IBM System Storage SAN Volume Controller
Version 6.3.0

Model 2145-CG8 Hardware Installation Guide

IBM

> **Note**
>
> Before using this information and the product it supports, read the general information in "Notices" on page 63, the information in the "Safety and environmental notices" on page ix, as well as the information in the *IBM Environmental Notices and User Guide* on the documentation DVD.

Contents

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Safety and environmental notices

Review the multilingual safety notices for the IBM® Systems Storage SAN Volume Controller, redundant ac-power switch, and the uninterruptible power supply 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:

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 *IBM System Storage SAN Volume Controller Safety Notices* with the user publications that were provided with the SAN Volume Controller hardware.

3. Find the matching identification number in the *IBM System Storage SAN Volume Controller Safety Notices*. Then review the topics concerning the safety notices to ensure that you are in compliance.

4. Optionally, read the multilingual safety instructions on the SAN Volume Controller website. Go to the Support for SAN Volume Controller (2145) website at www.ibm.com/storage/support/2145 and click the documentation link.

General safety

When you service the SAN Volume Controller, redundant ac-power switch, or the uninterruptible power supply, 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 to the customer, or that makes the equipment unsafe.

- Before you start the device, ensure that other service representatives and customer's 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 will not 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 SAN Volume Controller for unsafe conditions

Use caution when 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 start the safety inspection, make sure that the power is off, and that the power cord is disconnected.

Each device has required safety items installed to protect users and IBM service personnel from injury. This guide addresses only those items.

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

If any unsafe conditions are present, you must determine how serious the apparent hazard could 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 SAN Volume Controller node for unsafe conditions, perform the following steps. If necessary, see any suitable safety publications.

1. Turn off SAN Volume Controller and disconnect the power cord.
2. Check the frame for damage (loose, broken, or sharp edges).
3. Check the power cables 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 SAN Volume Controller 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 have not been removed or disturbed.

9. Before connecting SAN Volume Controller to the storage area network (SAN), check the grounding.

External device check

Ensure that you perform an external device check before you install or service the SAN Volume Controller.

To conduct an external device check, perform 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. If SAN Volume Controller is not installed in a rack cabinet, check for loose or broken feet.

4. Check the power cord for damage.

5. Check the external signal cable for damage.

6. Check the cover for sharp edges, damage, or alterations that expose the internal parts of the device.

7. Correct any problems that you find.

Internal device checks

Ensure that you perform an internal device check before you install or service SAN Volume Controller.

To conduct the internal device check, perform the following steps:

1. Check for any non-IBM changes that might have been 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 SAN Volume Controller, the uninterruptible power supply, and the redundant ac-power switch

Ensure that you understand how to check the grounding of a SAN Volume Controller, the uninterruptible power supply, and the optional redundant ac-power switch feature.

To test the grounding of a SAN Volume Controller node, perform the following steps. Follow the steps for the SAN Volume Controller configuration that you are

using. Before you start, confirm that you know the SAN Volume Controller model type, the uninterruptible power-supply type, and whether you are using redundant ac power. Determine the location of the signal cables that are attached to the SAN Volume Controller.

When you are asked to test the grounding continuity, use your local procedures to perform 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 SAN Volume Controller while it is undergoing a grounding test.

1. Ensure that the SAN Volume Controller node is powered off. See MAP 5350: Powering off a SAN Volume Controller node in the *IBM System Storage SAN Volume Controller Troubleshooting Guide*.

2. If the uninterruptible power supply is a 2145 UPS, ensure that other SAN Volume Controller nodes that are powered from the uninterruptible power supply are powered off.

3. Use the power button to power off the uninterruptible power supply.

4. Disconnect all signal cables from the SAN Volume Controller node, which includes the following cables:
   - The Fibre Channel cables
   - The Ethernet cable or cables
   - The serial cable that is connected to the uninterruptible power supply

5. Disconnect all signal cables from the uninterruptible power supply. If the uninterruptible power supply is a 2145 UPS, there might be multiple signal cables.

6. If the uninterruptible power supply is a 2145 UPS, disconnect any power cables that are connected to SAN Volume Controller nodes, except the one that is being tested.

7. If redundant ac power is not used, disconnect the uninterruptible power-supply power cable from the site power-distribution unit.

8. If redundant ac power is used, turn off any SAN Volume Controller that is being supplied from the redundant ac-power switch, and remove the power cable to this system from the redundant ac-power switch.

9. If redundant ac power is used, disconnect *both* input power leads from the site power distribution units.

10. If redundant ac power is not used, test the grounding continuity between a conductive area on the SAN Volume Controller frame and the ground pin on the plug of the uninterruptible power-supply input-power cable.

11. If redundant ac power is used, test the grounding continuity between a conductive area on the SAN Volume Controller frame and the ground pin on the plug of the main power cable of the redundant ac-power switch. If the test is successful, test the grounding continuity between a conductive area on the SAN Volume Controller frame and the ground pin on the plug of the backup power cable of the redundant ac-power switch. Both tests must be successful.

12. After you have completed testing the grounding continuity, perform one of the following procedures, depending on the outcome of the test.
    - If the test is successful, reconnect any cables that were removed, and power on any uninterruptible power-supply units and SAN Volume Controller 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 each component has been tested and the failing ones have been replaced, repeat the complete system test by returning to step 1 on page xv.

Test the components in the following order:

a. The SAN Volume Controller node, from the frame to the ground pin of the input power receptacle

b. The uninterruptible power supply from the ground pin of the input power receptacle to the ground conductor of the output power receptacle

c. If used, the redundant ac-power switch from the ground pin of the main input power receptacle to the ground conductor of the output power receptacle, and from the ground pin of the backup input power receptacle to the ground conductor of the output power receptacle

d. The SAN Volume Controller node to uninterruptible power-supply power-cable assembly, between the two ground conductors of the power cable

e. The uninterruptible power-supply input-power cable, between the two ground conductors of the power cable

f. If used, the redundant ac-power switch main input-power cable, between the two ground conductors of the cable

g. If used, the redundant ac-power switch backup input-power cable, between the two ground conductors of the cable

Inspecting the uninterruptible power supply for unsafe conditions

Ensure that you take the time to inspect the uninterruptible power supply for unsafe conditions.

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 bulging capacitor can cause serious injury.

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

Use caution when working in a potential safety hazard 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.

Using the following inspection checklist as a guide, inspect the uninterruptible power supply for unsafe conditions. If necessary, see any suitable safety publications.

1. If any equipment has been damaged during the shipment, keep the shipping cartons and packing materials.

2. To file a claim for the shipping damage, perform the following steps:

a. File with the carrier within fifteen days of receipt of the equipment.

b. Send a copy of the damage claim within fifteen days to your service support representative.

Uninterruptible power-supply requirements

Ensure that you comply with the requirements for the uninterruptible power supply.

The following list describes requirements for the 2145 UPS-1U:
- The voltage that is supplied to the 2145 UPS-1U must be 200-240 V single phase.
- The frequency that is supplied must be 50 or 60 Hz.

Note: The 2145 UPS-1U has an integrated circuit breaker and does not need external protection.

Attention:
- If the uninterruptible power supply is cascaded from another uninterruptible power supply, the source uninterruptible power supply must have at least three times the capacity per phase and the total harmonic distortion must be less than 5%.
- The uninterruptible power supply also must have input voltage capture that has a slew rate of no more than 3 Hz per second.

Emergency power-off shutdown

The SAN Volume Controller and each uninterruptible power supply support 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 two seconds. (This action removes static electricity from the package and from your body.)
- Remove the device from its package and install it directly into your SAN Volume Controller, 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 SAN Volume Controller or onto a metal table.
- Take additional care when you handle devices during cold weather because heating reduces indoor humidity and increases static electricity.

Environmental notices and statements

You must become familiar with the environmental notices and statements.

The following topics describe the environmental notices and statements that are applicable to this product.

Product recycling and disposal

Ensure that you are aware of the materials that must be recycled. Before using this information and the product that it supports, read the *IBM Environmental Notices and User Guide* on the IBM Environmental Notices CD.

About this guide

This guide describes the SAN Volume Controller node and provides detailed installation instructions.

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 related hardware components, such as uninterruptible power supply units or an optional redundant ac-power switch.
- 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 hardware, including the redundant ac-power switch and the uninterruptible power supply.

After the IBM service representative has installed the SAN Volume Controller hardware, the customer must use the *IBM System Storage SAN Volume Controller Software Installation and Configuration Guide* to install any additional software and to configure the SAN Volume Controller.

Summary of changes

This summary of changes provides a list of changed information for GC27-2283-01, the SAN Volume Controller Hardware Installation Guides since the last version of the guide.

Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change. This summary of changes describes new functions that have been added to this release.

Changed information

This document contains corrections to SAN Volume Controller 2145-CF8 planning information. Corrections include feature code numbers, quantities, part numbers, and whether a feature code is optional or required.

This document also contains additions and corrections to procedures for installing the rails for the SAN Volume Controller 2145-CG8 node in a rack. A section provides procedures for installing the uninterruptible power supply (2145 UPS-1U) in a rack.

Emphasis

Different typefaces are used in this guide to show emphasis.

The following typefaces are used to show emphasis:

Boldface	Text in **boldface** represents menu items.
Bold monospace	Text in `bold monospace` represents command names.
Italics	Text in *italics* 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.

SAN Volume Controller library and related publications

Product manuals, other publications, and websites contain information that relates to SAN Volume Controller.

SAN Volume Controller Information Center

The IBM System Storage® SAN Volume Controller Information Center contains all of the information that is required to install, configure, and manage the SAN Volume Controller. The information center is updated between SAN Volume Controller product releases to provide the most current documentation. The information center is available at the following website:

publib.boulder.ibm.com/infocenter/svc/ic/index.jsp

SAN Volume Controller library

Unless otherwise noted, the publications in the SAN Volume Controller library are available in Adobe portable document format (PDF) from the following website:

Support for SAN Volume Controller (2145) website at www.ibm.com/storage/support/2145

Each of the PDF publications in Table 1 is available in this information center by clicking the number in the "Order number" column:

Table 1. SAN Volume Controller library

Title	Description	Order number
IBM System Storage SAN Volume Controller Model 2145-CG8 Hardware Installation Guide	This guide provides the instructions that the IBM service representative uses to install the hardware for SAN Volume Controller model 2145-CG8.	GC27-3923

Table 1. SAN Volume Controller library (continued)

Title	Description	Order number
IBM System Storage SAN Volume Controller Hardware Maintenance Guide	This guide provides the instructions that the IBM service representative uses to service the SAN Volume Controller hardware, including the removal and replacement of parts.	GC27-2283
IBM System Storage SAN Volume Controller Troubleshooting Guide	This guide describes the features of each SAN Volume Controller model, explains how to use the front panel, and provides maintenance analysis procedures to help you diagnose and solve problems with the SAN Volume Controller.	GC27-2284
IBM System Storage SAN Volume Controller Software Installation and Configuration Guide	This guide provides guidelines for configuring your SAN Volume Controller. Instructions for backing up and restoring the cluster configuration, using and upgrading the management GUI, using the CLI, upgrading the SAN Volume Controller software, and replacing or adding nodes to a cluster are included.	GC27-2286
IBM System Storage SAN Volume Controller CIM Agent Developer's Guide	This guide describes the concepts of the Common Information Model (CIM) environment. Procedures describe such tasks as using the CIM agent object class instances to complete basic storage configuration tasks, establishing new Copy Services relationships, and performing CIM agent maintenance and diagnostic tasks.	GC27-2288
IBM System Storage SAN Volume Controller Safety Notices	This guide contains translated caution and danger statements. Each caution and danger statement in the SAN Volume Controller documentation has a number that you can use to locate the corresponding statement in your language in the *IBM System Storage SAN Volume Controller Safety Notices* document.	GA32-0844

Table 1. SAN Volume Controller library (continued)

Title	Description	Order number
IBM System Storage SAN Volume Controller Read First Flyer	This document introduces the major components of the SAN Volume Controller system and describes how to get started installing the hardware and software.	GA32-0843
IBM System Storage SAN Volume Controller and IBM Storwize V7000 Command-Line Interface User's Guide	This guide describes the commands that you can use from the SAN Volume Controller command-line interface (CLI).	GC27-2287
IBM Environmental Notices and User Guide	This multilingual guide describes environmental policies to which IBM products adhere, as well as how to properly recycle and dispose of IBM products and the batteries within IBM hardware products. Notices within the guide describe flat panel displays, refrigeration, water cooling systems, and external power supplies.	Z125-5823
IBM Statement of Limited Warranty	This multilingual document provides information about the IBM warranty for the SAN Volume Controller product.	Part number: 85Y5978
IBM License Agreement for Machine Code	This multilingual guide contains the License Agreement for Machine Code for the SAN Volume Controller product.	Z125-5468

Other IBM publications

Table 2 lists IBM publications that contain information related to the SAN Volume Controller.

