You can also use these procedures to replace a faulty CMA assembly.

About this task

As part of the initial installation of the 5U 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 71](#) on [page 64](#) shows.

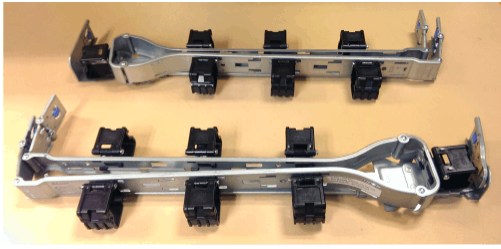


Figure 71. Upper and lower cable-management arms

As Figure 72 on page 64 shows, the support rail connectors of each CMA assembly are installed on the rail hooks at the end of the support rails.

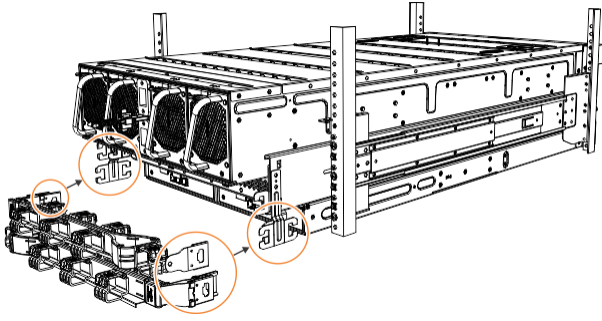


Figure 72. Upper and lower cable-management arms

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 73 on page 64 shows the connectors on the upper CMA assembly.

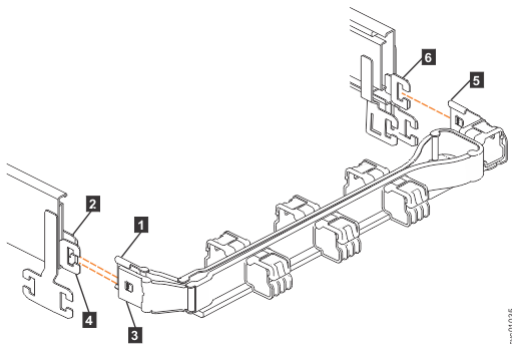


Figure 73. Connectors for the cable management arm

- 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 74 on page 65.

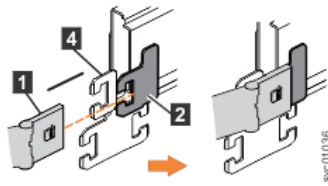


Figure 74. Install the inner connector of the upper CMA to the inner member of the support rail

3. Install the outer connector of the upper CMA assembly (3) to the outer member of the left support rail (4), as shown in Figure 75 on page 65.

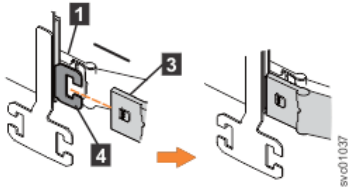


Figure 75. Install the outer connector of the upper CMA to the outer member of the support rail

4. Attach the support rail connector on the upper CMA assembly (5) to the connector base on the right support rail (6), as shown in Figure 76 on page 65.

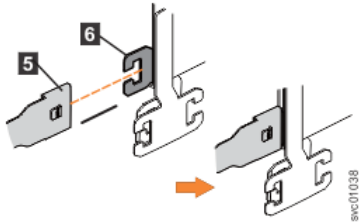


Figure 76. Attach the support rail connector of the upper CMA to the right support rail

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 77 on page 65 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.

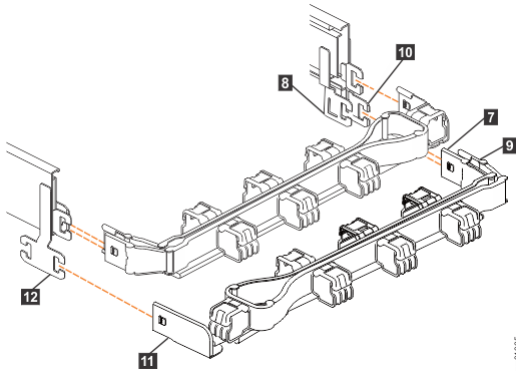


Figure 77. Comparing the location of the components of the CMA assemblies

- 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 77 on page 65](#).
 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 77 on page 65](#).
 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 77 on page 65](#).
- Ensure that the lower CMA assembly is securely attached to the hooks on the end of the support rails.
8. Route the cables and power cords on the CMA. If needed, secure them with cable ties or hook-and-loop fasteners.

Notes:

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

Installing or replacing the top cover

You can replace the top cover on a 5U 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 5U 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 78 on page 66](#).

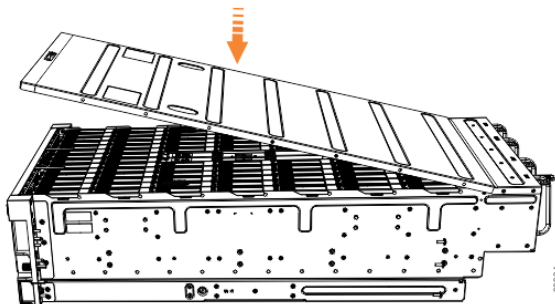


Figure 78. Aligning the top cover

2. Push the cover release lever to the side (**2**) as shown in [Figure 79 on page 67](#).
3. Slide the cover towards the back of the enclosure (**3**) back until it stops, as shown in [Figure 79 on page 67](#).

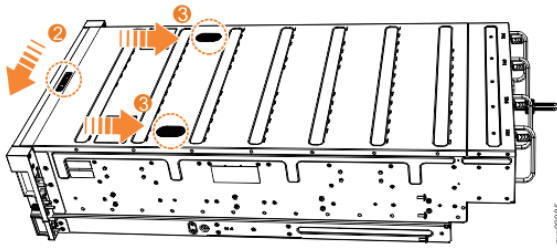


Figure 79. Replacing the top cover

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 80 on page 67](#)

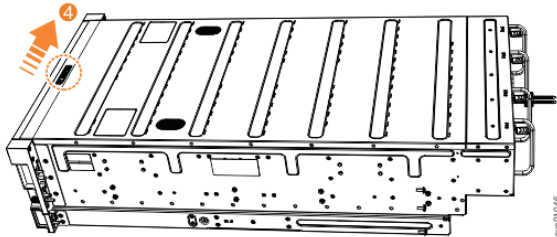


Figure 80. Locking the top cover

Installing or replacing a drive

Use the following procedure to install a drive for the first time or to replace a faulty drive in a 5U 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 5U expansion enclosure supports 92 drives. [Figure 81 on page 67](#) shows an example of a drive assembly.

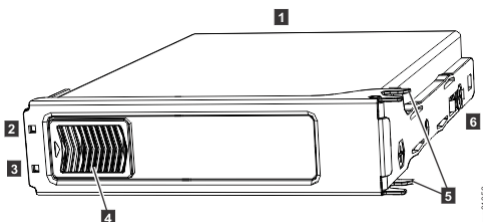


Figure 81. Drive assembly

- 1** Disk drive
- 2** Online indicator

- 3** Fault indicator
- 4** Release latch
- 5** Drive latch toes
- 6** Drive carrier

Procedure

1. Read all of the available safety information.
2. Remove the cover, as described in “Removing the top cover” on page 54.
3. Locate the empty drive slot to receive the new drive or that contains the faulty drive that you want to replace.

Note: When a drive is faulty, the amber fault indicator is lit (**3** in Figure 81 on page 67). 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 82 on page 68) 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.

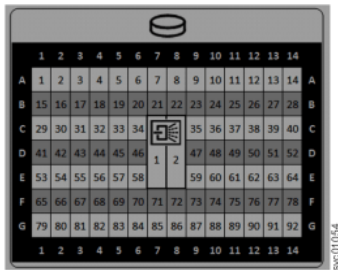


Figure 82. Drive locations in a 5U expansion enclosure

The drive slots must be populated sequentially, starting from the back-left corner position (slot 1, grid A1). Sequentially install the drive in the slots from left to right and back row to front. Always complete a full row before you install drives in the next row.

For example, in Figure 83 on page 68, 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.

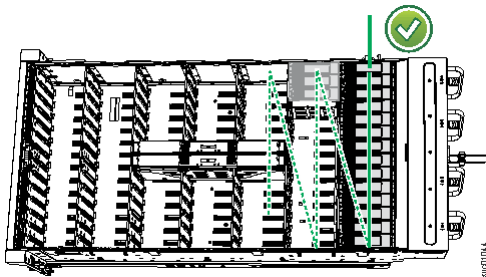


Figure 83. Correct drive installation

In Figure 84 on page 69, 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 84. Incorrect drive installation

4. Touch the static-protective package that contains the drive to any unpainted metal surface on the enclosure. Wear an anti-static wrist strap to remove the drive from the package.
5. Ensure that the drive handle (1 in Figure 85 on page 69) of the drive assembly is in the open (unlocked) position.
6. Align the drive carrier into the appropriate drive slot.

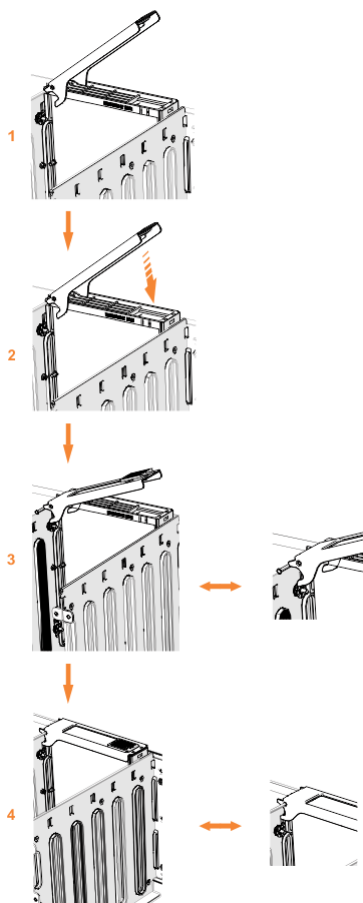


Figure 85. Replace the drive

7. Gently push the drive down until it stops and the bottom of the latch is aligned with the top of the partition. Ensure that the handle is not open more than 45 degrees from the drive carrier. (2 in Figure 85 on page 69).
8. Rotate the handle down to lock the drive assembly into the chassis (3 in Figure 85 on page 69).
9. Ensure the toe on the bottom of the latch is fully engaged with the partition in the chassis.
10. Ensure that the top toe of the latch is also fully engaged (4 in Figure 85 on page 69).
11. Repeat steps “4” on page 69 through “10” on page 69 for each drive you are replacing.
12. Replace the cover, as described in “Installing or replacing the top cover” on page 66.

13. Slide the expansion enclosure back into the rack, as described in [“Installing or replacing a 5U expansion enclosure in a rack”](#) on page 57.

Installing or replacing a secondary expander module

You can replace a faulty secondary expander module in a 5U expansion enclosure. You may also need to install a secondary expander module that was temporarily removed 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:

- Only an IBM Service Support Representative (SSR) can remove or replace the secondary expander module from an enclosure (FRU P/N 01LJ112) that is powered on. If the 01LJ112 enclosure is powered on, use caution and avoid contact with the connectors on the main board.
- If the FRU part number of the enclosure is 01LJ607, you can remove or replace the secondary expander module while the enclosure is powered on.

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.
- Ensure that the FRU P/N for the replacement secondary expander module is appropriate for the enclosure in which it is being installed.

About this task

As [Figure 86 on page 71](#) shows, the 5U expansion enclosure contains two secondary expander modules. In the figure, **A** shows the location of secondary expander module 1, **B** shows secondary expander module 2, and **C** shows the front of the enclosure.

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 expansion canister 1 through secondary expander module 2. SAS port 2 of each drive is connected to expansion canister 2 through secondary expander module 1. If secondary expander module 2 is missing or is faulty, the expansion canister can communicate only with SAS port 2 on each drive. Similarly, if secondary expander module 1 is missing or is faulty, the expansion canister can communicate only with SAS port 1 on each drive.



Figure 86. 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”](#) on page 54.
- The secondary expander module was removed, as described in [“Removing a secondary expander module”](#) on page 97.

Procedure

1. Slide the expansion enclosure out from the rack, as described in [“Removing a 5U expansion enclosure from a rack”](#) on page 85.
2. Identify the secondary expander module to be replaced; [Figure 87](#) on page 71 shows the LEDs on top of a secondary expander module.