Table 2. Other IBM publications

Title	Description	Order number
IBM System Storage Productivity Center Introduction and Planning Guide	This guide introduces the IBM System Storage Productivity Center hardware and software.	SC23-8824
Read This First: Installing the IBM System Storage Productivity Center	This guide describes how to install the IBM System Storage Productivity Center hardware.	GI11-8938
IBM System Storage Productivity Center User's Guide	This guide describes how to configure the IBM System Storage Productivity Center software.	SC27-2336

Table 2. Other IBM publications (continued)

Title	Description	Order number
IBM System Storage Multipath Subsystem Device Driver User's Guide	This guide describes the IBM System Storage Multipath Subsystem Device Driver for IBM System Storage products and how to use it with the SAN Volume Controller.	GC52-1309
IBM Storage Management Pack for Microsoft System Center Operations Manager User Guide	This guide describes how to install, configure, and use the IBM Storage Management Pack for Microsoft System Center Operations Manager (SCOM).	GC27-3909 publibfp.dhe.ibm.com/ epubs/pdf/c2739092.pdf
IBM Storage Management Console for VMware vCenter, version 2.6.0, Installation Guide	This publication provides installation, configuration, and usage instructions for the IBM Storage Management Console for VMware vCenter.	GA32-0929 publibfp.dhe.ibm.com/ epubs/pdf/a3209295.pdf

IBM documentation and related websites

Table 3 lists websites that provide publications and other information about the SAN Volume Controller or related products or technologies.

Table 3. IBM documentation and related websites

Website	Address
Support for SAN Volume Controller (2145)	Support for SAN Volume Controller (2145) website at www.ibm.com/storage/support/2145
Support for IBM System Storage and IBM TotalStorage products	www.ibm.com/storage/support/
IBM Publications Center	www.ibm.com/e-business/linkweb/publications/ servlet/pbi.wss
IBM Redbooks® publications	www.redbooks.ibm.com/

Related accessibility information

To view a PDF file, you need Adobe Acrobat Reader, which can be downloaded from the Adobe website:

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

How to order IBM publications

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

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

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

Sending your comments

To submit any comments about this book or any other SAN Volume Controller documentation:

- Go to the feedback page on the website for the SAN Volume Controller Information Center at publib.boulder.ibm.com/infocenter/svc/ic/ index.jsp?topic=/com.ibm.storage.svc.console.doc/feedback.htm. There you can use the feedback page to enter and submit comments or browse to the topic and use the feedback link in the running footer of that page to identify the topic for which you have a comment.
- Send your comments by email to starpubs@us.ibm.com. Include the following information in your email:
  – Publication title
  – Publication form number
  – Page, table, or illustration numbers that you are commenting on
  – A detailed description of any information that should be changed

SAN Volume Controller initial installation overview

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

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

When you plan or perform the installation and configuration tasks, have the following SAN Volume Controller information or publications available:

- Information center Planning section
- *IBM System Storage SAN Volume Controller Model 2145-XXX Hardware Installation Guide*, where 2145-*XXX* is a specific node model
- *IBM System Storage SAN Volume Controller Software Installation and Configuration Guide*

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

Support for SAN Volume Controller (2145) website at www.ibm.com/storage/support/2145

The IBM System Storage Productivity Center (SSPC) is the optional management environment for SAN Volume Controller clustered systems. For SSPC planning, installation, and configuration information, see the following publications:

- *IBM System Storage Productivity Center Introduction and Planning Guide*, SC23-8824
- *Read This First: Installing the IBM System Storage Productivity Center*, GI11-8938
- *IBM System Storage Productivity Center User's Guide*, SC27-2336

To access the SSPC publications, go to the **Printable PDFs** section and click the **IBM System Storage Productivity Center** link from the following website:

publib.boulder.ibm.com/infocenter/tivihelp/v4r1/index.jsp

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 SAN Volume Controller installation requirements have been met.**

   Ensure that space and power requirements are met before you begin the installation. SAN Volume Controller nodes and uninterruptible power-supply units are installed in pairs.

2. **Review SAN fabric and zoning guidelines and develop your SAN Volume Controller 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
   - Redundant ac-power connection chart

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

   Support for SAN Volume Controller (2145) website at www.ibm.com/storage/ support/2145

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

   For the SSPC, complete the planning worksheet in the Appendix of the *IBM System Storage Productivity Center Introduction and Planning Guide*.

   You can also obtain the planning work sheet from the following website:

   publib.boulder.ibm.com/infocenter/tivihelp/v4r1/index.jsp

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.**

   Chapter 2 of each *IBM System Storage SAN Volume Controller Model 2145-XXX Hardware Installation Guide* provides a list of all the parts that are required for an installation. The list includes the SAN Volume Controller nodes, uninterruptible power-supply units, optional redundant ac-power switches, and associated parts.

2. **Install the SAN Volume Controller hardware.**

   Chapter 2 describes the procedures for installing the uninterruptible power-supply units, SAN Volume Controller nodes, and the optional redundant ac-power switches.

3. **Install the SSPC server.**

   Read This First: Installing the IBM System Storage Productivity Center describes how to install the SSPC server.

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:

   Support for SAN Volume Controller (2145) website at www.ibm.com/storage/ support/2145

2. **Optionally, check for an updated version of the IBM System Storage Productivity Center software.**

Preinstalled software on the SSPC console might need to be updated to fully support the latest level of SAN Volume Controller. For the latest information, go to the Support for System Storage Productivity Center (SSPC) website:

Support for System Storage Productivity Center (SSPC) at www-947.ibm.com/support/entry/portal/Troubleshooting/Hardware/System_Storage/Storage_software/Storagae_infrastructure_management/System_Storage_Productivity_Center_(SSPC)/

3. **Configure the optional SSPC.**

   The *IBM System Storage Productivity Center User's Guide* describes how to configure the SSPC for the SAN Volume Controller.

4. **Create a SAN Volume Controller system.**

   The *IBM System Storage SAN Volume Controller Software Installation and Configuration Guide* describes this procedure, which is completed in two phases:

   a. Use the Create Cluster action on the front panel 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.

   The *IBM System Storage SAN Volume Controller Software Installation and Configuration Guide* describes how to perform these steps. The *IBM System Storage SAN Volume Controller Software Installation and Configuration Guide* and other publications in the SAN Volume Controller library are available in Adobe portable document format (PDF) from the following website:

   Support for SAN Volume Controller (2145) website at www.ibm.com/storage/support/2145

Chapter 1. SAN Volume Controller overview

The SAN Volume Controller 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. Those storage systems are then mapped to a set of volumes for use by attached host systems. System administrators can view and access a common pool of storage on the storage area network (SAN). This functionality helps administrators to use storage resources more efficiently and provides a common base for advanced functions.

Each SAN Volume Controller 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, with a minimum of one and a maximum of four pairs of nodes constituting a *system*. Each pair of nodes is known as an *I/O group*. All I/O operations that are managed by the nodes in an I/O group are cached on both nodes.

SAN Volume Controller operating environment

To use SAN Volume Controller, 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 SAN Volume Controller operating environment according to the following requirements:
- Minimum of one pair of SAN Volume Controller nodes
- Minimum of two uninterruptible power supply units
- One optional IBM System Storage Productivity Center per SAN installation for configuration

SAN Volume Controller 2145-CG8 node features

The SAN Volume Controller 2145-CG8 node has the following features:
- A 19-inch rack-mounted enclosure
- One 4-port 8 Gbps Fibre Channel adapter
- 24 GB memory
- One quad-core processor
- Dual, redundant power supplies
- Supports up to four optional solid-state drives (SSDs)
- iSCSI host attachment (1 Gbps Ethernet and optional 10 Gbps Ethernet)

Note: The optional SSDs and optional 10 Gbps Ethernet cannot be in the same node.

Redundant ac-power switch

The redundant ac-power switch is an optional feature that makes the SAN Volume Controller nodes resilient to the failure of a single power circuit. The redundant ac-power switch is not a replacement for an uninterruptible power supply. You must still use a uninterruptible power supply for each node.

You must connect the redundant ac-power switch to two independent power circuits. One power circuit connects to the main power input port and the other power circuit connects to the backup power-input port. If the main power to the SAN Volume Controller node fails for any reason, the redundant ac-power switch automatically uses the backup power source. When power is restored, the redundant ac-power switch automatically changes back to using the main power source.

Place the redundant ac-power switch in the same rack as the SAN Volume Controller node. The redundant ac-power switch logically sits between the rack power distribution unit and the 2145 UPS-1U.

You can use a single redundant ac-power switch to power one or two SAN Volume Controller nodes. If you use the redundant ac-power switch to power two nodes, the nodes must be in different I/O groups. In the event that the redundant ac-power switch fails or requires maintenance, both nodes turn off. Because the nodes are in two different I/O groups, the hosts do not lose access to the back-end disk data.

For maximum resilience to failure, use one redundant ac-power switch to power each SAN Volume Controller node.

Figure 1 shows a redundant ac-power switch.

Figure 1. Photo of the redundant ac-power switch

Cabling of redundant ac-power switch (example)

You must properly cable the redundant ac-power switch units in your environment.

Note: While this topic provides an example of the cable connections, it does not indicate a preferred physical location for the components.

Figure 2 on page 3 shows an example of the main wiring for a SAN Volume Controller clustered system with the redundant ac-power switch feature. The four-node clustered system consists of two I/O groups:

- I/O group 0 contains nodes A and B
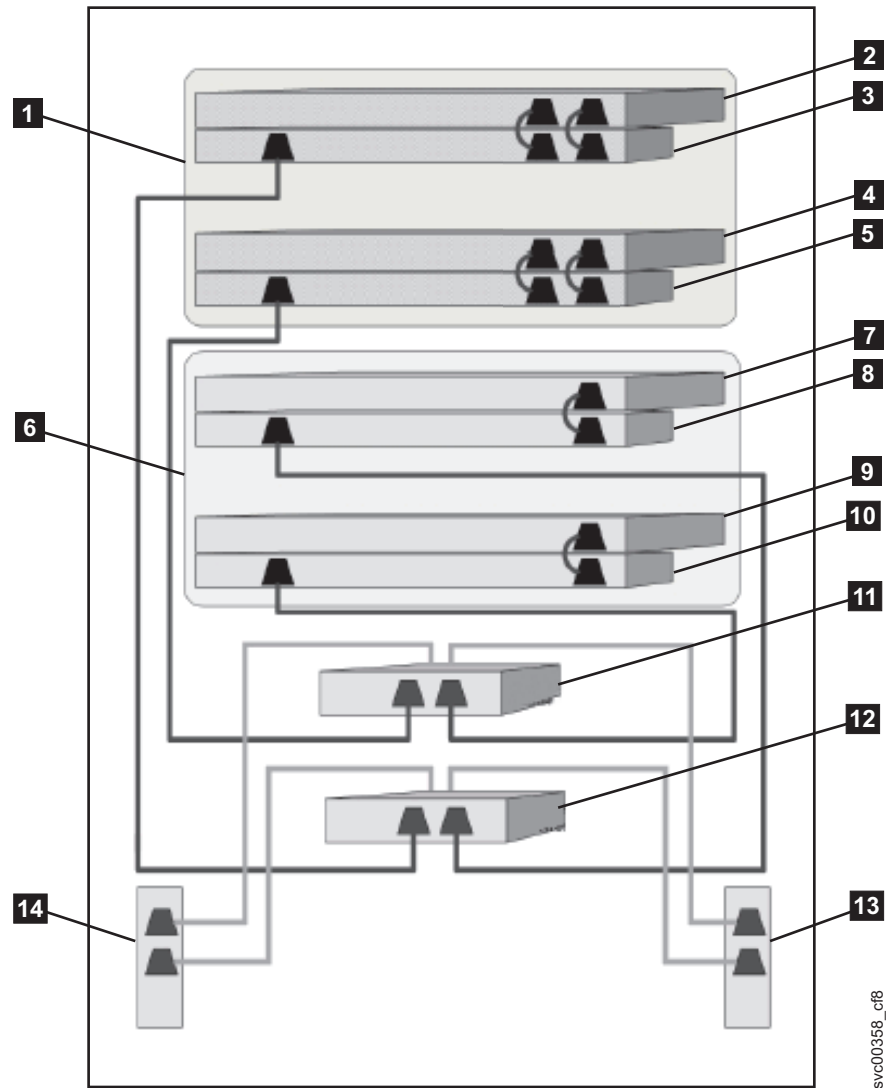- I/O group 1 contains nodes C and D

Figure 2. A four-node SAN Volume Controller system with the redundant ac-power switch feature

1 I/O group 0

2 SAN Volume Controller node A

3 2145 UPS-1U A

4 SAN Volume Controller node B

5 2145 UPS-1U B

6 I/O group 1

7 SAN Volume Controller node C

8 2145 UPS-1U C

9 SAN Volume Controller node D

10 2145 UPS-1U D

11 Redundant ac-power switch 1

12 Redundant ac-power switch 2

13 Site PDU X (C13 outlets)

14 Site PDU Y (C13 outlets)

The site PDUs X and Y (**13** and **14**) are powered from two independent power sources.

In this example, only two redundant ac-power switch units are used, and each power switch powers one node in each I/O group. However, for maximum redundancy, use one redundant ac-power switch to power each node in the system.

Some SAN Volume Controller node types have two power supply units. Both power supplies must be connected to the same 2145 UPS-1U, as shown by node A and node B. The SAN Volume Controller 2145-CG8 is an example of a node that has two power supplies. The SAN Volume Controller 2145-8A4 is an example of a node that has a single power supply.

Uninterruptible power supply

The uninterruptible power supply protects a SAN Volume Controller node against blackouts, brownouts, and power surges. The uninterruptible power supply contains a power sensor to monitor the supply and a battery to provide power until an orderly shutdown of the system can be performed.

SAN Volume Controller 2145-CG8 uses the 2145 UPS-1U.

2145 UPS-1U

A 2145 UPS-1U is used exclusively to maintain data that is held in the SAN Volume Controller dynamic random access memory (DRAM) in the event of an unexpected loss of external power. This use differs from the traditional uninterruptible power supply that enables continued operation of the device that it supplies when power is lost.

With a 2145 UPS-1U, data is saved to the internal disk of the SAN Volume Controller node. The uninterruptible power supply units are required to power the SAN Volume Controller nodes even when the input power source is considered uninterruptible.

Note: The uninterruptible power supply maintains continuous SAN Volume Controller-specific communications with its attached SAN Volume Controller nodes. A SAN Volume Controller node cannot operate without the uninterruptible power supply. The uninterruptible power supply must be used in accordance with documented guidelines and procedures and must not power any equipment other than a SAN Volume Controller node.

2145 UPS-1U configuration

A 2145 UPS-1U powers one SAN Volume Controller node.

To make the SAN Volume Controller clustered system more resilient against power failure, the 2145 UPS-1U units can be connected to the redundant ac-power switch.

If a redundant ac-power switch is not used, the two uninterruptible power supplies that power an I/O group can be connected to different, independent

electrical power sources. In this case, if a single power source fails, only one node in the I/O group stops and the SAN Volume Controller system can continue to operate, although with reduced performance.

Each uninterruptible power supply must be in the same rack as the node that it powers.

Each 2145 UPS-1U includes one power cord that connects the uninterruptible power supply to a redundant ac-power switch, if one exists, or to a rack power distribution unit (PDU), if one exists. The 2145 UPS-1U also includes an alternative power cable to connect to an external power source that is specific to your geography.

Each 2145 UPS-1U is connected to a SAN Volume Controller node with a power cable and a signal cable. To avoid the possibility of power and signal cables being connected to different uninterruptible power supplies, these cables are wrapped together and supplied as a single field-replaceable unit (FRU). The SAN Volume Controller node reads status and identification information from the uninterruptible power supply using the signal cable.

Chapter 2. Installing the SAN Volume Controller 2145-CG8 hardware

There are several steps that you must perform to prepare, and then install the SAN Volume Controller hardware.

To install the SAN Volume Controller hardware, perform the following tasks in order.

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

1. Prepare for the SAN Volume Controller hardware installation by confirming that you have all the planning information and parts that you require.
2. Optionally, install and verify the operation of the redundant ac-power switch, if the redundant ac-power switch is not already in use for a node.
3. Install the uninterruptible power supply.
4. Install the node.
5. Connect the Fibre Channel and Ethernet cables to the node.
6. Connect the node to the uninterruptible power supply.
7. Verify that the node is operational.

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

Preparing for the hardware installation

You must prepare for the installation of the optional redundant ac-power switch, the uninterruptible power supply, and the SAN Volume Controller.

Figure 3 on page 8 shows the major hardware components that you need.
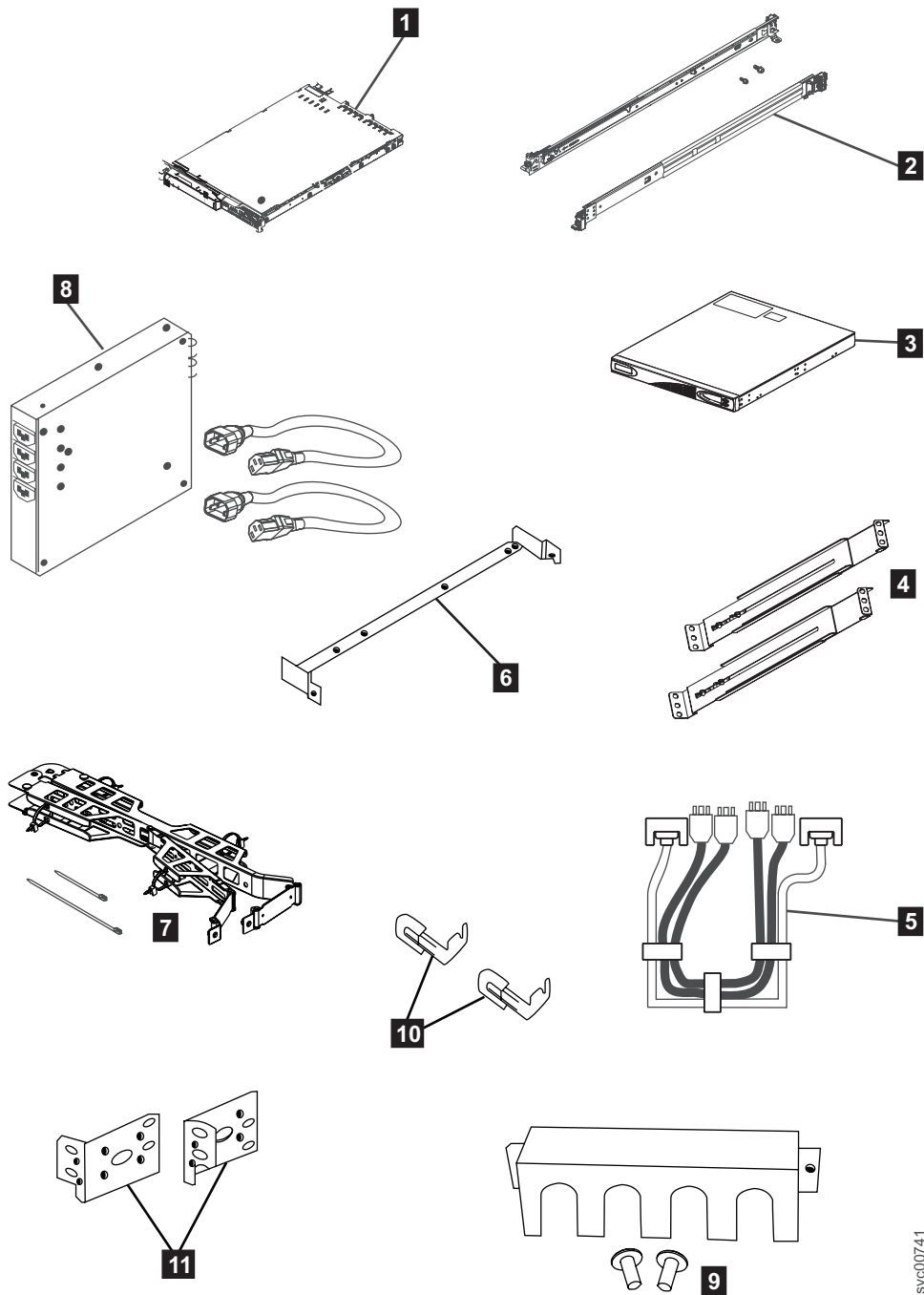
Figure 3. Parts provided for SAN Volume Controller 2145-CG8 hardware installation in a rack

1 SAN Volume Controller node

2 SAN Volume Controller support rails (2)

3 2145 UPS-1U

4 2145 UPS-1U support rails (2)

5 Power cable assembly

6 SAN Volume Controller cable-management support arm

7 SAN Volume Controller cable-management arm assembly

8 Optionally, one or more redundant ac-power switches, two mounting brackets per switch, and power cables

| **9** 2145 UPS-1U cable-retention bracket
| **10** SAN Volume Controller cable-retention brackets
| **11** 2145 UPS-1U mounting brackets

Not shown in Figure 3 on page 8 are two 2145 UPS-1U input-power cables that are provided. One cable comes with the 2145 UPS-1U; it has an IEC 320-C14 plug, which is suitable for most rack-mounted power distribution units. The other country-specific cable comes with the SAN Volume Controller node; this cable is intended for your country-specific power sockets. Use only one of these cables.

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

Three boxes are shipped for each node: one box contains the uninterruptible power supply, one box contains the publications, and the third box contains all the other parts. A label on the third, or main, box indicates the features that were shipped.

Note:

1. You must install at least two SAN Volume Controller nodes. Each node requires an uninterruptible power supply.
2. Optionally, install two redundant ac-power switches to power the nodes in an I/O group through two 2145 UPS-1U units.
3. You must ensure that you have the appropriate cables to connect the redundant ac-power switch or uninterruptible power supply to the power distribution unit. See Appendix B, "SAN Volume Controller physical installation planning," on page 45 for more details.

Perform the following steps to prepare for installation:

1. Ensure that you have everything you need for installation, including the customer-completed planning tables and charts. The customer can obtain the planning tables and charts from Support for SAN Volume Controller (2145) website at www.ibm.com/storage/support/2145.

   | The SAN Volume Controller 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. If you are connecting cables to switches
   | that are currently in use, confirm with the customer that it is safe for you to
   | proceed. Go no further with these instructions until you are satisfied that all
   | the information is correct and valid.