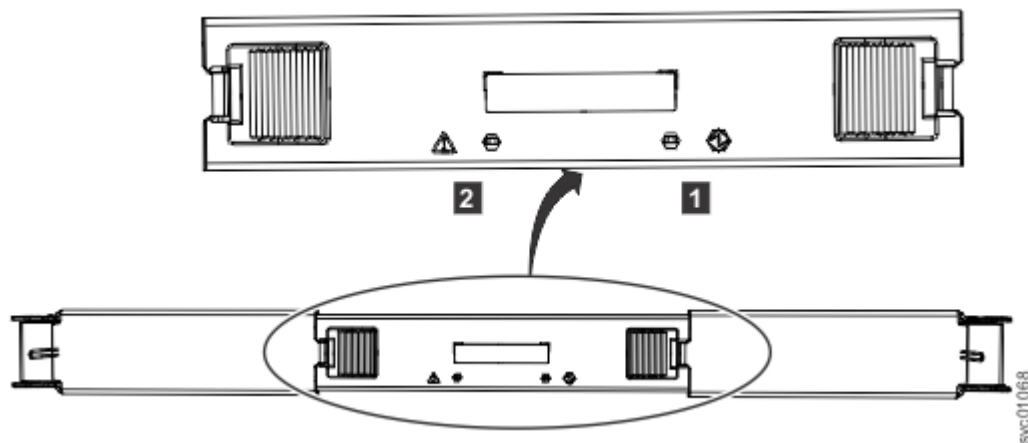


Figure 87. LEDs on a secondary expander module

- 1** Online indicator
- 2** Fault indicator

3. Rotate both handles on the new secondary expander module to an open position, as shown in [Figure 88](#) on page 72.

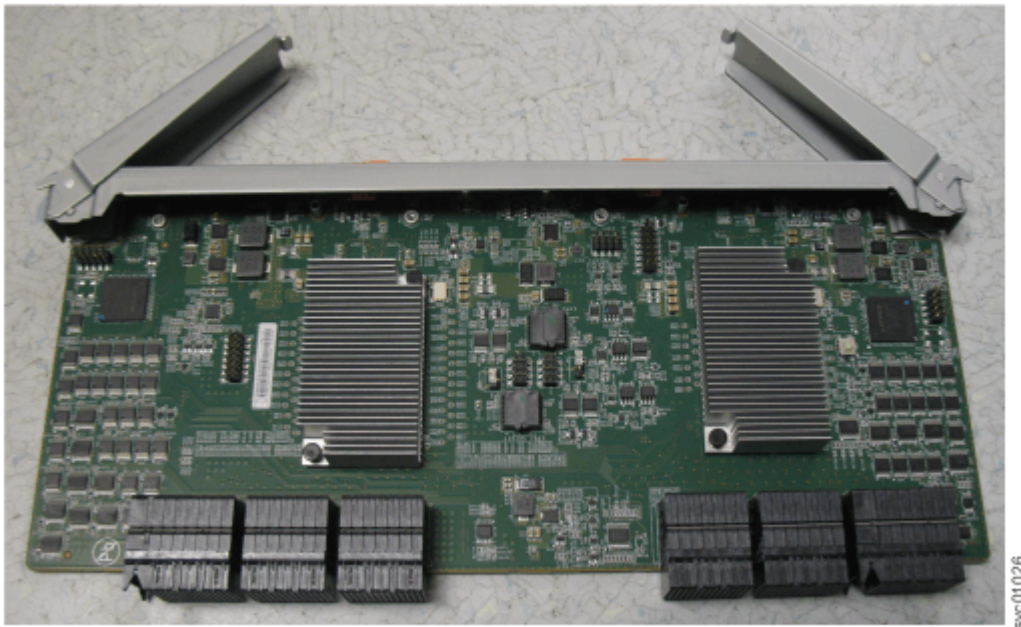


Figure 88. Open the secondary expander module handles

4. Align the edges of the secondary expander module carefully in the guide slot in the enclosure, as shown in [Figure 89](#) on page 72.

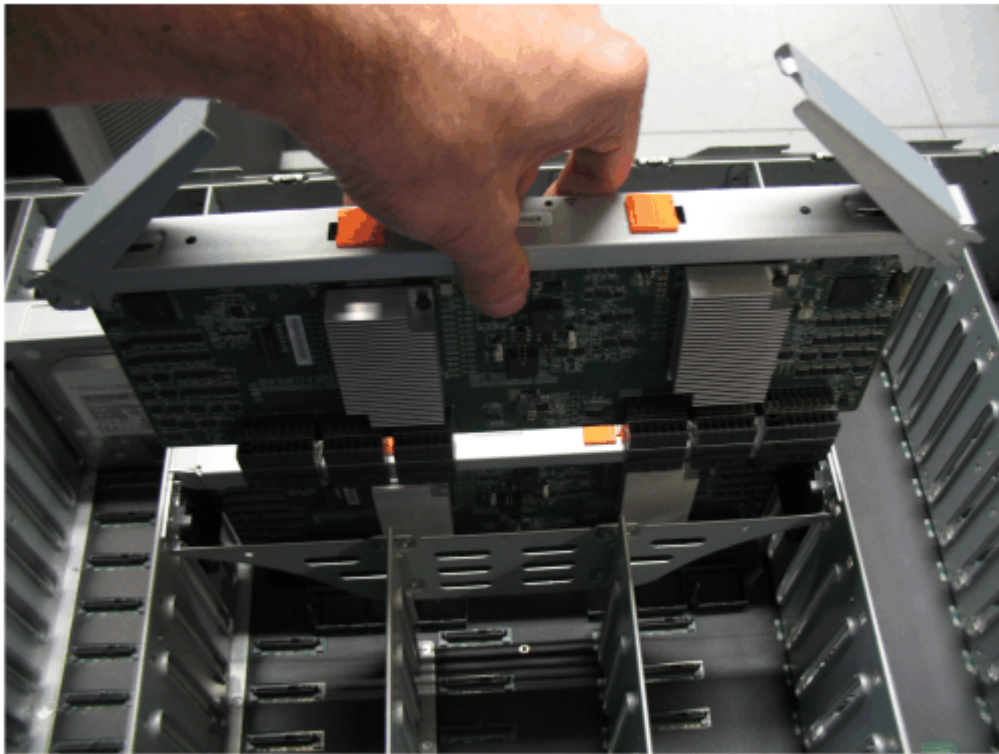


Figure 89. Replace the secondary expander module

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 71 through step “6” on page 72 to replace the other secondary expander module.
8. Replace the top cover, as described in [“Installing or replacing the top cover”](#) on page 66.

9. If needed, reconnect the power cables to the expansion enclosure, as described in [“Powering on the 5U expansion enclosure”](#) on page 118.
10. Check the LEDs on the top of the secondary expander module to verify that it is receiving power. [“5U expansion enclosure LEDs and indicators”](#) on page 121 describes the status indicated by the LEDs.

Installing or replacing the fascia

During the initial installation process or after you perform service, you can install the fascia components on the front of a 5U 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 90 on page 73](#) shows, the fascias are independent; you can remove or replace one without having to remove or replace the other.

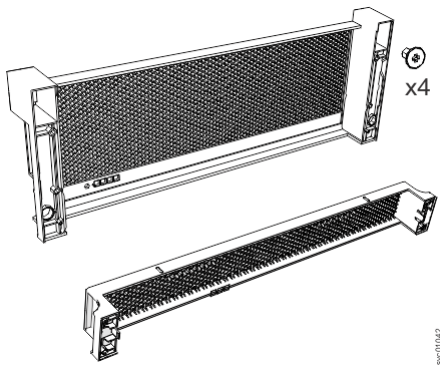


Figure 90. Fascia components on the expansion enclosure

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

Procedure

Attach the front (4U) fascia

1. Align the front 4U fascia with the enclosure so that the thumbscrews go through the holes on each side. As [Figure 91 on page 74](#) shows, this action aligns the screw holes on the back of the fascia with the screw holes on the front flange of the enclosure.
2. Replace the four screws to reattach the 4U fascia. Secure the screws from the back of the flange and into the rear of the fascia. Each side of the 4U fascia contains two screws.

Attach the bottom (1U) fascia

3. Reattach the bottom 1U fascia that covers the power supply units (PSUs). Align the fascia with the enclosure and gently push it until it clicks into place on the chassis, as shown in [Figure 91 on page 74](#).

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.

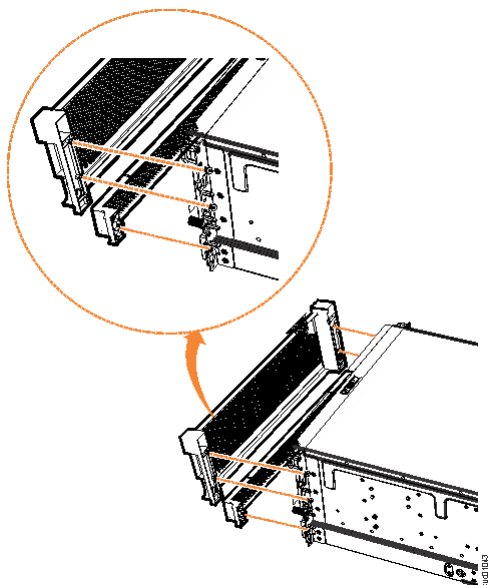


Figure 91. Replace fascia components on the expansion enclosure

Installing or replacing a power supply

Use the following procedures to replace either of the redundant power supplies in the 5U 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 ”](#) on page 92.
- You removed the fascia that covers the PSU from the front of the expansion enclosure, as described in [“Removing the fascia ”](#) on page 77.
- 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 92](#) on page 75.



Figure 92. Preparing to install the power supply

3. Slide the PSU forward into the chassis until it clicks in to place, as shown in [Figure 93 on page 76](#).

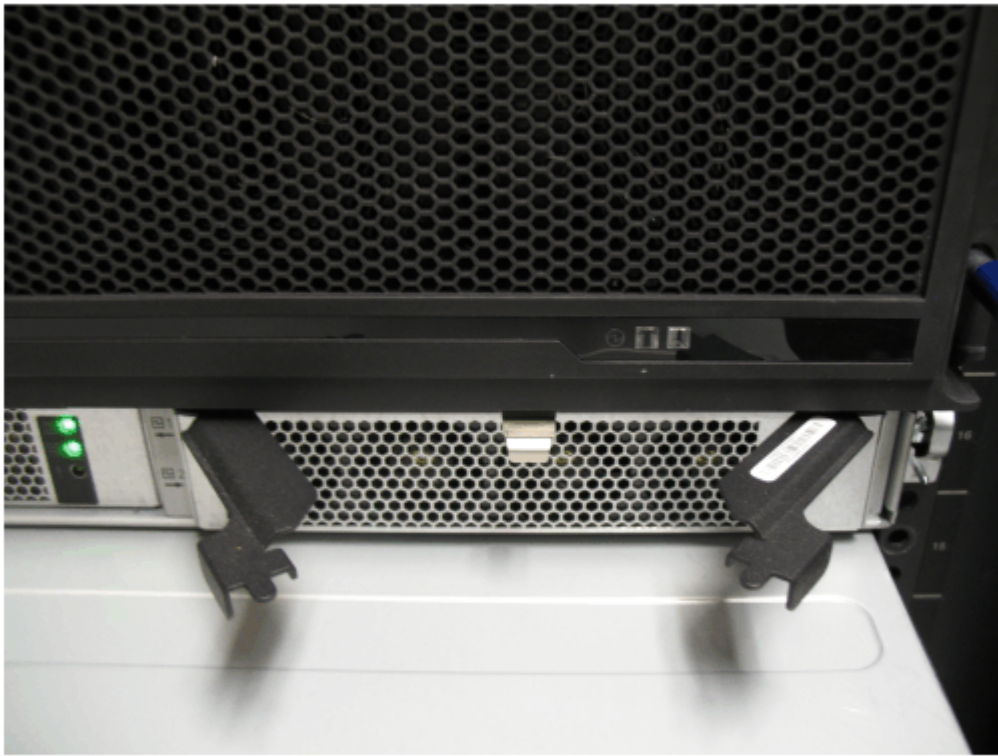


Figure 93. Install the power supply

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 94 on page 76](#).



Figure 94. Power supply indicators

For more information about the power supply indicators, see [“5U expansion enclosure LEDs and indicators”](#) on page 121.

Removing the fascia

To complete some service tasks, you can remove each component of the fascia from the front of a 5U expansion enclosure.

About this task

The 5U 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 95 on page 77](#) shows, the fascias are independent; you can remove or replace one without having to remove or replace the other.

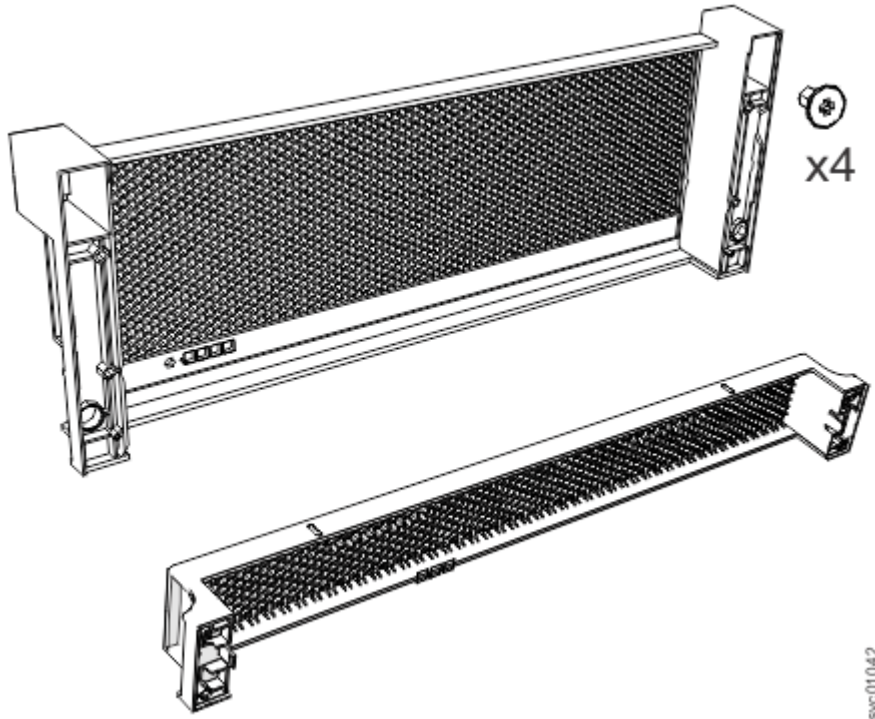


Figure 95. Fascia components on the expansion enclosure

Procedure

1. Use the slide rails to pull the enclosure out of the rack, as described in [“Removing a 5U expansion enclosure from a rack”](#) on page 85.

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 96 on page 78](#).