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

   The following feature codes are included:

   - Feature code 0010: initial SAN Volume Controller 2145-CG8 software preinstalled on feature code 3001 and 3002
   - One of the following:
     - Feature code 3001: initial SAN Volume Controller 2145-CG8 node, quantity 1
     - Feature code 3002: additional SAN Volume Controller 2145-CG8 node, quantity 1
   | - Feature code 5608: Fibre Channel longwave small form-factor pluggable
   | (SFP) transceiver, quantity 1 - 4

- Optionally, feature code 4500: Solid-state drive (SSD) attachment, quantity 1
- Optionally, feature code 4601: 146 GB Solid-state drive (SSD), quantity 1 - 4
- Optionally, feature codes 5700 and 5711: 10 Gbps Ethernet adapter, quantity 1 and SFP transceivers, quantity 2; the single feature code contains both SFPs. Both feature codes preinstalled on feature code 3001 and 3002
- One of the following country-specific SAN Volume Controller 2145-CG8 power cable feature codes: 9714, 9715, 9716, 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9724, 9725, 9726, or 9727.
- Feature code 8115: 2145 UPS-1U kit, quantity 1
- Optionally, feature codes 5305 and 5325 for SAN Volume Controller fiber-optic, Fibre Channel, or 10 Gbps Ethernet cables, quantity 1 - 6
- Optionally, feature code 8300: redundant ac-power switch, quantity 1

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 code 0010 is preinstalled software. There is no shipped part for this software.
- Feature codes 3001 and 3002 ship the same parts. Verify that you have the listed parts:
  - SAN Volume Controller 2145-CG8 node
  - Part number 69Y1365: SAN Volume Controller 2145-CG8 Support rail kit, quantity 1
  - Part number 69Y1366: SAN Volume Controller 2145-CG8 Cable-management arm assembly, quantity 1
  - Part number 31P1105: SAN Volume Controller publications and 31P1242: ship group in a separate box
    31P1105 contains:
    - SAN Volume Controller Publications CD
    - SAN Volume Controller Read first
    - *IBM Systems Safety Notices*
    - *IBM System Storage SAN Volume Controller Model 2145-CG8 Hardware Installation Guide*
    - *IBM System Storage SAN Volume Controller Troubleshooting Guide*
    - *IBM System Storage SAN Volume Controller Hardware Maintenance Guide*
    - SAN Volume Controller License information for IBM CIM agent and console for management GUI
    - SAN Volume Controller License information for SAN Volume Controller
    - SAN Volume Controller Statement of Limited Warranty
    - IPLA booklet for warranted products
    - ILA booklet with pointer sheet
    - IBM agreement for acquisition of support
    - IBM license information for machine code
    - Other miscellaneous flyers
  - 31P1242 contains:
    - Part number 31P1243: SAN Volume Controller power cable-retention brackets, quantity 2
    - Part number 31P1294: Kit containing the power and signal cable bundle, 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 in a plastic ziplock bag
- Feature codes 9714, 9715, 9716, 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9724, 9725, 9726, and 9727 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.
- Optional feature code 5608 ships uninstalled, quantity 1 - 4
- Optional feature code 4500 ships installed in the SAN Volume Controller 2145-CG8 node, quantity 1
- Optional feature code 4601 ships installed in the SAN Volume Controller 2145-CG8 node, quantity 1 - 4
- Optional feature codes 5700 and 5711 ship installed in the SAN Volume Controller 2145-CG8 node, quantity 1 each
- Feature code 8115 ships in a separate box that is labeled part number 31P1391. Verify that the box contains these items:
  - 2145 UPS-1U, quantity 1
  - 2145 UPS-1U output power-cable retention-bracket kit, quantity 1
  - Cable clip and two screws in plastic ziplock bag
  - Uninterruptible power-supply rail kit, quantity 1
  - Power cable for connecting the uninterruptible power supply to a rack; PDU, quantity 1
  - Multilingual battery-reconnection flyer and other miscellaneous flyers
  - Environmental Notices and User's Guide CD
- Optional feature code 8300 ships in a box within the main box. Verify that the box contains the following items:
  - Part number 95P5083: redundant ac-power switch, quantity 1
  - Part number 31P0966: power cables, quantity 2
  - Part number 96P1728: mounting plates, quantity 2
  - Part number 12J5289: hex head screws, quantity 4
  - Part number 00N8709: "c" clips, quantity 4
  - Part number 24R0207: other screws, quantity 6
  - Part number 31P0876: label set, quantity 1

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

If feature codes 5700 and 5711 are ordered, and feature codes 5305 and 5325 are not ordered for Ethernet connection, the customer must supply their own OM2 or OM3 fiber-optic cables. Make sure that two cables per node are available.

Note: Part numbers are subject to change between SAN Volume Controller releases. The part numbers listed here might not always reflect what the customer has received.

4. Read "Safety and environmental notices" on page ix to ensure that you are correctly installing the 2145 UPS-1U units.
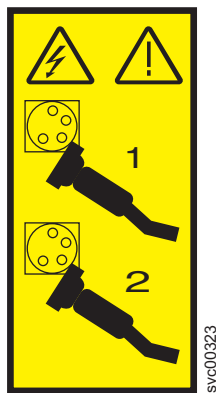
Optionally installing the redundant ac-power switch

Use the redundant ac-power switch to make the SAN Volume Controller clustered system more resilient to power failure.

DANGER

> **Multiple power cords: The product is equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords. (L003)**
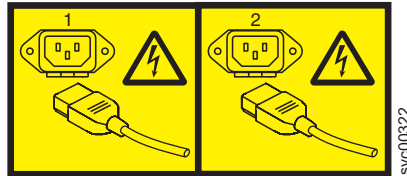
or

The following topics describe the redundant ac-power switch installation tasks in the order that they must be performed:

1. Attach the mounting plates to the redundant ac-power switch.
2. Label the cables.
3. Connect the power input cables to the redundant ac-power switch.
4. Install the redundant ac-power switch in the rack.
5. Connect the redundant ac-power switch to the site power.
6. Test the redundant ac-power switch to ensure that it automatically switches power supplies when the main power source fails or is restored.

Attaching the mounting plates to the redundant ac-power switch

Attach the mounting plates to the redundant ac-power switch before you label the cables.

Perform the following steps to attach the mounting plates to the redundant ac-power switch.

1. Attach each of the two mounting plates to the redundant ac-power switch using three M3 Torx T8 head screws.
2. Position the mounting face on the side of the redundant ac-power switch containing the output power sockets. See Figure 4.

Figure 4. Attaching the mounting plates

Labeling the cables

You must label each end of the two redundant ac-power switch input-power cables before you connect the input-power cables to the redundant ac-power switch.

Perform the following steps to label each end of the two redundant ac-power switch input-power cables:

1. Label the rack power-distribution end "Power source <name>, outlet <id> to redundant ac-power switch <location> <MAIN | BACKUP> input." For example, "Power source D2, outlet 4 to redundant ac-power switch pos 7 MAIN input." One cable is labeled "MAIN;" the other is labeled "BACKUP."
2. Label the redundant ac-power switch end "redundant ac-power switch <location> <MAIN | BACKUP> input from Power source <name>, outlet <id>." One cable is labeled "MAIN;" the other is labeled "BACKUP."

Connecting the input-power cables to the redundant ac-power switch

You will find it easier to connect the input-power cables to the redundant ac-power switch before you install the redundant ac-power switch in the rack.

Perform the following steps to connect the input-power cables to the redundant ac-power switch:

1. Connect the main input-power cable to the redundant ac-power switch.
2. Connect the backup input-power cable to the redundant ac-power switch.
3. Secure both the redundant ac-power switch input-power cables using the clips of the redundant ac-power switch. See Figure 5 on page 14.

Figure 5. Power cable clips

Installing the redundant ac-power switch in the rack

You must install the redundant ac-power switch in the rear of the rack before you connect the redundant ac-power switch to the site power.

Perform the following steps to install the redundant ac-power switch in the rack:

1. Use the hardware location chart to determine where to install the redundant ac-power switch in the rack. The redundant ac-power switch can be installed horizontally in a rack slot or vertically in one of the side slots of the rack.

2. Position the four "C" clips in the rack's mounting bar, as shown in Figure 6 on page 15.
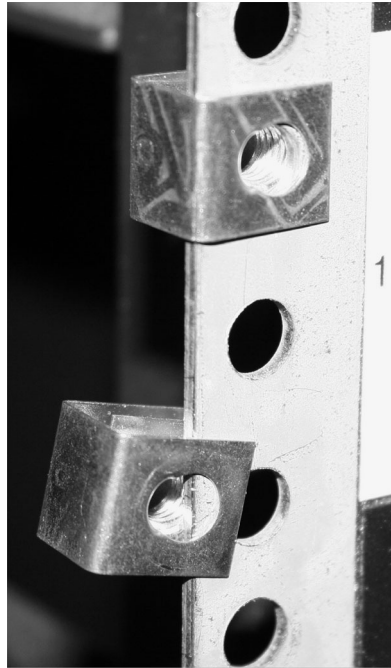
Figure 6. Positioning the clips

3. Position the redundant ac-power switch in the rack first, pushing the cables through to the front of the rack. Mount in place, as shown in Figure 7, using the four M6 screws.

Figure 7. Positioned in rack

Connecting the redundant ac-power switch to the site power

You must connect the redundant ac-power switch to the site power before you test the redundant ac-power switch.

Perform the following steps to connect the redundant ac-power switch to the site power:

1. Determine a suitable cable route from the redundant ac-power switch to the power distribution units.
2. Route the main input-power cable of the redundant ac-power switch to the specified power distribution unit, and connect it.
3. Route the backup input-power cable of the redundant ac-power switch to the specified power distribution unit, and connect it.
4. Verify that the redundant ac-power switch power cables are tidy. Ensure that they do not obstruct other equipment and that they are tied in place where necessary.

Testing the redundant ac-power switch

You can test the redundant ac-power switch before you continue installing other SAN Volume Controller components. You can test the redundant ac-power switch later if a suitable test device is not available.

You can test whether the redundant ac-power switch correctly switches between power inputs when the main input power fails or is restored. You can either use a volt meter to measure for voltage at the output or attach a work light, or similar device with a C14 plug, to the redundant ac-power switch output and verify that it remains powered when a failure is simulated on either of the inputs.

Notes:
- If you do not have a separate device to verify that there is power on the output port of the redundant ac-power switch, you can delay this test until you connect the redundant ac-power switch to the uninterruptible power supply. In that case, turn on the uninterruptible power supply (not the SAN Volume Controller node) and see if it changes to battery power. The test fails if the uninterruptible power supply switches to battery power for more than five seconds.
- Any transient indications of battery power can be ignored.

When the instructions say to "remove power," you can either turn the power off if the site power-distribution unit (PDU) has outputs that are individually switched or remove the specified redundant ac-power switch power cable from the outlet of the site PDU.

Note: If at any time there is no power on the output socket, ensure that the power distribution sockets of the power source are turned on. If they are, recheck all of the connections and decide if the redundant ac-power switch assembly, which includes the input-power cables, is defective.

Perform the following steps to test the redundant ac-power switch:
1. Confirm that there is power at redundant ac-power switch output socket 2.
2. Confirm that there is power at redundant ac-power switch output socket 1.
3. Remove power from the main power cable to the redundant ac-power switch and confirm that there is power at the redundant ac-power switch output 1.
4. Reconnect the main power cable.
5. Remove power from the backup power cable to the redundant ac-power switch and confirm that there is power at the redundant ac-power switch output 1.
6. Reconnect the backup power cable and remove the monitoring device.

   Note: After any failure, repeat the test phase from the start until all the tests succeed.