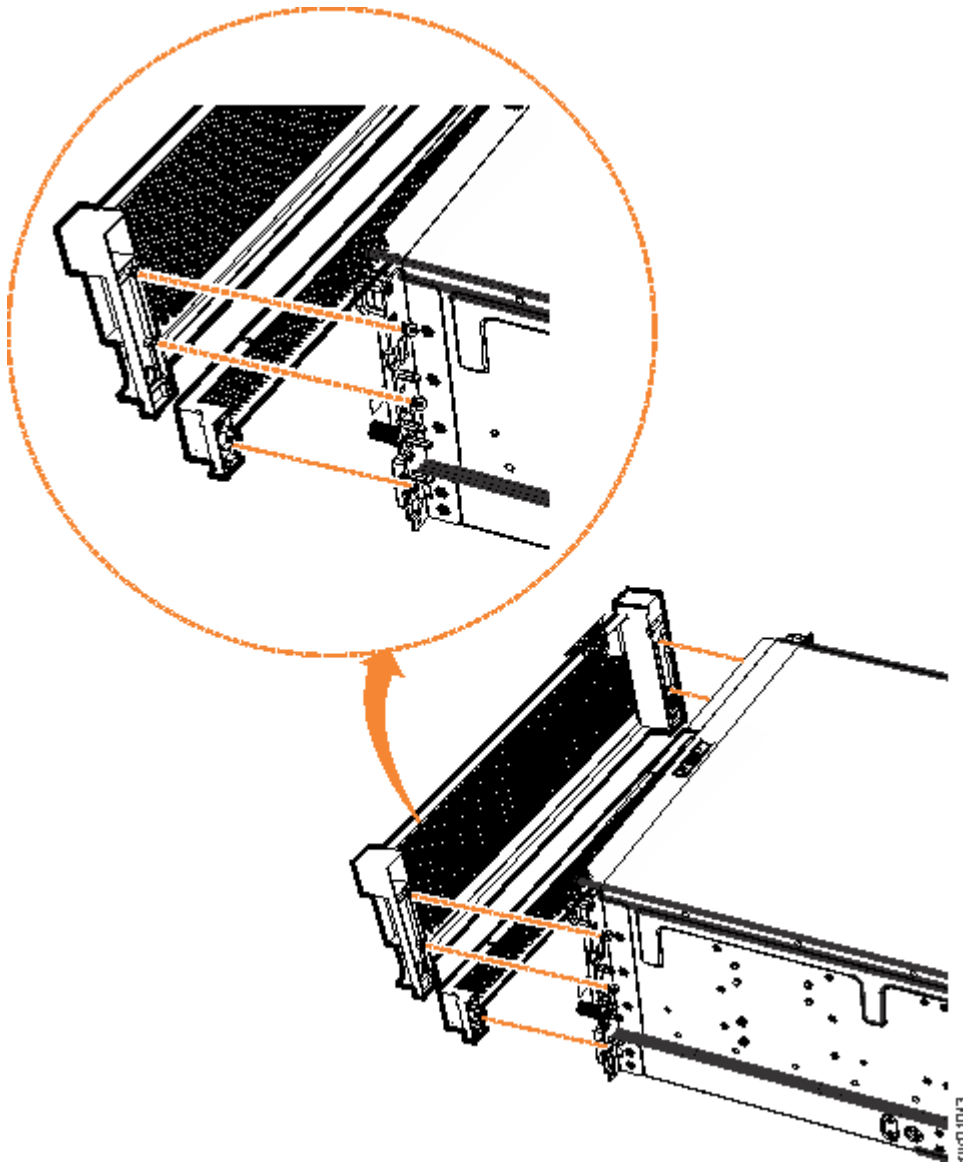


Figure 96. Remove fascia components from the expansion enclosure

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 96](#) on page [78](#). The PSU fascia disengages 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 97](#) on page [79](#) shows, you do not have to remove the front fascia.



Figure 97. 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” on page 73](#).

Removing and installing a SAS cable

Use the following procedures to attach SAS cables to the 5U 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. See the Installing container of the IBM Knowledge Center for information about the correct SAS cabling for expansion enclosures.

When the 5U expansion enclosure is installed in the rack, the expansion canisters are upside down. The input cable connects to the right port (port 1) on the expansion canister. The output cable connects to the left port (port 2) on the canister.

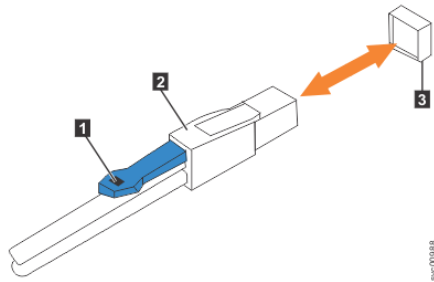
Procedure

Removing a SAS cable

1. Locate the connector at the end of the SAS cable that is to be removed from the expansion enclosure.
2. Grasp the connector by its blue tag. Pull the tag.
3. Release the connector and slide it out of the SAS port.
4. Repeat steps [“2” on page 79](#) and [“3” on page 79](#) 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 98 on page 80](#). The blue tab must face towards the top of the enclosure canister.



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

Figure 98. 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 system node

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

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

8. Route the SAS cables through the cable management arms, as shown in [Figure 99 on page 80](#).

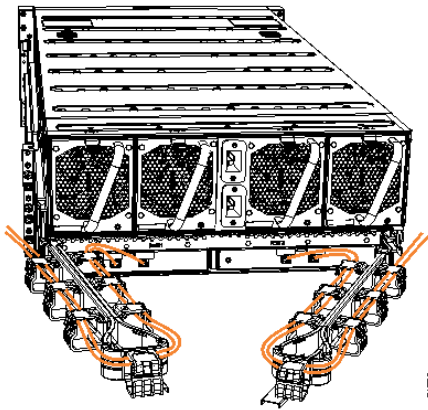


Figure 99. Example of SAS cables routed through the cable management arms

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

For example, [Figure 100 on page 81](#) shows the LEDs of expansion canister 1 on a 5U expansion enclosure. The SAS cable is successfully inserted in to port 1 (input); port 2 (output) does not contain a SAS cable.



Figure 100. SAS cable correctly inserted into the SAS port

Installing or replacing a fan module

You can reinstall a fan module or replace a faulty fan module in a 5U 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.

This task assumes that the following condition was met:

- You removed a fan module, following the process described in [“Removing a fan module” on page 102](#).

Procedure

1. Hold the fan module with the release tab on top and the connector pin on the bottom, as shown in [Figure 101 on page 82](#).



Figure 101. Fan module orientation

2. Carefully insert the fan module into the chassis until it clicks in place, as shown in [Figure 102 on page 82](#).

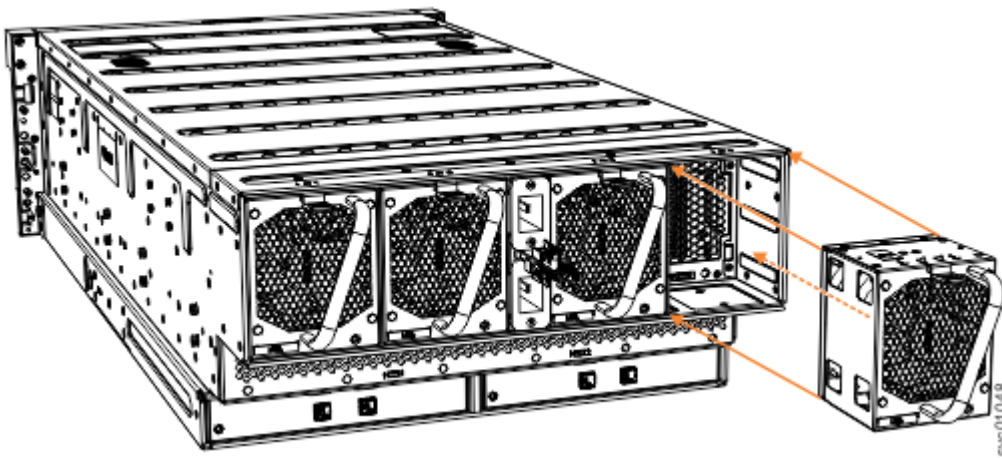


Figure 102. Replace fan module

Replacing all fan modules

3. Repeat steps “1” on [page 81](#) and “2” on [page 82](#) for each fan module to be replaced.
4. Power on the expansion enclosure.

Installing or replacing a fan interface board

You can replace a fan interface board (FIB) in a 5U expansion enclosure.

Before you begin

This task assumes that the following conditions are met:

- You removed the fan interface board, following the process described in “[Removing a fan interface board](#)” on [page 104](#).
- All power cables were removed from the enclosure, as described in “[Powering off the 5U expansion enclosure](#)” on [page 120](#).
- The expansion enclosure is removed from the rack, as described in “[Removing a 5U expansion enclosure from a rack](#)” on [page 85](#).

- 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 5U 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 expansion enclosure”](#) on page 107.

Procedure

1. Assemble the new FIB, cover, and the cover screws (shown in [Figure 103 on page 83](#)) in a safe location.

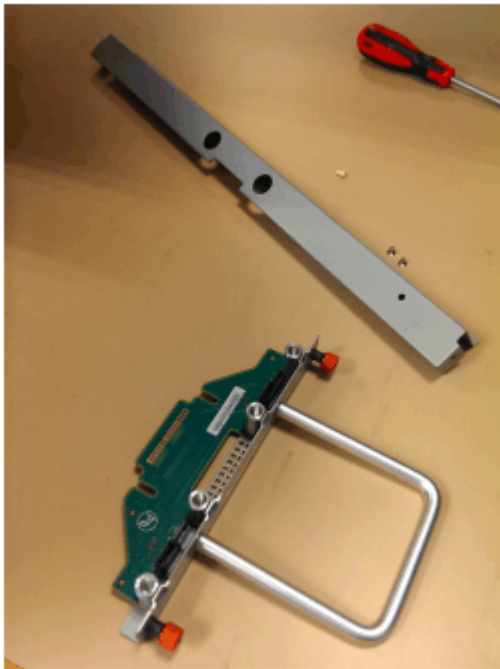


Figure 103. FIB parts for the chassis

2. Carefully insert the new FIB into the expansion enclosure chassis, as shown in [Figure 104 on page 84](#).



Figure 104. 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 105 on page 84.



Figure 105. Secure the FIB to the drive board

4. If needed, repeat steps “2” on page 83 and “3” on page 84 to replace the other FIB.

5. Replace the narrow metal cover, which is shown in [Figure 106 on page 85](#), over the FIB assemblies. The attachment screws are on each side of the chassis.



Figure 106. Replace the FIB cover

6. Place the enclosure back in the rack, as described in [“Installing or replacing a 5U expansion enclosure in a rack” on page 57](#)
7. Replace each of the fan modules. Follow the procedure that is described in [“Installing or replacing a fan module” on page 81](#).
8. Replace the drives, secondary expander modules, and other heavy FRUs that were removed before the enclosure was removed from the rack.
9. Replace the top cover, as described in [“Installing or replacing the top cover” on page 66](#).
10. Reconnect power to the enclosure, as described in [“Powering on the 5U expansion enclosure” on page 118](#).

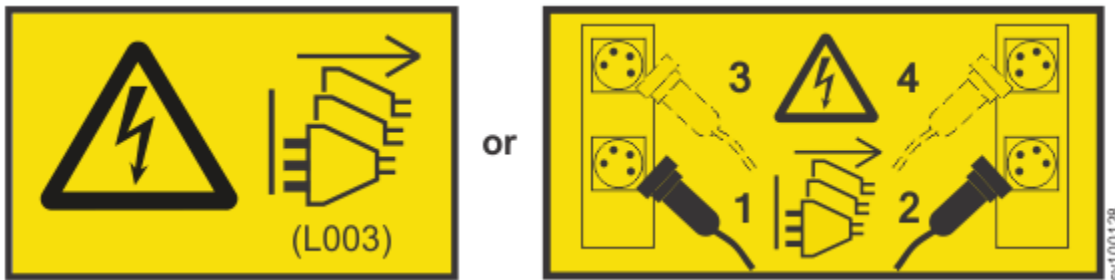
Removing a 5U expansion enclosure from a rack

You might need to slide the 5U 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)



Use the reference numbers in parentheses at the end of each notice (for example, D005) to find the matching translated notice in *IBM System Storage SAN Volume Controller 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:

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

snc01053

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



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



CAUTION: CAUTION regarding IBM provided VENDOR LIFT TOOL:

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

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

About this task



Attention: To avoid potential equipment damage during transport and subsequent loss of data, see [Procedure: Transporting a 5U 92-drive expansion enclosure](#). The procedure describes what to do for the following situations.

- When you are powering off a 92F, 92G, or an A9F 5U expansion enclosure because you intend to transport it to another location
- When you intend to move a rack that contains a 92F, 92G, or an A9F 5U expansion enclosure

The procedure describes how to remove each drive from the 5U enclosure and transport the enclosure. Removing the drives prevents damage to the drives and makes the lighter enclosure easier to move.

To complete 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 completely from the rack.

Important:

The 5U 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 complete 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 107 on page 91](#).

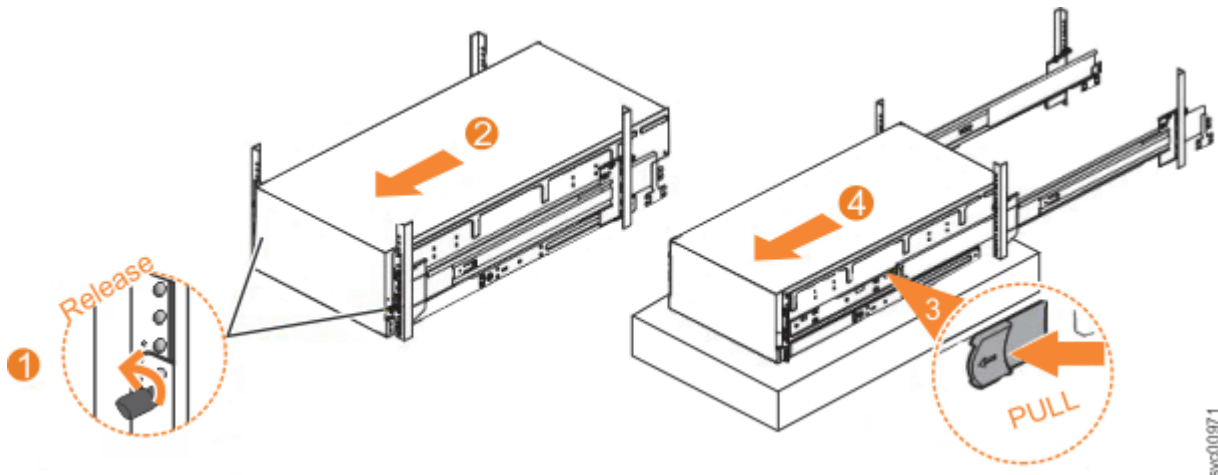


Figure 107. Removing the 5U expansion enclosure from the rack

2. Carefully slide the enclosure forward out of the rack (2), as shown in [Figure 107 on page 91](#).
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 107 on page 91](#).
4. Slide the enclosure and inner rail member out of the rack (4) in [Figure 107 on page 91](#).

For safety, ensure that 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” on page 91 through step “7” on page 92) only if you must completely remove the expansion enclosure from the rack to complete 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](#)” on page 54
 - “[Removing the fascia](#)” on page 77 (for the PSU fascia) and “[Removing a power supply](#)” on page 92
 - “[Removing a drive](#)” on page 94
 - “[Removing a secondary expander module](#)” on page 97
 - “[Removing an expansion canister](#)” on page 101 and “[Removing and installing a SAS cable](#)” on page 79
 - “[Removing a fan module](#)” on page 102

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 a 5U expansion enclosure in a rack ” on page 57.](#)

Removing a power supply

You can remove either of the redundant power supply units in a 5U 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 108 on page 93](#), 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 ” on page 77.](#)
3. Press on the handle lock to release the handles on the PSU.
4. Rotate the handles outward, as shown in [Figure 108 on page 93.](#)



Figure 108. 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 109](#) on page 94.



Figure 109. 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”](#) on page 74.

Removing a drive

You can remove a faulty drive from a 5U 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, complete 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 5U expansion enclosure supports 92 drives. [Figure 110 on page 95](#) shows an example of a drive assembly.

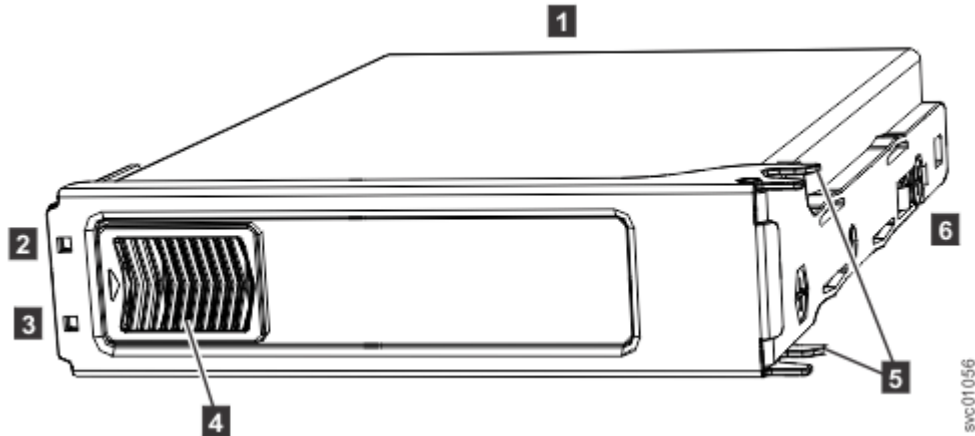


Figure 110. Drive assembly

- 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 a 5U expansion enclosure from a rack” on page 85](#).
3. Remove the top cover, as described in [“Removing the top cover” on page 54](#).
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 110 on page 95](#)). 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 111 on page 96](#)) 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.

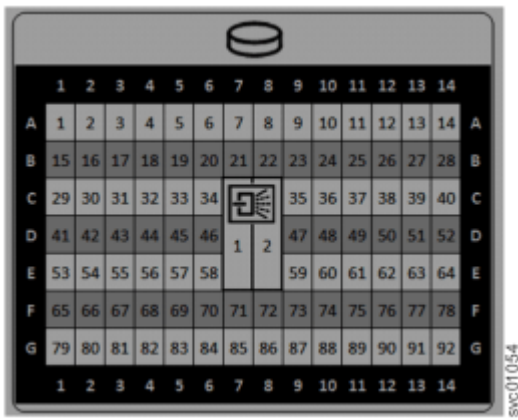


Figure 111. Drive locations in a 5U expansion enclosure

5. Slide the release latch forward (1), as shown in Figure 112 on page 96.

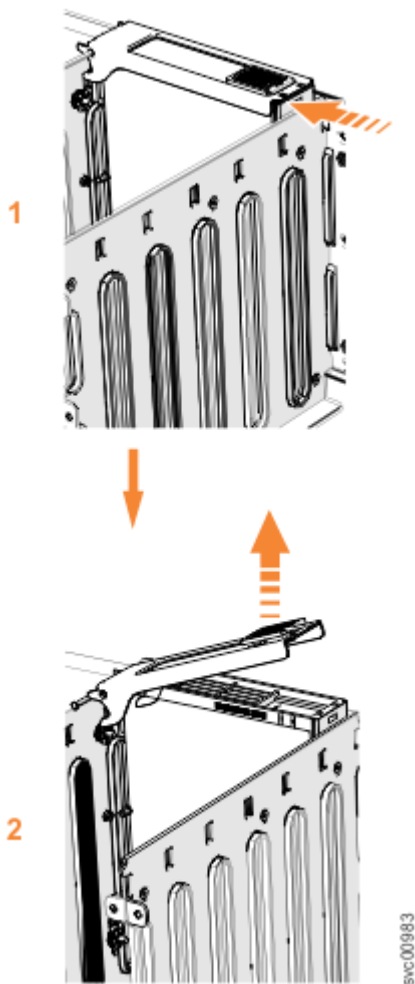


Figure 112. Remove the drive assembly

6. Lift the handle (2) to unlock the drive carrier from the partition, as shown in Figure 112 on page 96. 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 95 through step “7” on page 96 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”](#) on page 67.

Removing a secondary expander module

You can remove a secondary expander module from a 5U 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:

- Only an IBM Service Support Representative (SSR) can remove or replace the secondary expander module from an enclosure (FRU P/N 01LJ112) that is powered on. If the 01LJ112 enclosure is powered on, use caution and avoid contact with the connectors on the main board.
- If the FRU part number of the enclosure is 01LJ607, you can remove or replace the secondary expander module while the enclosure is powered on.

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 5U expansion enclosure is shipped, as [Figure 113](#) on [page 98](#) shows.



Figure 113. Location of secondary expander modules

Figure 114 on page 98 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.

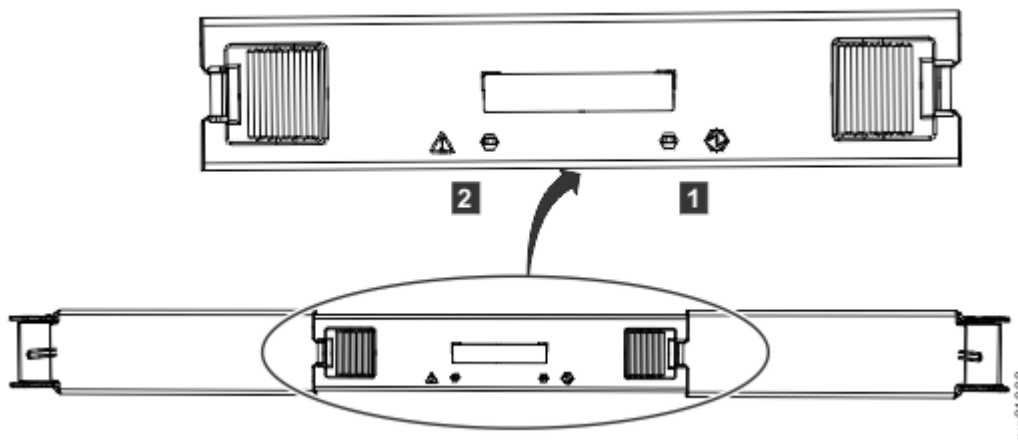


Figure 114. Location of LEDs on the secondary expander module

Table 16 on page 98 describes the function and status values of each LED indicator.

Table 16. 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.
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 a 5U expansion enclosure from a rack”](#) on page 85.
- The top cover was removed, as described in [“Removing the top cover”](#) on page 54.

Procedure

1. Identify the secondary expander module to be replaced; refer to [Table 16](#) on page 98.
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. Lift the secondary expander module carefully out of the enclosure, as shown in [Figure 115](#) on page 99.

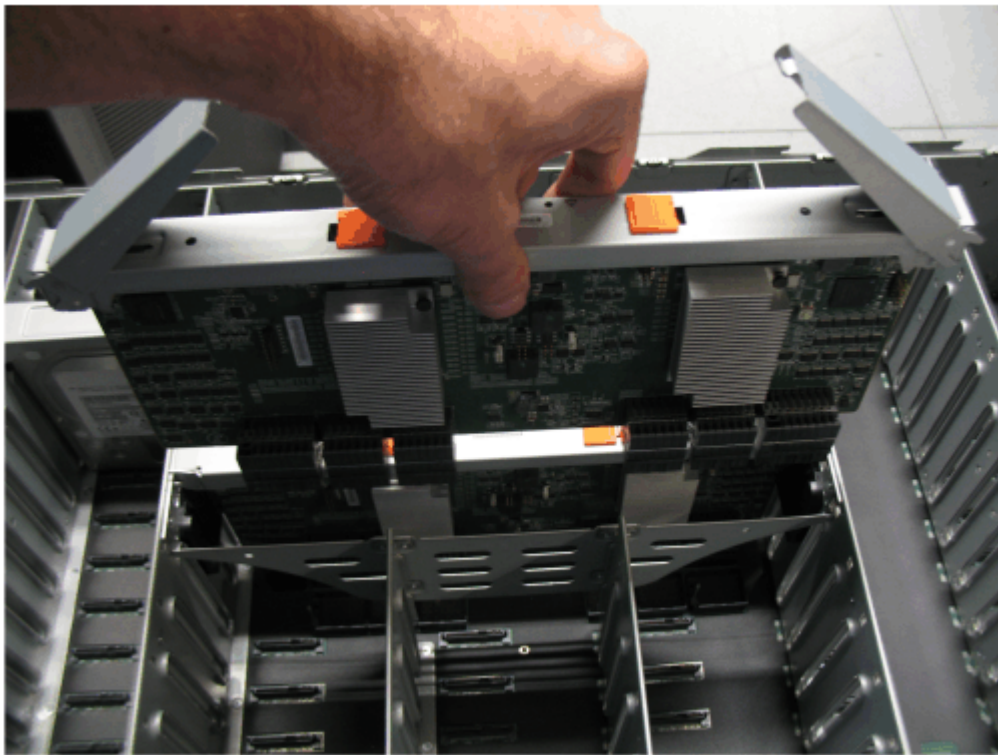


Figure 115. Remove the secondary expander module

Important: To avoid electric shock after you remove the secondary expander module, do not touch the connectors inside the enclosure (FRU P/N 01LJ112), which are shown in [Figure 116](#) on page 100.

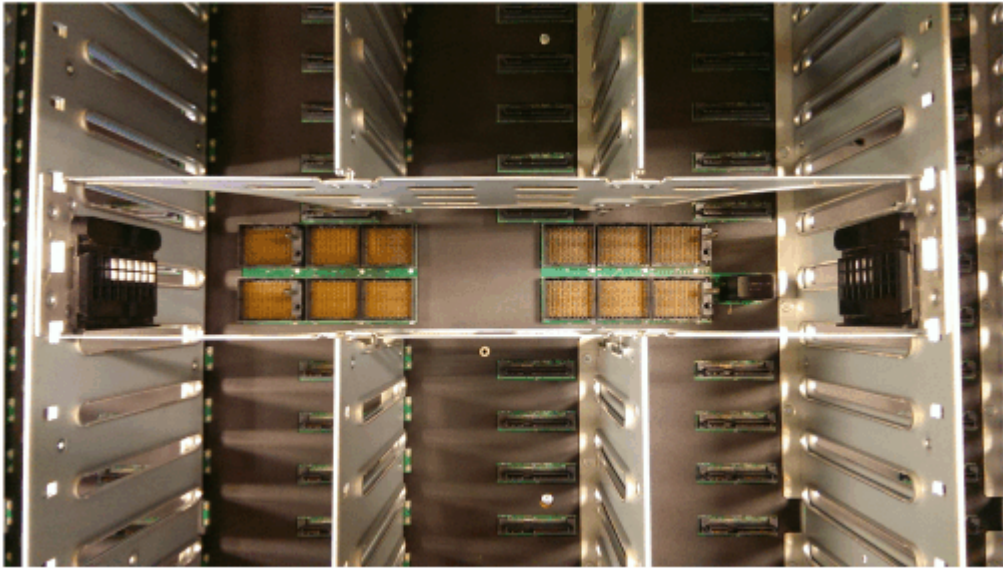


Figure 116. Secondary expander module connectors

5. Place the secondary expander module in a safe location, as shown in [Figure 117 on page 100](#).

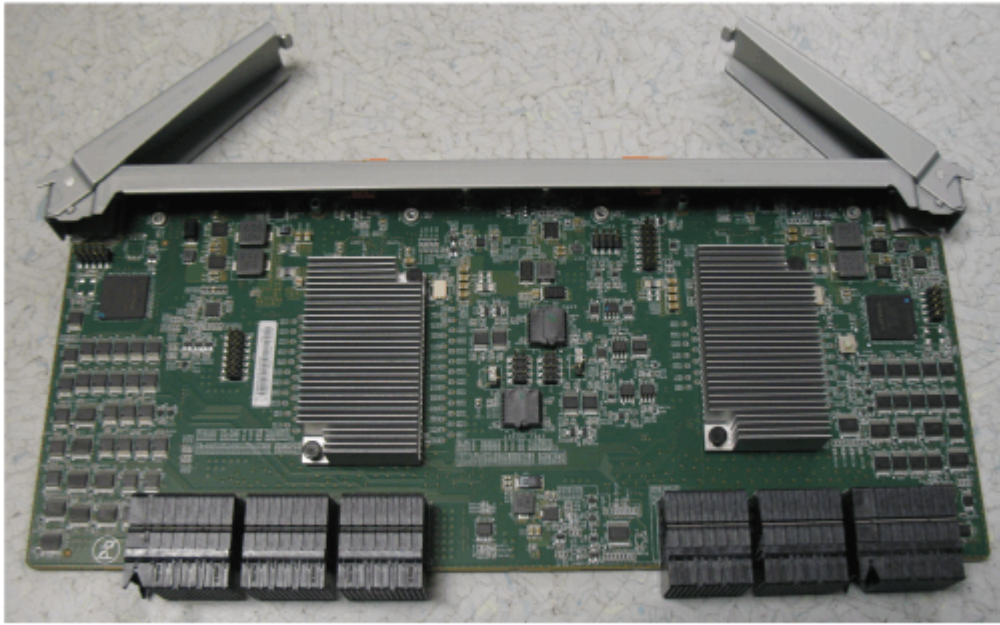


Figure 117. Secondary expander module removed from the enclosure

6. If needed, repeat step “2” on [page 99](#) through step “5” on [page 100](#) 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” on page 70](#).