Installing the 2145 UPS-1U

Before you can use the SAN Volume Controller, you need to install the uninterruptible power supply.

Complete the following steps to install the 2145 UPS-1U:
1. Install the support rails for the 2145 UPS-1U.
2. Install the 2145 UPS-1U in the rack.
3. Install the 2145 UPS-1U cable-retention bracket.

Installing the support rails for the 2145 UPS-1U

You must install the support rails in the rack before installing the 2145 UPS-1U.

Complete these prerequisites before installing the support rails:

1. Use the customer's hardware-location chart to determine where in the rack to install the 2145 UPS-1U.
2. At the back of the rack, observe the Electronic Industries Alliance (EIA) positions and determine where you are going to install the 2145 UPS-1U. Because of its weight, position the 2145 UPS-1U where it is easy to handle in one of the lower positions in the rack.

Perform the following steps to install the support rails for the 2145 UPS-1U:

1. Open the top of the 2145 UPS-1U shipping carton. Grip the flaps on either side of the 2145 UPS-1U.
2. Lift the 2145 UPS-1U clear of the shipping carton and place it on a flat, stable surface with the front facing you.
3. Attach the long side of a mounting bracket **1** to each side of the 2145 UPS-1U using four M3 × 6 screws **2** for each bracket, as shown in Figure 8.
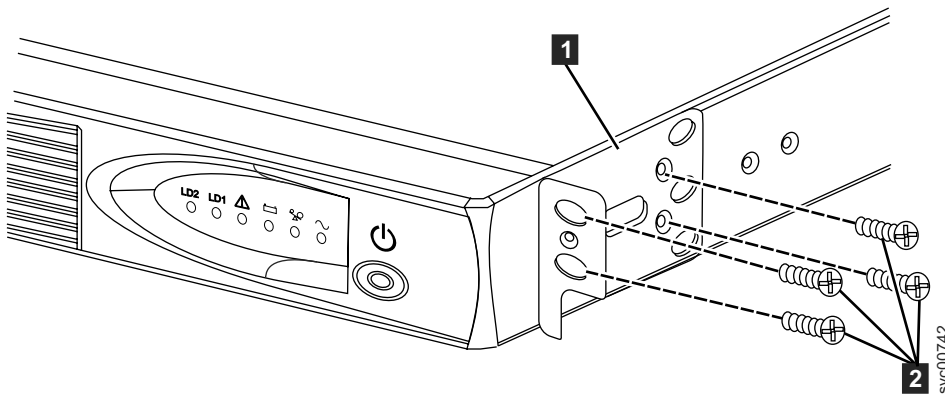
Figure 8. Installing the 2145 UPS-1U mounting brackets for the 2145 UPS-1U

4. Loosen the wing nuts (**1** and **2**) on both rail assemblies and adjust the rail size to the depth of your rack. After you adjust the depth, tighten the wing nuts as much as possible while still allowing some movement.

   Refer to Figure 9 on page 18 for information about how to tighten or loosen wing nuts and achieve a desired rail depth.
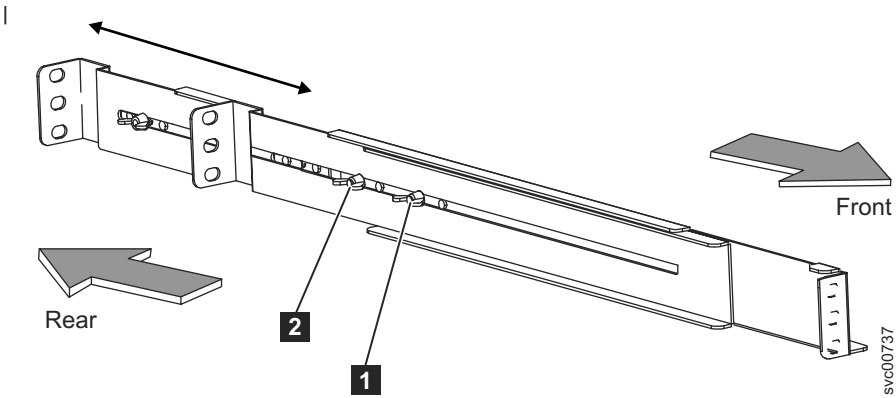
Figure 9. Adjusting the rail depth on the 2145 UPS-1U

Wing nut **1**

Wing nut **2**

5. Select the holes in the rail where you want to position the uninterruptible power supply.

   The figure shows the rear rail where the 2145 UPS-1U attaches to the rack. See Figure 10.

   Note: The bottom flange of the support rail must align with the EIA mark on the rack.
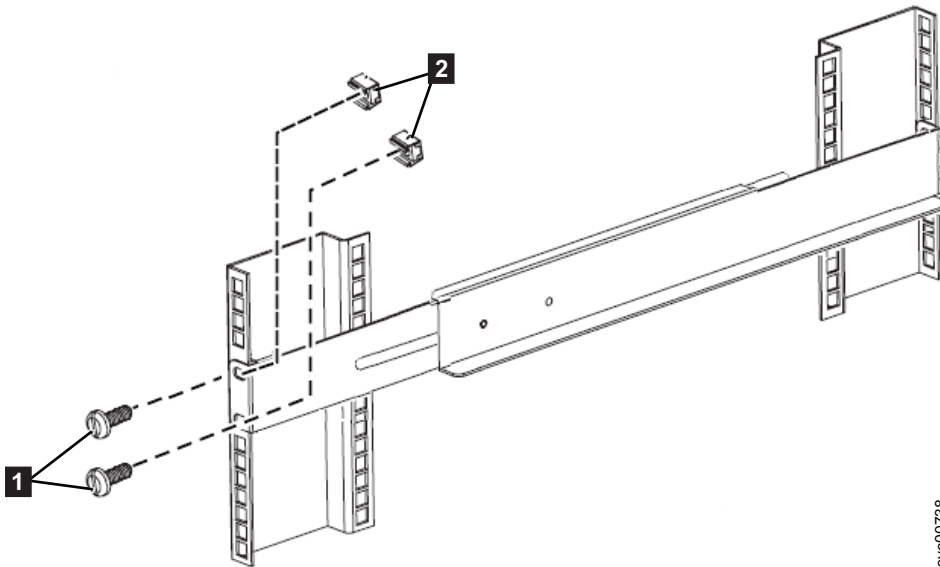
Figure 10. Attaching the rear of the 2145 UPS-1U rail to the rack

6. Install 2 clip nuts **2** and 2 M6 x 10 screws **1**, to attach the rail to the rear of the rack.

7. Install 2 clip nuts **2** and **3** to the front of the rack. Then attach the rail using just 1 M6 x 10 screw **1** in the bottom mounting hole as shown in Figure 11 on page 19.

   Note:

a. The extra clip nut **3** is reserved for later installation of the 2145 UPS-1U when the mounting brackets must be attached to the vertical rail on the rack.

b. The rack might be different from the one shown here, and if so, might require different clip nuts or fasteners.
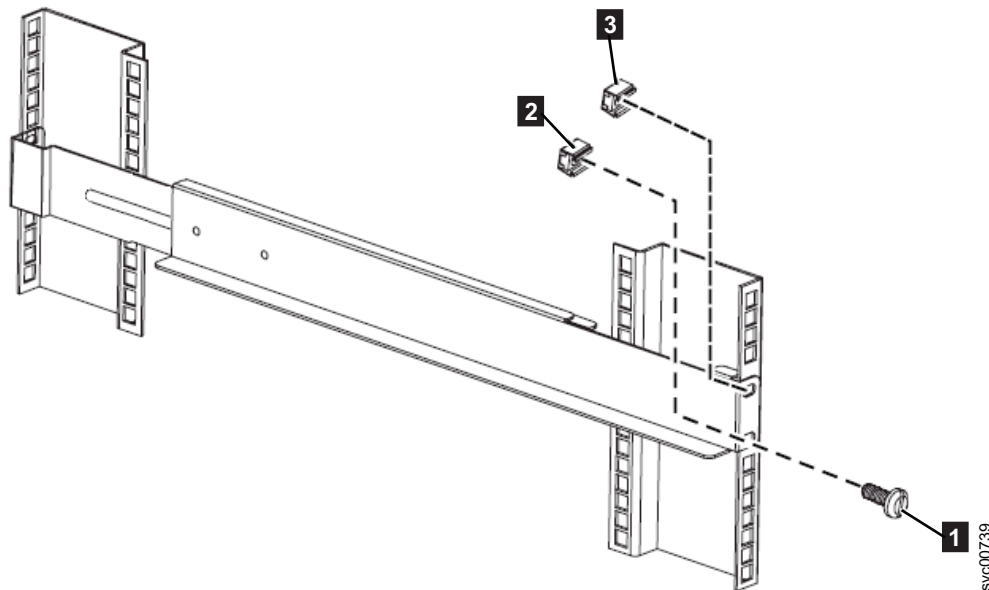
Figure 11. Attaching the front of the 2145 UPS-1U rail to the rack.

8. Repeat steps 6 on page 18 and 7 on page 18 for the other rail.
9. Tighten the wing nuts on both rail assemblies.

Installing the 2145 UPS-1U in the rack

After you have completed the preparation procedures, you are ready to install the 2145 UPS-1U in the rack.

Attention: See "Safety and environmental notices" on page ix before you start the installation process. Use the reference numbers in parentheses at the end of each safety notice to find the matching translated notice. For the translation of the danger, caution, and attention notices, see the *IBM Systems Safety Notices*.

CAUTION:
The uninterruptible power supply contains its own energy source (sealed, lead-acid batteries). The output receptacles might carry live voltage, even when the uninterruptible power supply is not connected to an ac supply. (11)

CAUTION:
Do not remove or unplug the input cord when the uninterruptible power supply is turned on. Unplugging the input cord removes the safety ground from the uninterruptible power supply and the equipment connected to the uninterruptible power supply. (12)

CAUTION:
To reduce the risk of fire or electric shock, install the uninterruptible power supply in a temperature- and humidity-controlled indoor environment, free of conductive contaminants. Ambient temperature must not exceed 40°C (104°F). Do not operate near water or excessive humidity (95% maximum). (13)

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.

Perform the following steps to install the 2145 UPS-1U in the rack.

Note: You might have already completed steps 3 through 6 on page 22 if you used the *Read Me First* pamphlet, which is included with the 2145 UPS-1U.

1. Stand at the front of the rack and place the back of the 2145 UPS-1U onto the support rails, and then slide the 2145 UPS-1U into the rack.
   CAUTION:
   The 2145 UPS-1U weighs 16 kg (35.3 lb). If you feel unsure about lifting the uninterruptible power supply to its location in the rack, seek assistance or remove the battery to reduce its weight.

2. At the front of the 2145 UPS-1U, install the two mounting screws (M6x10) **1** as shown in Figure 12.
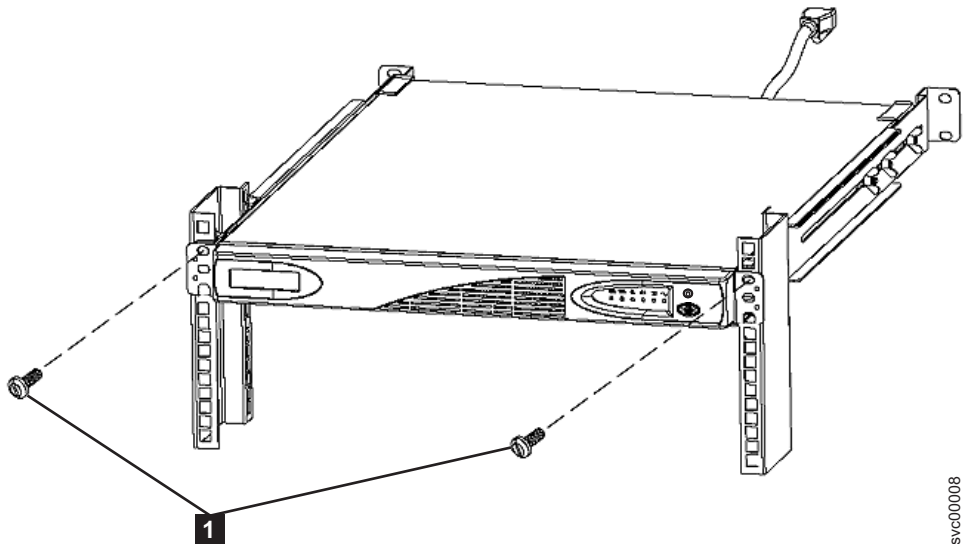
Figure 12. Mounting screws for the 2145 UPS-1U

3. If you have not already connected the internal battery connector, remove the 2145 UPS-1U front panel, shown in "Installing the 2145 UPS-1U in the rack" on page 19, by pulling the panel forward (1), then pushing to the left (2).
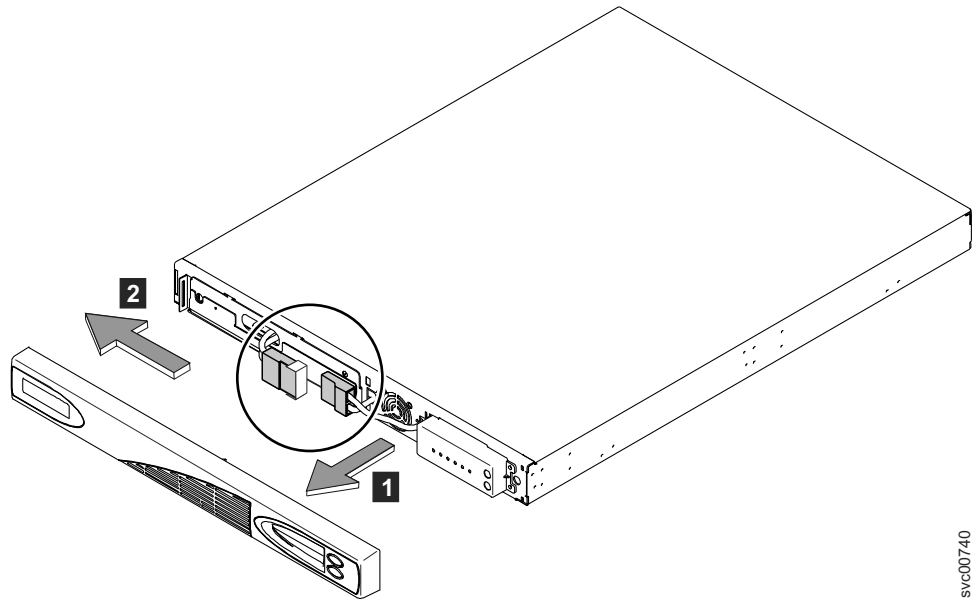
Figure 13. Removing the 2145 UPS-1U front panel

4. Remove the protective label from the internal battery connector (shown in Figure 14).
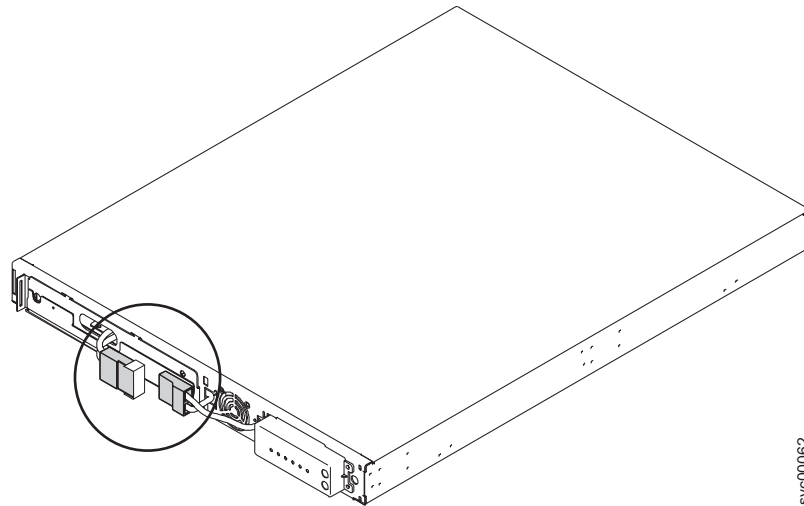
Figure 14. The 2145 UPS-1U internal battery connector with protective tape

5. Connect the internal battery connector (shown in Figure 15 on page 22). Each end of the keyed connector has two wires: one red (+) and one black (−). Align the connector so that the two red wires are joined together and the two black wires are joined together.

Note: A small amount of arcing might occur when connecting the batteries. This is normal and does not damage the unit or present any safety concerns.
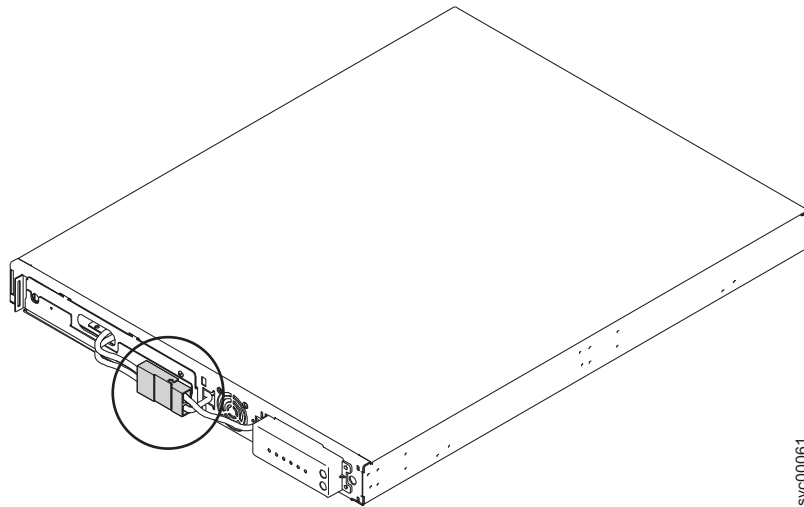
Figure 15. The 2145 UPS-1U internal-battery connector

6. Reinstall the front panel. You might first need to move the sliding section on the front of the 2145 UPS-1U to the closed position.

7. At the back of the 2145 UPS-1U, plug the 2145 UPS-1U main-power connector into the power socket.

   The power socket is shown by **1** in Figure 16.

   The 2145 UPS-1U is in standby mode; so all indicators are off.

   Connect each 2145 UPS-1U for an I/O group to a different power source.
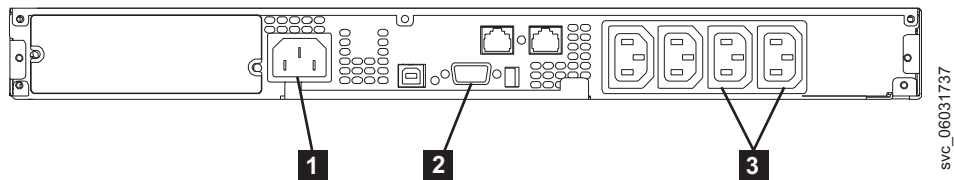
Figure 16. 2145 UPS-1U (rear view)

1 Main power connector
2 Communication port
3 Load segment 2 receptacles

Attention: Ensure that you comply with the following requirements:
- The voltage supplied to the 2145 UPS-1U must be 200 - 240 V single phase.
- The frequency supplied must be 50 or 60 Hz.

Notes:
a. The 2145 UPS-1U has an integrated circuit breaker and does not require external protection.
b. The 2145 UPS-1U is intended to maintain power on SAN Volume Controller nodes until data can be saved to the local hard-disk drive. Only SAN Volume Controller nodes can be plugged into the 2145 UPS-1U or the SAN Volume Controller clustered system will malfunction.

8. Press and hold the on/off button (**7** in Figure 17 on page 23) for approximately five seconds. You might need a pointed device, such as a

screwdriver, to press the on/off button. The front panel indicators cycle through a startup sequence while the 2145 UPS-1U conducts a self-test.
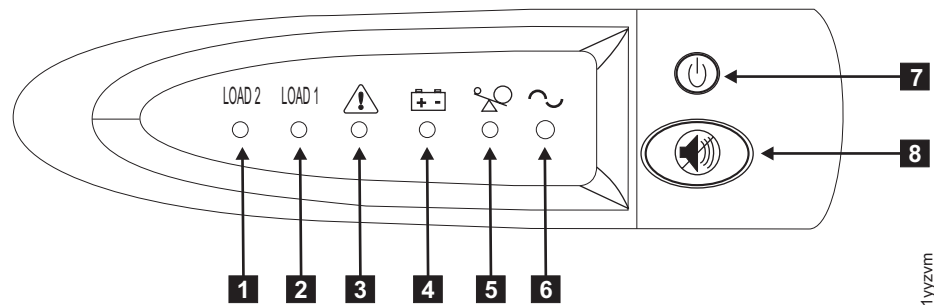
Figure 17. 2145 UPS-1U front-panel assembly

When the self-test is complete, the power-on indicator **6** and the load indicators (**1** and **2**) illuminate to indicate that power is being supplied by the 2145 UPS-1U. The 2145 UPS-1U is now in normal mode, and is charging its battery. If the battery indicator **4** is on and the alarm is sounding, the voltage range setting might not be correct. When a SAN Volume Controller is connected to the 2145 UPS-1U, the SAN Volume Controller automatically adjusts the voltage range setting. Take no action for this alarm condition unless it persists for more than five minutes after a SAN Volume Controller has been connected to this 2145 UPS-1U and turned on.

9. Repeat all of these steps to install additional 2145 UPS-1U units.

Installing the 2145 UPS-1U cable-retention bracket

The 2145 UPS-1U cable-retention bracket ensures that the power cable connection between the 2145 UPS-1U and the SAN Volume Controller node is stable.

Install the bracket after you install the power and signal cable assembly that was supplied with the node to connect the 2145 UPS-1U and the node.

You can attach the bracket by performing the following steps:

1. Install the power cable into the rightmost power outlet on the rear of the 2145 UPS-1U.

2. Remove the bracket and the two screws (shown in Figure 18 on page 24) from the packaging.
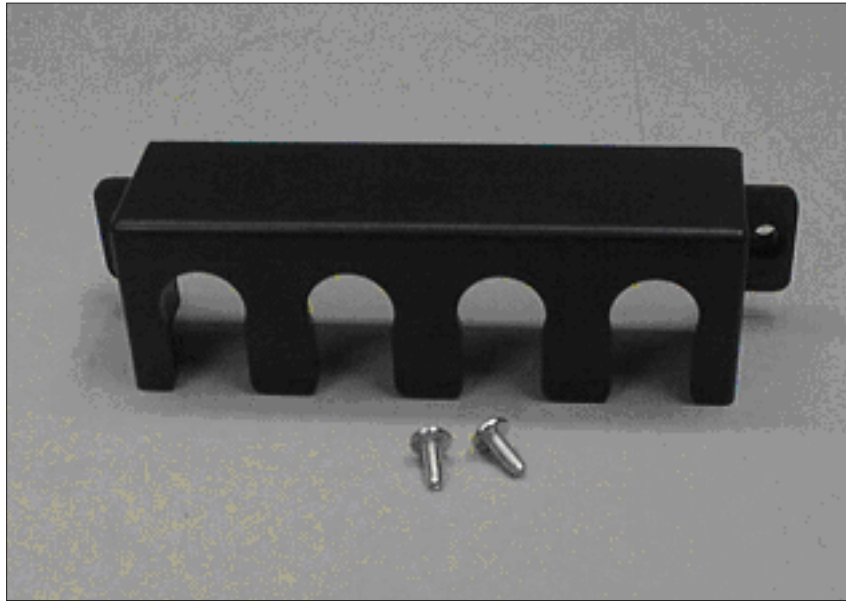
Figure 18. 2145 UPS-1U power cable-retention bracket hardware

3. Place the bracket over the power outlets on the right rear of the 2145 UPS-1U, so that the two screw holes line up.
4. Position the bracket with the power cable protruding through the rightmost slot in the bracket.
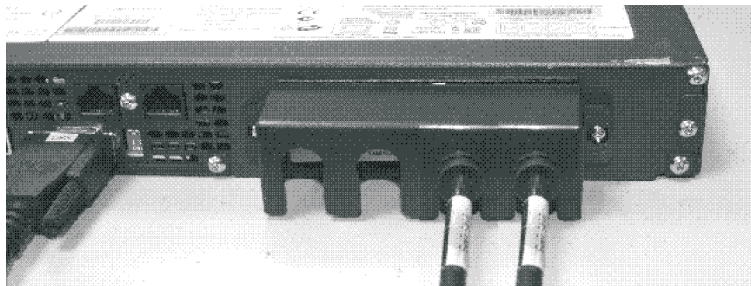5. Secure the bracket in place with one screw on each side, as shown in Figure 19.