Removing an expansion canister

You can remove the expansion canisters in a 5U 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 5U expansion enclosure and control enclosure system. If either of the two expansion canisters has a failure, the other expansion canister assumes the full I/O load. [Figure 118 on page 101](#) shows the features of an expansion enclosure.

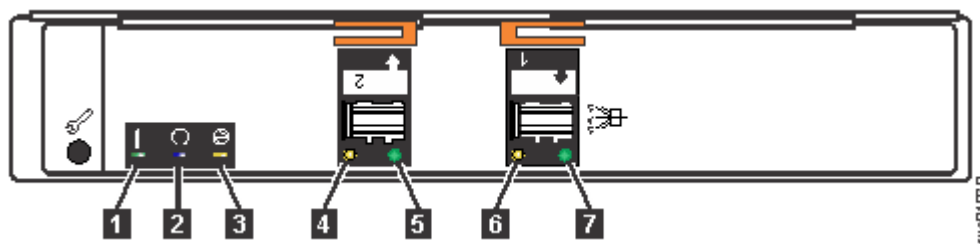


Figure 118. Expansion canister

- 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” on page 62](#).
4. Remove the SAS cables from the expansion canister, as described in [“Removing and installing a SAS cable” on page 79](#).
5. Rotate the handles on the expansion canister outward, as shown in [Figure 119 on page 102](#).



Figure 119. 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”](#) on page 58.

Removing a fan module

You can remove a fan module from a 5U 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

Note: If you plan to remove the expansion enclosure from the rack, you must remove all of the fan modules.

Procedure

1. Identify the fan module to be replaced. When lit, the amber LED on the front of the fan module (1 in [Figure 120 on page 103](#)) identifies a fault.

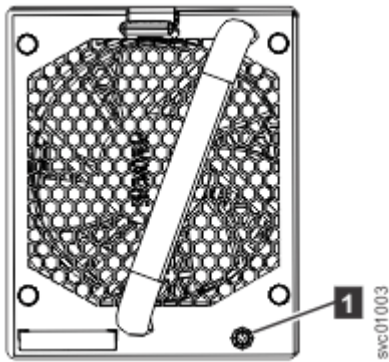


Figure 120. Fan module LED

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 121 on page 103](#) shows.

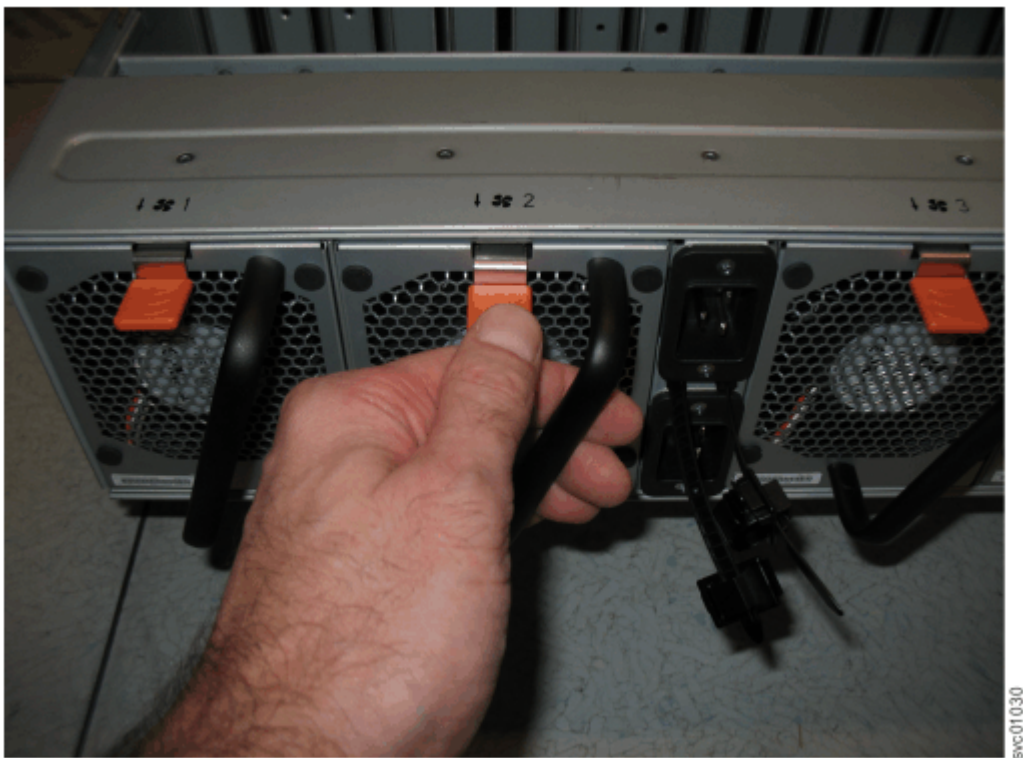


Figure 121. Fan module release tab

3. Use the handle to pull the fan module out of the expansion enclosure chassis, as shown in [Figure 122 on page 104](#).

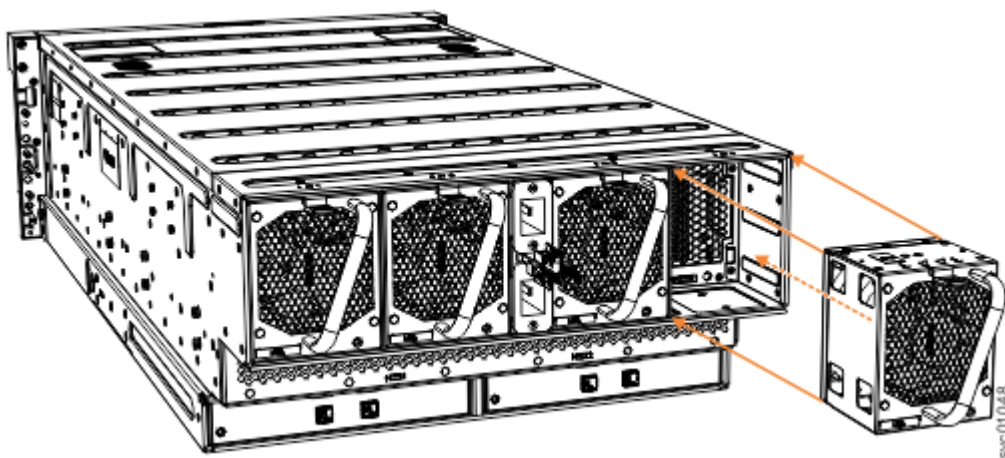


Figure 122. Remove fan module

4. Repeat steps “2” on page 103 and “3” on page 103 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” on page 81.

Removing a fan interface board

You can remove a fan interface board (FIB) from a 5U 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 5U expansion enclosure” on page 120.
- 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 a 5U expansion enclosure from a rack” on page 85.

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

About this task

The 5U 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” on page 102 and “Installing or replacing a fan module” on page 81 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 123 on page 105).

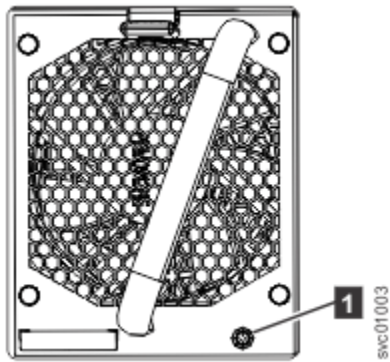


Figure 123. Fan module LED

Procedure

1. Using a cross head screwdriver, remove the narrow metal cover that is over the FIBs, as shown in [Figure 124 on page 105](#). The screws are on each side of the chassis. Place the cover and cover screws in a safe location.



Figure 124. Location of the FIB cover

2. Use a cross head screwdriver to loosen the retaining screws on the FIB, as shown in [Figure 125 on page 106](#).



Figure 125. Loosen the FIB screws

3. Use the handle to pull the FIB out of the expansion enclosure chassis, as shown in [Figure 126 on page 106](#).



Figure 126. Remove the FIB from the chassis

4. Place the FIB (shown in [Figure 127 on page 107](#)) in a safe location.

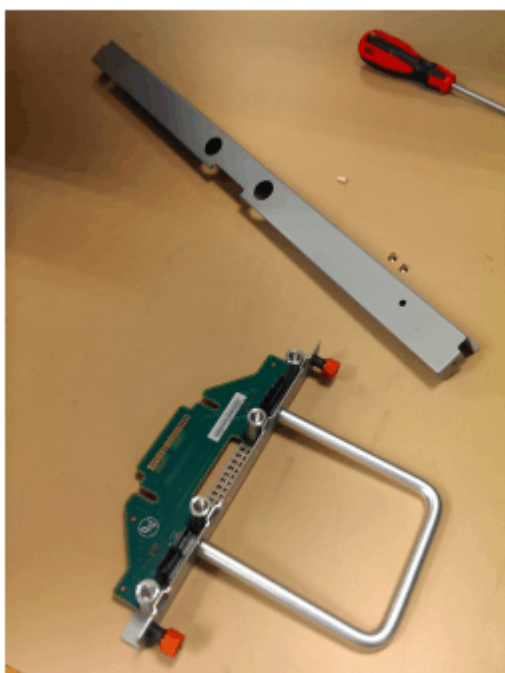


Figure 127. FIB parts removed from the chassis

5. If needed, repeat steps “2” on page 105 through “3” on page 106 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 ” on page 82.

Replacing an expansion enclosure

You can replace a faulty enclosure of a 5U 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:

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

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)

Notes:

- Perform the following procedure only if directed to do so by IBM Remote Technical support or by a fix procedure in the management GUI.
- An enclosure can have FRU P/N 01LJ112 or FRU P/N 01LJ607. When needed, an enclosure with FRU P/N 01LJ607 is used to replace FRU P/N 01LJ112.

This task assumes that the following conditions are met:

- All power cables were removed from the enclosure, as described in [“Powering off the 5U expansion enclosure”](#) on page 120.
- All SAS cables were removed, as described in [“Removing and installing a SAS cable”](#) on page 79.
- The following FRUs were removed from the enclosure, as described in the applicable tasks:
 - Top cover ([“Removing the top cover”](#) on page 54)
 - Drives ([“Removing a drive ”](#) on page 94)
 - PSU (1U) fascia ([“Removing the fascia ”](#) on page 77)
 - Power supply units ([“Removing a power supply ”](#) on page 92)
 - Secondary expander modules ([“Removing a secondary expander module ”](#) on page 97)
 - Expansion canisters ([“Removing an expansion canister ”](#) on page 101)
 - Fan modules ([“Removing a fan module”](#) on page 102)
- The expansion enclosure was removed from the rack, as described in [“Removing a 5U expansion enclosure from a rack”](#) on page 85.
- A suitably rated mechanical lift is available to support the weight of the enclosure.

About this task

The expansion enclosure 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 ”](#) on page 77.
 - a) Install the front display (4U) and PSU (1U) fascia on the new enclosure, as described in [“Installing or replacing the fascia”](#) on page 73.
2. Remove the display panel assembly from the old enclosure, as described in [“Removing the display panel assembly ”](#) on page 109.
 - a) Install the display panel assembly into on the new enclosure, as described in [“Installing or replacing the display panel assembly ”](#) on page 111.
3. Remove the fan interface boards from the old enclosure, as described in [“Removing a fan interface board ”](#) on page 104.
 - a) Install the fan interface boards into on the new enclosure, as described in [“Installing or replacing a fan interface board ”](#) on page 82.
4. Remove the inner section of the slide rail from the old enclosure, as described in [“Removing the support rails”](#) on page 113.
5. Attach the inner rail section to the new enclosure, as described in [“Installing the support rails ”](#) on page 54.

6. Replace the new enclosure in rack, as described in [“Installing or replacing a 5U expansion enclosure in a rack”](#) on page 57.
7. Reinstall the remaining parts into the enclosure, as described in the following topics. You can install the parts in any order.
Important: Ensure that 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”](#) on page 74
 - [“Installing or replacing a drive”](#) on page 67
 - [“Installing or replacing a secondary expander module”](#) on page 70
 - [“Installing or replacing an expansion canister”](#) on page 58
 - [“Installing or replacing a fan module”](#) on page 81
 - [“Installing or replacing the top cover”](#) on page 66
8. Reconnect the SAS cables, as described in [“Connecting the optional 5U SAS expansion enclosures”](#) on page 114 .
9. Reconnect the power cables, as described in [“Powering on the 5U expansion enclosure”](#) on page 118.
10. Run the next recommended fix procedure in the management GUI to set the serial number of the 5U expansion enclosure.