Figure 19. 2145 UPS-1U power cable-retention bracket

Installing the SAN Volume Controller 2145-CG8

There are several steps that you must perform to install the SAN Volume Controller 2145-CG8 node.

Installing the SAN Volume Controller 2145-CG8 consists of the following tasks:

1. Installing the support rails in the rack cabinet.
2. Installing the SAN Volume Controller 2145-CG8 node.
3. Installing the cable-management arm in the rack cabinet.
4. Connecting the SAN Volume Controller 2145-CG8 node to the uninterruptible power supply.

Installation guidelines

Before you install the support rails for the SAN Volume Controller 2145-CG8 node, review the following guidelines:

- Do not install a unit in a rack where the internal-rack ambient temperature exceeds the lowest manufacturer-recommended ambient temperature for all 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 overcurrrent 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.
- Do not install a SAN Volume Controller node directly above the pull-out monitor and keyboard of the IBM System Storage Productivity Center (SSPC) server. The front panel of the node protrudes beyond the front of the rack and overlaps part of the monitor, which prevents you from opening it.

Installing the support rails for the SAN Volume Controller 2145-CG8

You must install the support rails that hold the SAN Volume Controller 2145-CG8 node.

Figure 20 shows the items that you need to install the SAN Volume Controller 2145-CG8 node in a rack.
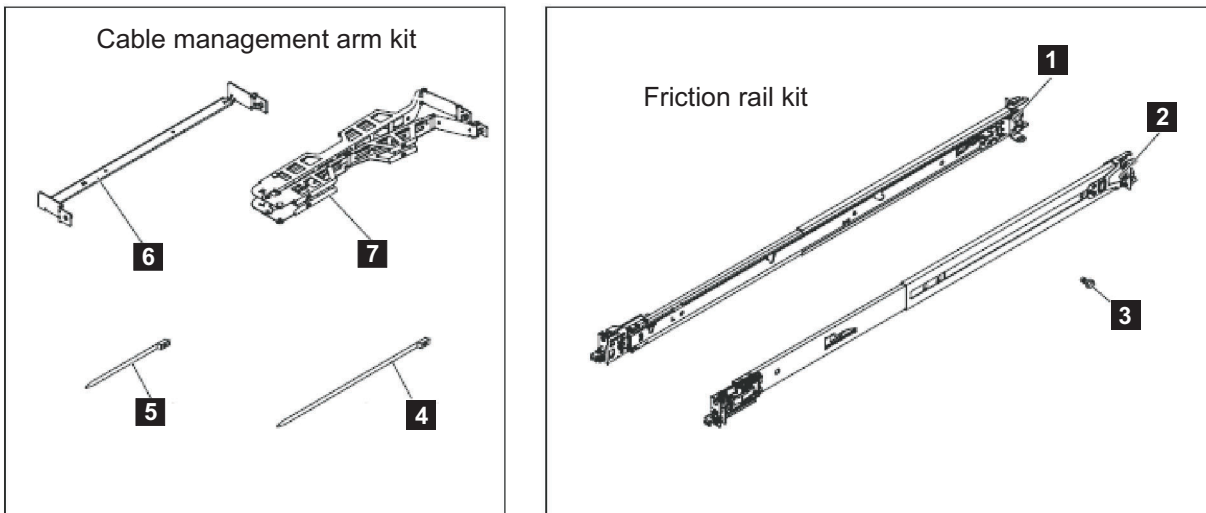
Figure 20. SAN Volume Controller 2145-CG8 cable-management arm, support rails, and associated parts

Table 4. Cable-management arm and associated parts descriptions and quantities

Reference	Description	Quantity
1	Slide rail (left)	1

Table 4. Cable-management arm and associated parts descriptions and quantities (continued)

Reference	Description	Quantity
2	Slide rail (right)	1
3	M6 screws	4
4	Large cable tie	1
5	Cable ties	5
6	Cable-management support arm	1
7	Cable-management arm assembly	1

Notes:

- With some types of racks, you might find it helpful to remove the rack doors and side panels to provide easier access during installation.
- The slide rails are marked (RIGHT / FRONT and LEFT / FRONT) for proper placement on the rack flanges.
- The front and back of each rail has a spring-loaded rail-locking carrier, which can be locked in the open position and then released when the rail is in the rack.

When you are ready to install the support rails, use the customer's hardware-location chart and the Electronic Industries Alliance (EIA) positions on the rack to determine where in the rack that the SAN Volume Controller node is to be installed.

Perform the following steps to install the support rails:

1. Verify that you have all the items that you need for installing the support rails and that you have identified the front of each rail, as shown in Figure 20 on page 25.

    1 Slide rail (left)
    2 Slide rail (right)
    3 M6 screws

    Note: You might find it helpful, with some types of racks, to remove the rack doors and side panels to provide easier access during installation.

2. Open the rear-slide-rail hooks, as shown in Figure 21 on page 27.
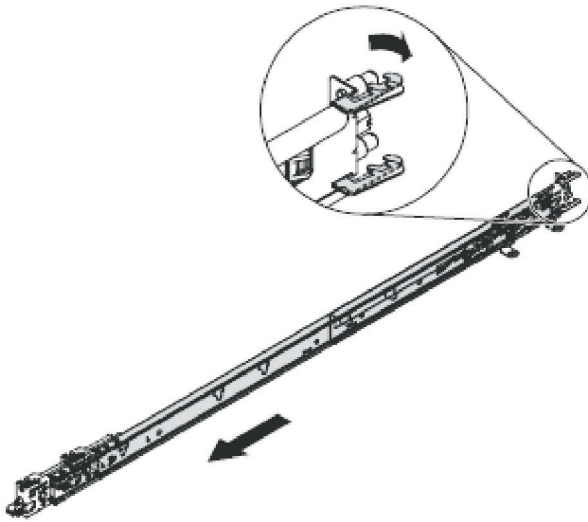
Figure 21. Opening the rear slide-rail hooks

> **Note:** The maximum distance between the front and the rear EIA rails of the rack is 810 mm (31.9 in.).
>
> Each slide rail is marked with either an R (right) or an L (left). Select one of the slide rails and pull the rear bracket all the way back. If a thumbscrew is installed in the slide rail, remove it.

3. Install the rear end of the slide rails, as shown in Figure 22.
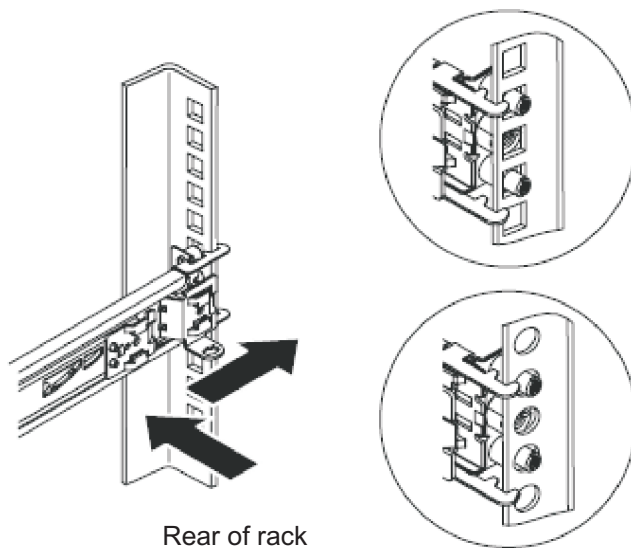
Rear of rack

Figure 22. Installing the rear end of the slide rails

> From the front of the rack, line up the two pins on the rear of the slide rail in the selected U on the rear of the rack. Push the rails so that the pins go into the holes and slide the rails into the rack to lock the rear of the slide rails into the rack.

4. Prepare the front end of the slide rails, as shown in Figure 23 on page 28.
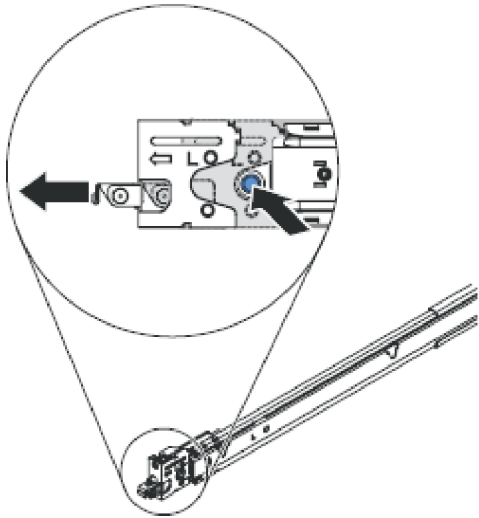
Figure 23. Preparing the front end of the slide rails

> Push the blue button to allow the latch to slide forward. Then pull the slide rail forward and pull the latch on the front of the rail in the U on the front of the rack. Adjust the length of the rail.

5. Install the front end of the slide rails, as shown in Figure 24.
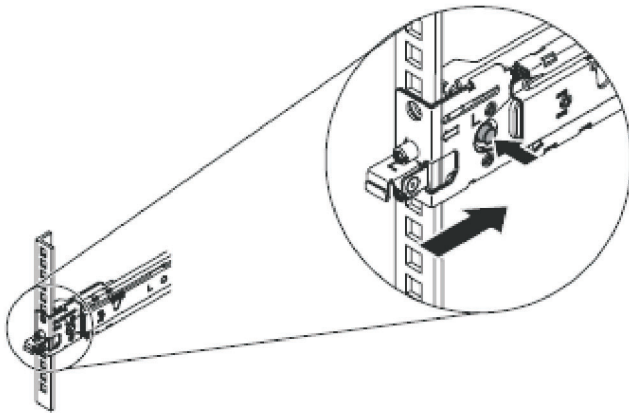
Figure 24. Installing the front end of the slide rails

> Press the blue button to release the bracket. Push the front latch in all the way. Make sure the latch is fully engaged.

6. Install the other rail in the same manner.

Installing the cable-management arm for the SAN Volume Controller 2145-CG8

The SAN Volume Controller 2145-CG8 uses a cable-management arm to route and secure power and communication cables.