Removing the display panel assembly

You can remove the display panel assembly from a 5U expansion enclosure.

Procedure

1. Slide the expansion enclosure out of the rack, as described in [“Removing a 5U expansion enclosure from a rack”](#) on page 85.
2. Remove the top cover, as described in [“Removing the top cover”](#) on page 54.
3. Press the release tab at the top of the display panel assembly, as shown in [Figure 128](#) on page 109.

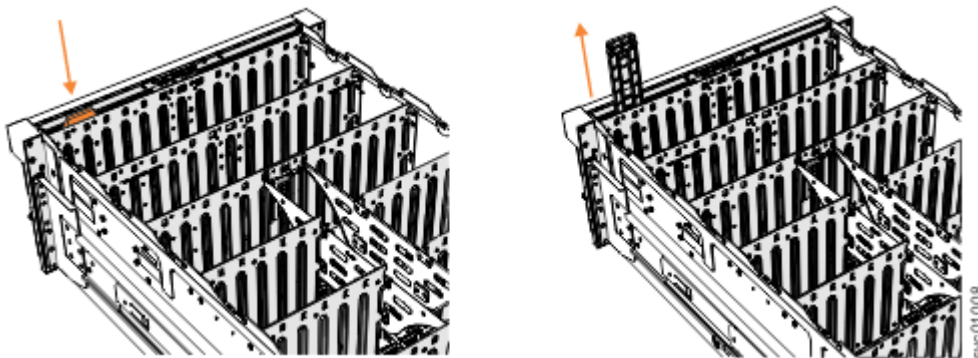


Figure 128. Removing the display panel assembly

4. Carefully pull the display panel assembly, which is shown in [Figure 129](#) on page 110, out of the chassis.



Figure 129. Display panel assembly

Replace the display panel assembly

5. To reinstall the display panel assembly, or replace it with one from FRU stock, follow the procedure in [“Installing or replacing the display panel assembly”](#) on page 111.

Installing or replacing the display panel assembly

You can replace the display panel assembly in a 5U expansion enclosure.

About this task

This task assumes that the following conditions were met:

- The expansion enclosure was moved out from the rack on the slide rails, as described in [“Removing a 5U expansion enclosure from a rack” on page 85](#)
- The top cover was removed, as described in [“Removing the top cover” on page 54](#).
- The display panel assembly was removed, as described in [“Removing the display panel assembly ” on page 109](#).

Procedure

1. Remove the display panel assembly, which is shown in [Figure 130 on page 112](#), from its packaging.



Figure 130. Display panel assembly

2. Carefully align the display panel assembly in the slot at the front of the expansion enclosure, as shown in [Figure 131 on page 113](#).

Ensure the display panel assembly, which is shown in [Figure 130 on page 112](#), faces toward the outside of the chassis.

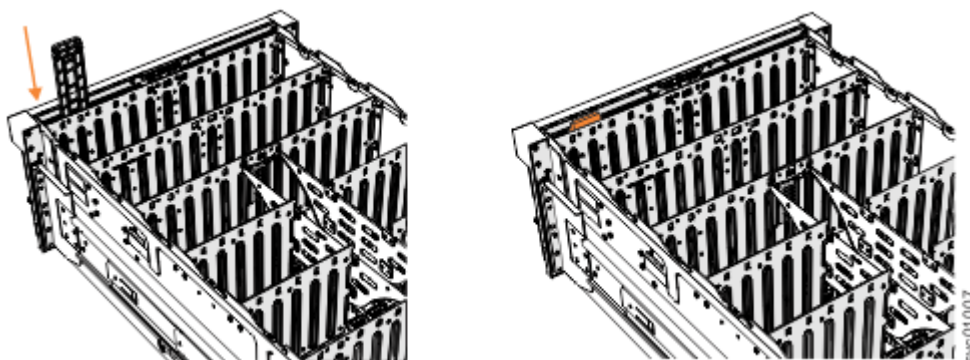


Figure 131. Installing the display panel assembly

3. Insert the display panel assembly until it clicks into position.
4. Replace the top cover, as described in [“Installing or replacing the top cover”](#) on page 66.
5. Ensure the LEDs on the display panel are lit correctly. See [“5U expansion enclosure LEDs and indicators”](#) on page 121 for details.

Removing the support rails

You can remove the support rails for the 5U expansion enclosure.

About this task

This task assumes the following conditions:

- The cable management arm is removed, as described in [“Removing or moving the cable-management arm”](#) on page 59.
- The expansion enclosure is removed from the rack, as described in [“Removing a 5U expansion enclosure from a rack”](#) on page 85.

Procedure

1. Remove the two screws that attach the outer rail section to the front bracket assembly, as shown in [Figure 132 on page 113](#).

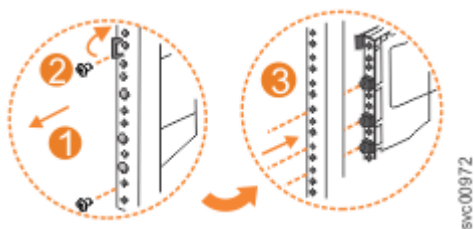


Figure 132. Remove the rail assembly from the front frame bracket

2. Remove the rail section by pulling it away from the front bracket, as shown in [Figure 132 on page 113](#).
3. Remove the two screws that attach the inner rail section to the rear bracket, as shown in [Figure 133 on page 114](#).

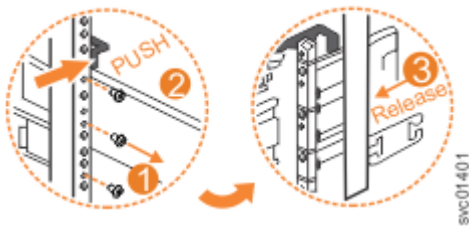


Figure 133. Remove the rail assembly from the rear frame bracket

4. Pull the rail forward, away from the rear bracket, as shown in [Figure 133 on page 114](#).
5. Repeat step “1” on [page 113](#) through step “4” on [page 114](#) for the other side of the rail assembly.

Replace the support rails

6. To reinstall the support rails, or replace them with support rails from FRU stock, follow the procedure in [“Installing the support rails” on page 54](#).

Connecting the optional 5U SAS expansion enclosures

After you install the 5U SAS expansion enclosures into the rack, you must connect them to each 2145-SV1 or 2145-DH8 node in the I/O group that will use them.

Before you begin

Important: To support the 5U expansion enclosure, 2145-SV1 and 2145-DH8 systems require 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 5U expansion enclosure. When you insert the SAS cables, ensure that the connector is oriented correctly to the node and expansion enclosure.

- For 2145-24F or 2145-12F expansion enclosures, the blue pull tab must be below the cable (**1** in [Figure 134 on page 114](#)).

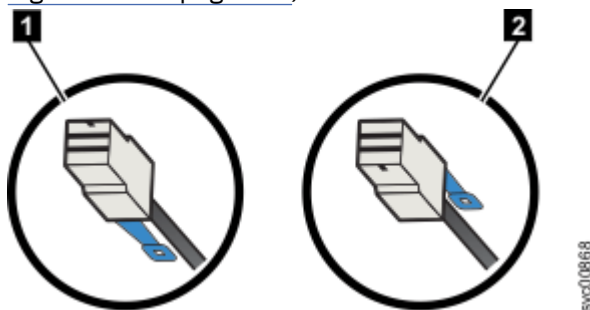


Figure 134. SAS cable connector orientation

- For 2145-SV1 or 2145-DH8 nodes and 5U expansion enclosures, the blue pull tab must be above the connector (**2** in [Figure 134 on page 114](#)).
- 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.

Note: It might be hard to attach the SAS cable to a SAS port on a 2145-SV1 enclosure. If it will not close by itself, you might need to push the SAS cable latch down with your finger ([Figure 135 on page 115](#)).

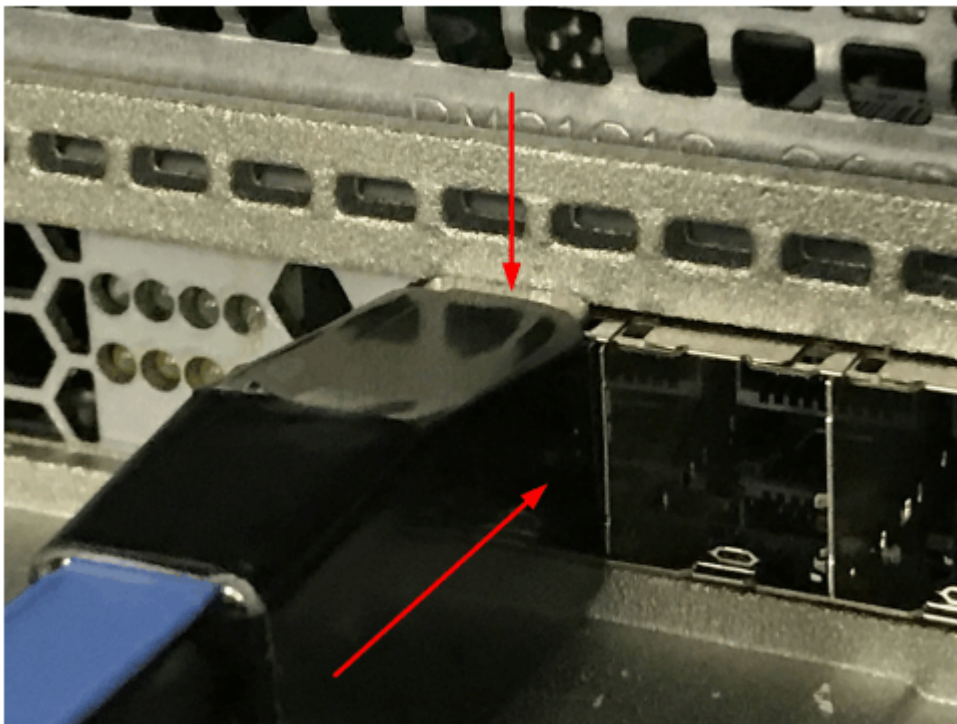


Figure 135. Pushing the SAS cable latch closed

- 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 136 on page 116](#).

Note: Figure 136 on page 116 is provided to show the cable connections between the SAS enclosures and each node 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 5U expansion enclosure near the bottom of the rack.

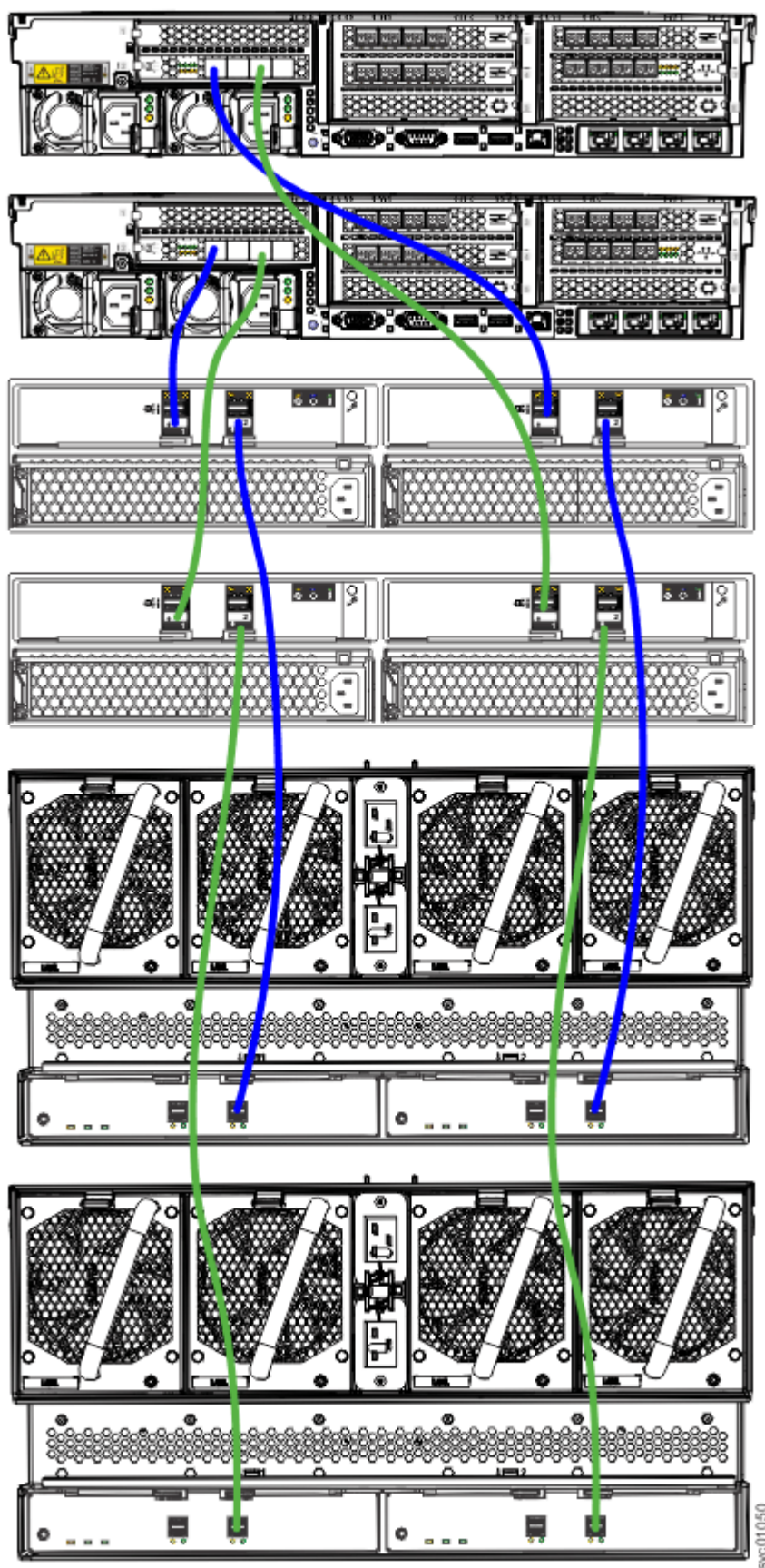


Figure 136. Connecting the SAS cables

2. If more I/O groups are configured, repeat the cabling procedure for the other I/O groups. Each system can have a maximum of four I/O groups, with two chains of expansion enclosures 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 136 on page 116](#) shows, you can combine 2U expansion enclosures (12 drive and 24 drive) and 5U expansion enclosures in a SAS chain. The limiting factor is the combined *chain weight* of the various components. The maximum SAS chain weight that can be attached to a node SAS port is 10:

- 5U expansion enclosures have a chain weight of 2.5
- 2U expansion enclosures have a chain weight of 1.

Example

[Table 17 on page 117](#) shows examples of different combinations of SAS weights.

<i>Table 17. Examples of supported SAS chain combinations</i>			
Enclosures (12 drives)	2U Enclosures (24 drives)	5U Enclosures	Combined chain weight
0	0	4	10
2	0	3	9.5
2	3	2	10
0	7	1	9.5
1	1	1	4.5 (as shown in Figure 136 on page 116)

In addition, the orientation of the Input and Output SAS ports on the 2U and 5U SAS expansion enclosures differs. [Figure 137 on page 118](#) shows the SAS ports on the 5U and 2U SAS expansion enclosures.

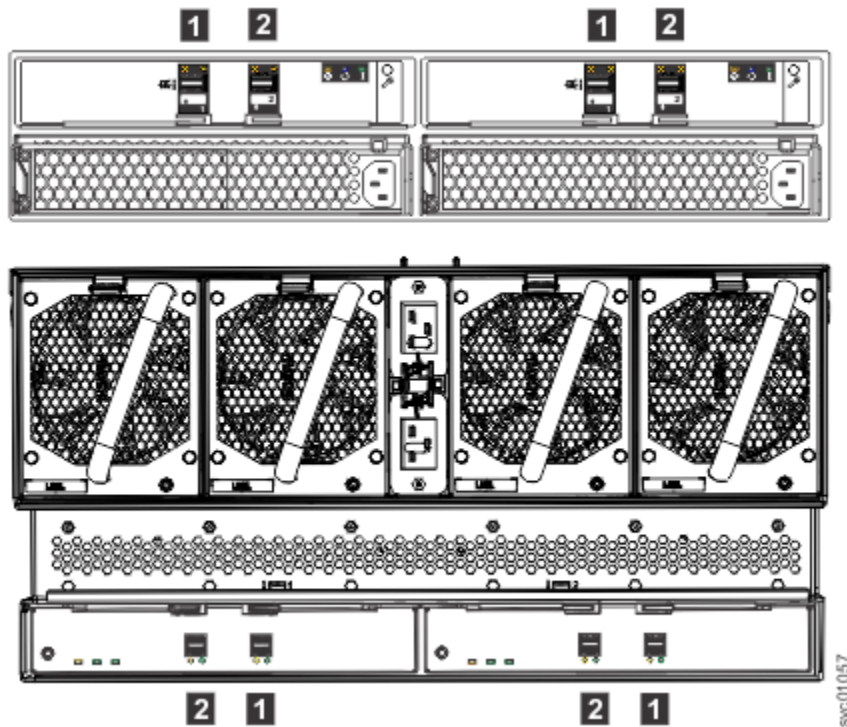


Figure 137. SAS port orientation on expansion enclosures

- 1 Input SAS port
- 2 Output SAS port

Powering on the 5U expansion enclosure

Use the following procedure to provide power to the 5U expansion enclosure as part of the initial installation process or after a service procedure.

Before you begin

Important: Before you connect the power cables to the rear of the enclosure, always check that the expansion enclosure is secured in the rack. If needed, tighten the thumbscrews on the front of the enclosure (2 in Figure 138 on page 118) to ensure that the enclosure drawer does not roll open.

About this task

The 5U expansion enclosure has two power supply units (PSUs) that are accessible from the front of the enclosure (4 in Figure 138 on page 118). As the figure also shows, the PSUs are covered by the 1U fascia (5).

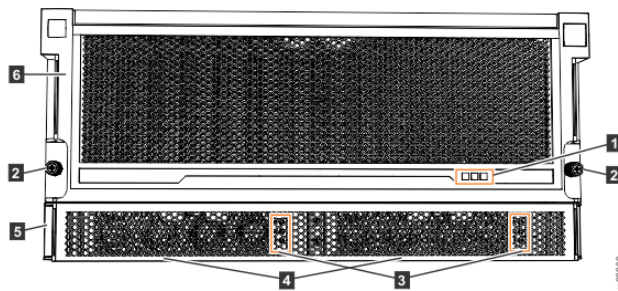


Figure 138. Features on the front of the 5U expansion enclosure

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

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

Procedure

1. Connect the C19-C20 power cables to the power connectors on the rear of the expansion enclosure. The enclosure automatically powers on and begins its Power On Self-Tests (POST).
2. Secure the power cables in the cable retainer at each power connector on the rear of the enclosure, as shown in Figure 139 on page 119. Also, ensure that each cable is installed along one of the cable management arms. The cable management arms also support the SAS cables.

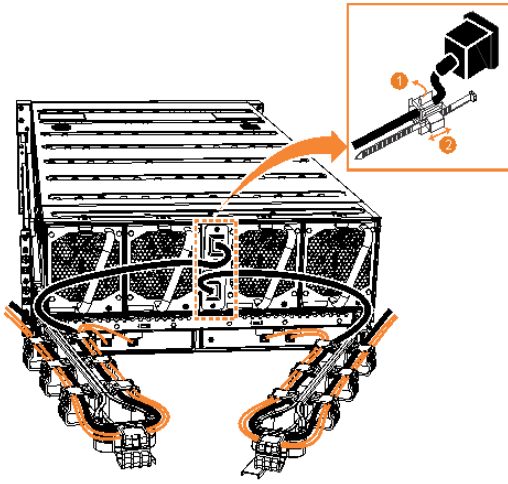


Figure 139. Secure power cables

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



Figure 140. Power and SAS cable connections on the back of the enclosure

3. Verify that the expansion enclosure and its components are operating as expected. On the back of the expansion enclosure, all four fans and the expansion canister indicators (3 and 8 in Figure 141 on page 120) become active when the power is connected.

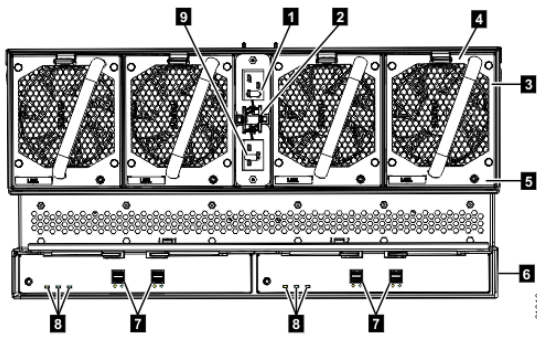


Figure 141. Features on the rear of the 5U expansion enclosure

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

4. Verify that the system recognizes the expansion enclosure.

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

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

Powering off the 5U expansion enclosure

Before you power down a 5U expansion enclosure, review the following procedure.

Before you begin



Attention: To avoid potential equipment damage during transport and subsequent loss of data, see [Procedure: Transporting a 5U 92-drive expansion enclosure](#). The procedure describes what to do for the following situations.

- When you are powering off a 92F, 92G, or an A9F 5U expansion enclosure because you intend to transport it to another location
- When you intend to move a rack that contains a 92F, 92G, or an A9F 5U expansion enclosure

The procedure describes how to remove each drive from the 5U enclosure and transport the enclosure. Removing the drives prevents damage to the drives and makes the lighter enclosure easier to move.

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

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.

5U expansion enclosure LEDs and indicators

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

Note: The 5U expansion enclosures are only supported by the SAN Volume Controller 2145-SV1 and SAN Volume Controller 2145-DH8 control enclosures. The 2145-SV2 and 2145-SA2 control enclosures do not support any expansion enclosures.

A 5U expansion enclosure has sets of LEDs on the front and rear of the enclosure. Inside of the expansion enclosure, LEDs also indicate the status of the drives and each secondary expander module.

Note: All of the information about the 2145-92F , expansion enclosure is also applicable to the 2147-92F expansion enclosure.

LEDs on the front of the expansion enclosure

As Figure 142 on page 121 shows, the front of the 5U expansion enclosure contains LEDs for the display panel (1) and for each of the power supply units (3).

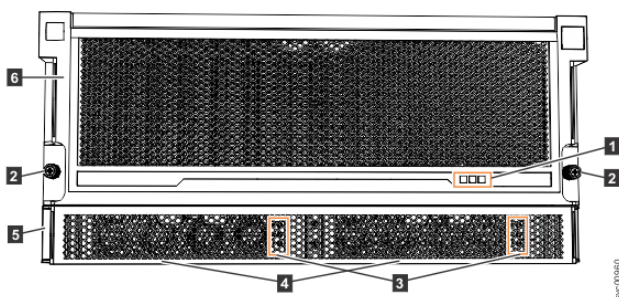


Figure 142. LEDs on the front of the expansion enclosure

- 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 18 on page 121 describes the function and meaning of the LEDs on the front display panel.

Table 18. 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.

Table 18. Display panel LEDs (continued)			
Function	Color	Status	Description
Identify	Blue	On	Identifies the expansion enclosure; this LED is controlled by the system. Use the management GUI or service interface to identify an enclosure.
		Off	The expansion enclosure is operating normally.
Enclosure fault	Amber	On	The expansion enclosure is coming up or a fault is detected against a component within the enclosure.
		Off	No faults are detected.

The 5U expansion enclosure contains two PSUs (4 in Figure 142 on page 121) that are accessible from the front of the enclosure. Each PSU has its own a set of LEDs, as shown in Figure 143 on page 122.

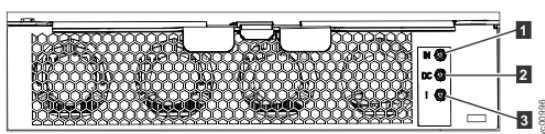


Figure 143. LEDs on the front of a power supply unit

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

Table 19 on page 122 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 146 on page 124.

Table 19. 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 5U expansion enclosure has two LED indicators. To view the drives and secondary expansion modules, you must remove the cover of the enclosure, as described in “Removing the top cover” on page 54.

Figure 144 on page 123 shows the components of a drive assembly. Each drive has an online indicator (2) and fault indicator (3).

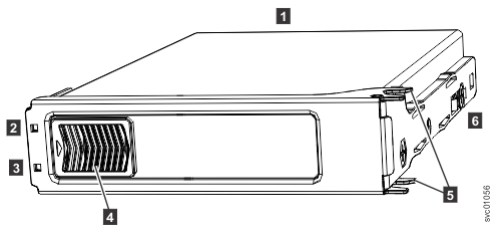


Figure 144. LEDs on a drive assembly

Table 20 on page 123 describes the meaning of the LEDs on each drive.

Table 20. LED indicators on drives			
Function	Color	Status	Description
2 Activity	Green	On	The drive is ready to be used.
		Flashing	The drive is operating and I/O is occurring.
		Off	The drive is not installed or an installed drive is not ready to be used.
3 Fault	Amber	On	A fault occurred on the drive. The LED is turned off when the drive is removed and replaced.
		Flash	The drive is being identified, a fault might or might not be detected.
		Off	The installed drive is operating normally.

Figure 145 on page 123 shows the LEDs on a secondary expansion module.

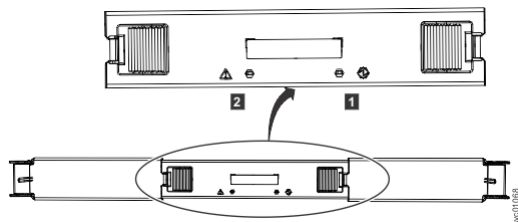


Figure 145. LEDs on a secondary expansion module

1 Online indicator

2 Fault indicator

Table 21 on page 123 describes the meaning of the LEDs on each secondary expansion module.

Table 21. LED indicators on secondary expansion modules			
Function	Color	Status	Description
1 Power	Green	On	The secondary expansion module is receiving power.
		Flashing	Not used.
		Off	The secondary expansion module is not receiving power.
2 Fault	Amber	On	Not used.
		Flash	The secondary expansion module is being identified.
		Off	The secondary expansion module is operating normally.

LEDs on the rear of the expansion enclosure

Figure 146 on page 124 shows the rear view of a 2145-92F , expansion enclosure. LEDs on the rear of the enclosure provide information about each fan module, each expansion canister, and SAS links.

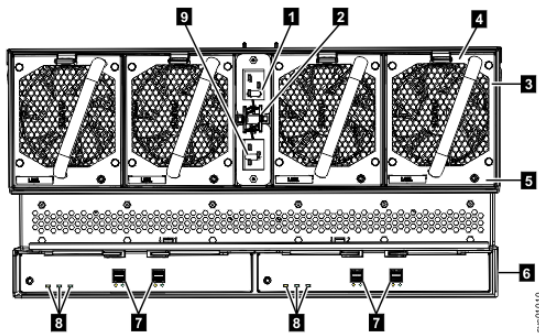


Figure 146. LEDs on the back of the expansion enclosure

The expansion enclosure has four fans. Each fan has one LED; for example, Figure 146 on page 124 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 146 on page 124 also shows, the expansion enclosure contains two expansion canisters. Each expansion canister contains its own set of LEDs, as shown in Figure 147 on page 124. The LEDs provide status information about the expansion canister itself and the SAS connections.

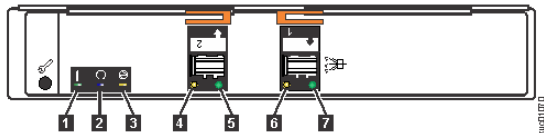


Figure 147. LEDs on the back of the expansion canister

- 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 22 on page 124 describes the values and meaning of each LED.

Table 22. 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	A vital product data (VPD) error occurred.
3 Canister power	Green	Off	Canister is off.
		On	Canister is receiving power.

Table 22. Expansion canister and SAS port LEDs (continued)

Name	Color	State	Meaning
4 and 6 SAS link fault	Amber	Off	No faults are detected. All four phys have a link connection.
		On	Several error conditions are possible: <ul style="list-style-type: none"> • Only 1, 2, or 3 phys are connected, but not all 4. • The phys are not operating at the same speed. • All phys 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 operational	Green	Off	No link connection on any lane. The connection is down.
		On	The SAS link is active. At least one of the four lanes is connected.

Chapter 5. Initializing the system

To begin the initialization process for the system, you access the initialization GUI. You need to know the default user name and password.

Next, you initialize the system by using the technician port.

After you create the system, you must configure it.

Checking your web browser settings for the initialization GUI

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

Before you begin

The management GUI supports the following HTML5-compliant browsers:

- Mozilla Firefox 72.0.1
- Mozilla Firefox Extended Support Release (ESR) 68.4
- Microsoft Internet Explorer (IE) 11 and Microsoft Edge 44
- Google Chrome 79.0

Note: The minimum viewpoint for browser window for the management GUI is 1024 x 768. Scaling browser view to less than those dimensions affects readability of data on management GUI pages.

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 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** check box.

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 23. 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 (SAN Volume Controller 2145-SV1)

To initialize a new system, you must connect a personal computer to the technician port on the rear of a node and run the initialization tool. This node becomes the configuration node and provides access to the initialization GUI. Access the initialization GUI by using the management IP address through your IP network or through the technician port. Use the initialization GUI to add each candidate node to the system.

Before you begin

Important: Do not use the initialization tool on a node if any other node in the system is already active. For example, a node status LED is solid on any node of the system.

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.

Important:

- Browser security features might prompt the user before it accepts the self-signed certificate that the system issues.
- It might be necessary to remove old certificates that are stored in the browser before the browser accepts the request.
- The web browser might display a warning about a potential security risk. It is safe to accept the risk and continue.
- After the technician port physical connection is completed (that is, connected both ends), it can take up to 45 seconds before the port is fully up and able to process requests. Submitting requests before this interval might result in 404 error responses.
- If the `http://service` request in the browser causes a 404 error, or fails to produce a response, it might be necessary to use the url `https://192.168.0.1` in the browser request to connect to the system.

If you are unable to connect to the system by using the technician port, you can use a monitor and keyboard that are connected to the VGA and USB ports on the system to initialize the system. Complete the following steps.

1. Access the command line by using the superuser credentials.
2. Issue the CLI command `mkcluster -clusterip x.x.x.x -mask m.m.m.m -gw g.g.g.g -name name` to create the system.

Procedure

To initialize the system, complete the following steps.

1. Ensure that the nodes and switches of the system are powered on.
(Refer to "Powering on and powering off the clustered system" in the SAN Volume Controller IBM Knowledge Center.)
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. Starting from the right at the rear of the node, locate the first Ethernet port to the left, which is the technician port. This port is labeled **1** in the figure below.

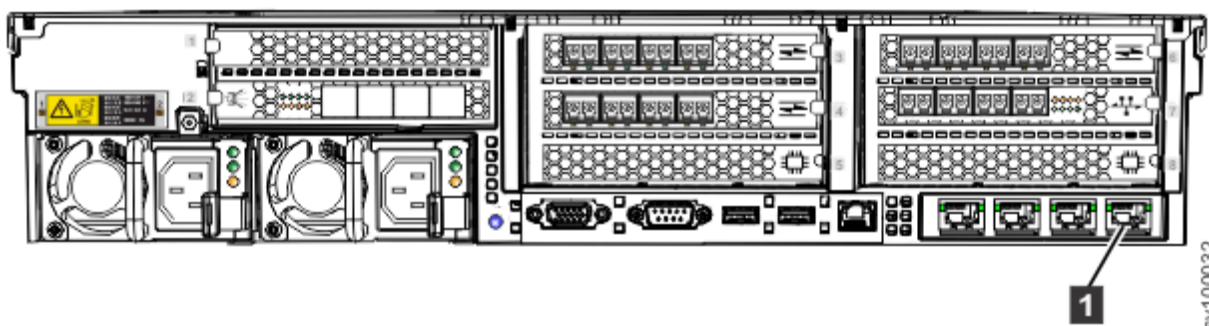


Figure 148. Technician port

4. Connect an Ethernet cable between the port of the personal computer that is configured in step “2” on page 130 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 uses the values that you provided in step “2” on page 130.

5. After the Ethernet port of the personal computer is connected, open a supported browser and browse to address `http://service`. (If you do not have DHCP, open a supported browser and go to the following static IP address `192.168.0.1`.)

The browser is automatically directed to the initialization tool.

Note: If the system cannot be initialized, you are directed to the service assistant interface.

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 management GUI can now be reached by opening a supported web browser and pointing it to `http://management_IP_address`. Use the management GUI to add each candidate node to the system. Then, it is best to use the management GUI to set the service IP address for each node now. Ensure that the system is disconnected from the technician port.

Verify and update the system firmware and software (customer task)

After the installation and initial configuration of the hardware is complete, IBM strongly suggests that the customer checks to see whether a later level of firmware and software is available, and update to that level.

To download updated drive firmware, system software, and other applicable software, go to <https://www.ibm.com/support/fixcentral> and follow the instructions there.

Adding nodes to an existing system

Before you add a node to an existing system, consider this high-level overview of the requirements and tasks involved.

Before you begin

This task requires that the following conditions are met:

- All nodes that are configured in the system are present. Nodes must be installed in pairs. Each pair of nodes is an I/O group.
- All errors in the system event log are fixed.
- All managed disks (MDisks) are online.
- A node with only Fibre Channel over Ethernet (FCoE) ports (all FCoE ports) that is connected to the switch and properly zoned can also be added to an I/O group.

Note: Latency peaks of 15 to 30 seconds can occur when you use this procedure. It might impact existing production environments. Especially environments with heavy loaded hosts.

About this task

Table 24 on page 132 lists the models and software version requirements for nodes.

<i>Table 24. Node models and software version requirements</i>	
Node model	Required system software version
SAN Volume Controller 2145-SV2 and 2145-SA2	8.3.1 or later
SAN Volume Controller 2145-SV1	7.7.1.0 or later
SAN Volume Controller 2145-DH8 with a 2145-12F expansion enclosure	7.7.0.0 or later
SAN Volume Controller 2145-DH8 with a 4-port 16G Fibre Channel adapter	7.6.0.0 or later
SAN Volume Controller 2145-DH8 with a 2-port 16G Fibre Channel adapter	7.4.0.0 or later
SAN Volume Controller 2145-DH8	7.3.0.0 or later

Procedure

1. Install the system nodes in the rack.
2. Connect the nodes to the LAN.
3. Connect the nodes to the SAN fabric.
For example, connect to the FC or FCoE ports on the nodes.
4. Start the nodes.
5. Zone the node ports in the existing zone.
The system zone exists in each fabric with only node ports.
6. Zone the node ports in the existing system and storage zone.
A storage zone contains all of the system node ports and storage system ports that are in the fabric and used to access the physical disks.
7. For each storage system that is used with the system, use the system management application to map the LUNs that are currently used by the system to all of the WWPNs of the system nodes that you want to add.
The nodes must recognize the same LUNs that the existing nodes in the system can recognize before they can be added. If the system nodes cannot recognize the same LUNs, the system is marked degraded.
8. Add the nodes to the system.
9. Check the status of the storage systems and MDisks to ensure that status is not marked degraded.
If the status is degraded, a configuration problem must be resolved before you can do any further system configuration task. If the problem cannot be resolved, remove the newly added nodes from the clustered system and contact your system support center for assistance.

What to do next

For specific instructions about adding a node or a replacement node to a clustered system, see the information about adding nodes to a system.

Appendix A. Accessibility features for the system

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

Accessibility features

These are the major accessibility features for the system:

- You can use screen-reader software and a digital speech synthesizer to hear what is displayed on the screen. HTML documents are tested by using JAWS version 15.0.
- This product uses standard Windows navigation keys.
- Interfaces are commonly used by screen readers.
- Keys are discernible by touch, but do not activate just by touching them.
- Industry-standard devices, ports, and connectors.
- You can attach alternative input and output devices.

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

IBM and accessibility

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

Appendix B. Where to find the Statement of Limited Warranty

The *Statement of Limited Warranty* is available in both hardcopy format and in the SAN Volume Controller IBM Knowledge Center.

Appendix C. SAN Volume Controller physical installation planning

Before the IBM service representative can set up your environment, you must verify that the prerequisite conditions for system installation are met.

SAN Volume Controller 2145-SV1 environment requirements

Before the SAN Volume Controller 2145-SV1 is installed, the physical environment must meet certain requirements. This includes verifying that adequate space is available and that requirements for power and environmental conditions are met.

Input-voltage requirements

Ensure that your environment meets the voltage requirements that are shown in [Table 25 on page 139](#).

Table 25. Input-voltage requirements	
Voltage	Frequency
100-127 / 200-240Vac	50 Hz or 60 Hz

Maximum power requirements for each node

Ensure that your environment meets the power requirements as shown in [Table 26 on page 139](#).

The maximum power that is required depends on the node type and the optional features that are installed.

Table 26. Power consumption	
Components	Power requirements
SAN Volume Controller 2145-SV1	~450 W typical, 700 W maximum (200 - 240V ac, 50/60 Hz)

Environment requirements without redundant AC power

Ensure that your environment falls within the following ranges if you are not using redundant AC power.

If you are not using redundant ac power, ensure that your environment falls within the ranges that are shown in [Table 27 on page 139](#).

Table 27. Physical specifications				
Environment	Temperature	Altitude	Relative humidity	Maximum dew point
Operating in lower altitudes	5°C to 40°C (41°F to 104°F)	0 - 950 m (0 ft to 3,117 ft)	8% to 85%	24°C (75°F)
Operating in higher altitudes	5°C to 28°C (41°F to 82°F)	951 m to 3,050 m (3,118 ft to 10,000 ft)		

<i>Table 27. Physical specifications (continued)</i>				
Environment	Temperature	Altitude	Relative humidity	Maximum dew point
Turned off (with standby power)	5°C to 45°C (41°F to 113°F)	0 m to 3,050 m (0 ft to 10,000 ft)	8% to 85%	27°C (80.6°F)
Storing	1°C to 60°C (33.8°F to 140.0°F)	0 m to 3,050 m (0 ft to 10,000 ft)	5% to 80%	29°C (84.2°F)
Shipping	-40°C to 60°C (-40°F to 140.0°F)	0 m to 10,700 m (0 ft to 34,991 ft)	5% to 100%	29°C (84.2°F)

Note: Decrease the maximum system temperature by 1°C for every 175 m increase in altitude.

Preparing your environment

The following tables list the physical characteristics of a SAN Volume Controller 2145-SV1 node.

Dimensions and weight

Use the parameters that are shown in [Table 28 on page 140](#) to ensure that space is available in a rack capable of supporting the node.

<i>Table 28. Dimensions and weight</i>			
Height	Width	Depth	Maximum weight
87 mm (3.4 in.)	447 mm (17.6 in)	746 mm (30.1 in)	25 kg (55 lb) to 30 kg (65 lb) depending on configuration

Additional space requirements

Ensure that space is available in the rack for the additional space requirements around the node, as shown in [Table 29 on page 140](#).

<i>Table 29. Additional space requirements</i>		
Location	Additional space requirements	Reason
Left side and right side	Minimum: 50 mm (2 in.)	Cooling air flow
Back	Minimum: 100 mm (4 in.) If the cable-management arm is used, allow 177 mm (7 in.)	Cable exit

Maximum heat output of each SAN Volume Controller 2145-SV1 node

The node dissipates the maximum heat output that is given in [Table 30 on page 141](#).

<i>Table 30. Maximum heat output of each SAN Volume Controller 2145-SV1 node</i>	
Model	Heat output per node
SAN Volume Controller 2145-SV1	<ul style="list-style-type: none"> • Minimum configuration: 419.68 Btu per hour (AC 123 watts) • Maximum configuration: 3480.24 Btu per hour (AC 1020 watts)

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

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

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

EN 55032 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden:

"Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen."

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)." Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU in der Bundesrepublik Deutschland.

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

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

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

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

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

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Generelle Informationen:

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

Japan Electronics and Information Technology Industries Association (JEITA) Notice

(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の各製品の
仕様ページ参照

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

高調波電流規格 JIS C 61000-3-2 適合品

This statement applies to products greater than 20 A, single phase.

高調波電流規格 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、P F C回路付)
- 換算係数 : 0

This statement applies to products greater than 20 A per phase, three-phase.

高調波電流規格 JIS C 61000-3-2 準用品

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- 回路分類：5（3相、PFC回路付）
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VCCI-A

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People's Republic of China Notice

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在这种情况下,可能需要用户对其
干扰采取切实可行的措施。

Russia Notice

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В жилых помещениях оно может создавать
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於居住環境中使用時，
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IBM Taiwan Contact Information:

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

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This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

Responsible Party:
International Business Machines Corporation
New Orchard Road

Armonk, NY 10504

Contact for FCC compliance information only: fccinfo@us.ibm.com

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