The parts involved in installing the cable-management arm are shown in Figure 25 on page 29.
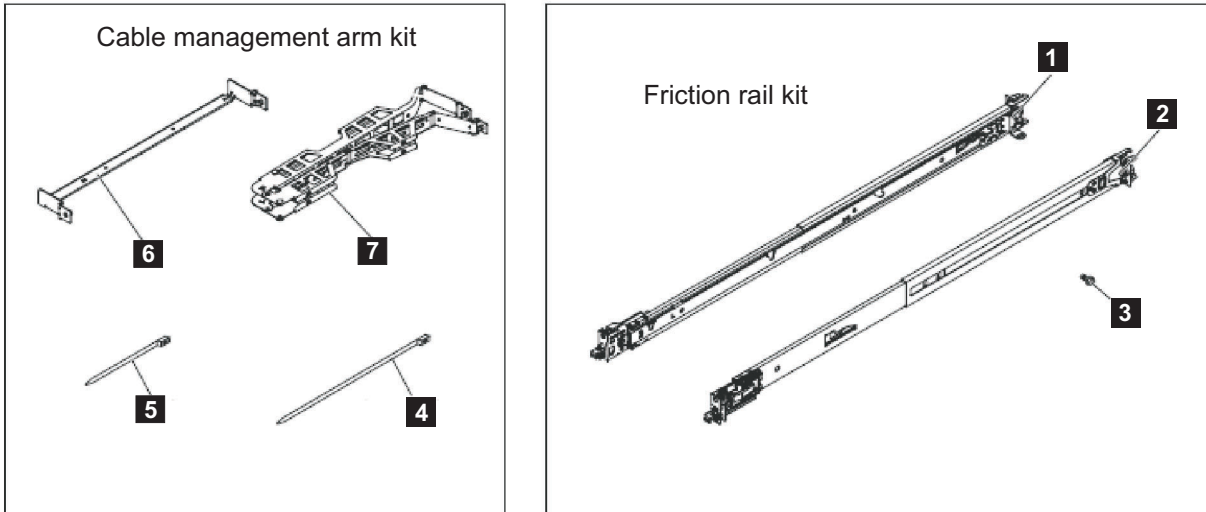
Figure 25. SAN Volume Controller 2145-CG8 cable-management arm, support rails, and associated parts

Table 5. Cable-management arm and associated parts descriptions and quantities

Reference	Description	Quantity
1	Slide rail (left)	1
2	Slide rail (right)	1
3	M6 screws	4
4	Large cable tie	1
5	Cable ties	5
6	Cable-management support arm	1
7	Cable-management arm assembly	1

To attach the arm, perform the following steps:

1. At the rear of the rack, install the cable-management-support arm.

   Insert both ends of the cable management support arm into the slide rail, as shown by Figure 26 on page 30.
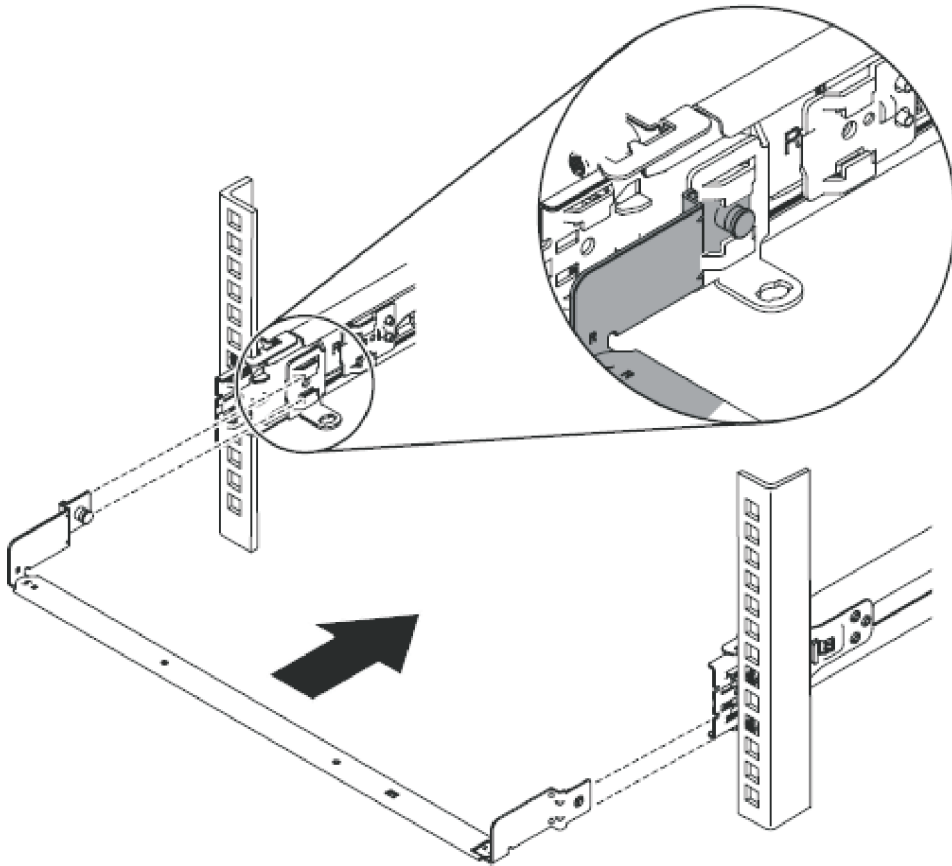
Figure 26. Installing the cable-management-support arm

2. Install the cable management arm, as shown in Figure 27 on page 31.

Figure 27. Installing the cable-management arm

> **Note:** Make sure that the junctions on the arm, as shown by **1** in Figure 27, are facing the SAN Volume Controller 2145-CG8.
>
> Place the cable management arm on the support arm. Pull out both cable-management-arm pins and then slide the cable-management-arm tabs into the slots on both the inside and the outside of the slide rail. Push the tabs until they snap into place.

3. Adjust the location of the cable management arm, as shown in Figure 28 on page 32.

Figure 28. Adjusting the location of the cable-management arm

Make sure that the support rail is located between the 2 nailhead features.

4. You may wish to return to this section once these actions have been performed. After you have installed the node and have attached the cables the rear of the node:

   a. Route the data cables and power cords along the cable-management arm, as shown **1** in Figure 29 on page 33.

      If you attach the arm properly and route the cables properly, the arm swings into the rack as you pull the node forward in the rack, opening to allow the cables to follow the node toward the front of the rack. You can perform some service procedures without disconnecting the Fibre Channel cables and the Ethernet cables. You can also perform some service procedures without turning off the node or disconnecting the power cables.

   b. Secure the cables with cable ties or hook-and-loop fasteners.

Note: Leave some slack in all of the cables to avoid tension in the cables as the cable-management arm moves.
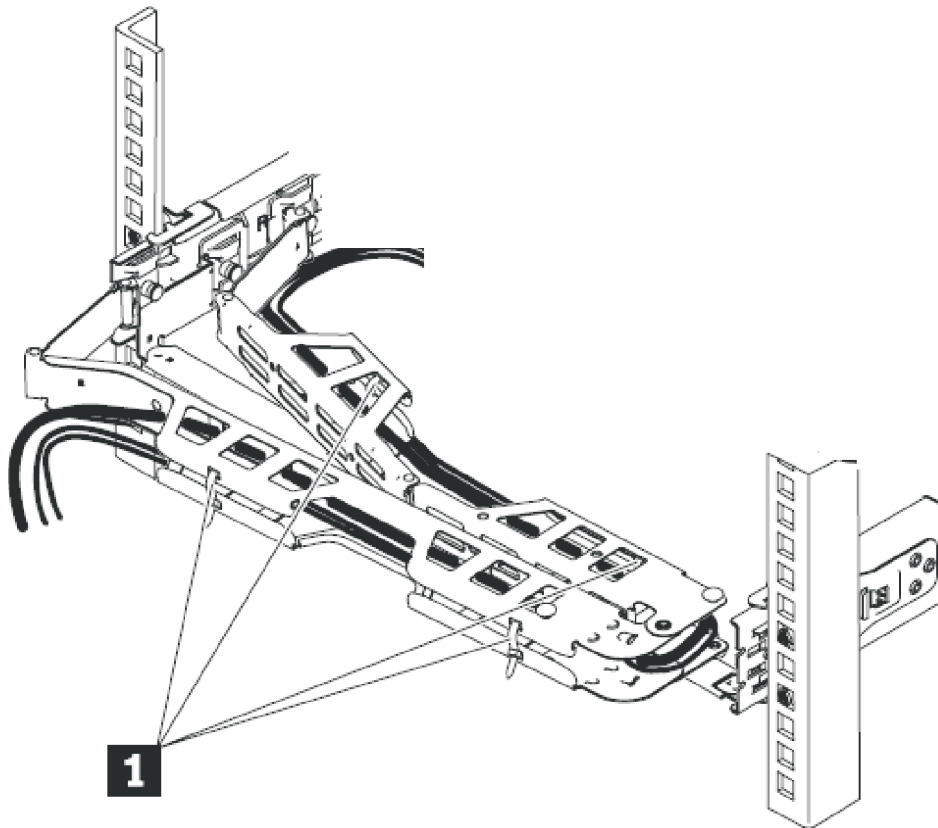
Figure 29. Connecting and routing the cables

Installing the SAN Volume Controller 2145-CG8 in a rack

After installing the support rails, you can install the SAN Volume Controller 2145-CG8 node in the rack.

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.

To install the SAN Volume Controller 2145-CG8 node in the rack, perform the following steps:

1. Place the SAN Volume Controller 2145-CG8 in the rails on the rack.

   a. Pull the slide rails forward until they click twice into place.

   b. Lift the node and carefully tilt it into position over the slide rails. Line up the rear nail heads **2** on the node line up with the rear slots **3** on the slide rails.

   c. Slide the node down until the rear nail heads slip into the two rear slots.

   d. Lower the front of the node **4** until the other nail heads slip into the other slots on the slide rails.

   e. Verify that the front latch **5** slides over the nail heads.
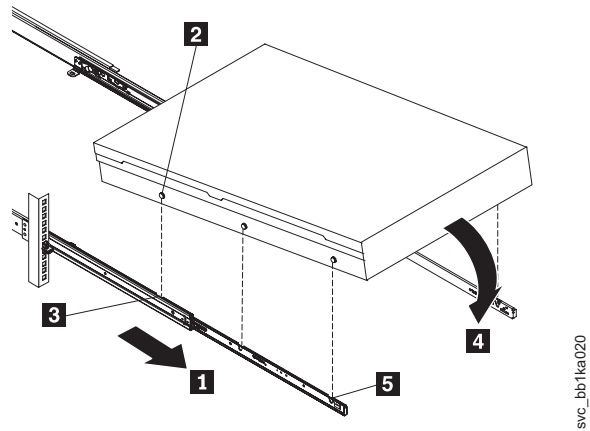
Figure 30. Installing the SAN Volume Controller 2145-CG8 node in the slide rails of the rack

2. Lift the locking levers on the slide rails and push the node **2** all the way into the rack until it clicks into place.

   See **1** in Figure 31.
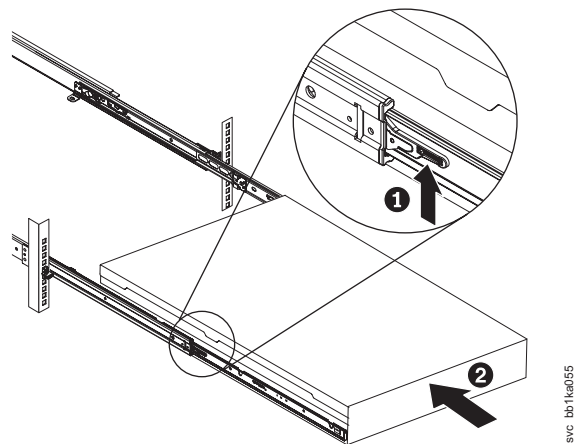
Figure 31. Raising the SAN Volume Controller 2145-CG8 locking levers of the slide rails of the rack

Connecting the SAN Volume Controller 2145-CG8 to the 2145 UPS-1U

Connect the SAN Volume Controller to the 2145 UPS-1U to protect your data in the event of an unexpected loss of external power.

Notes:

- To make the SAN Volume Controller clustered system more resilient to power failure, the 2145 UPS-1U units can be connected to the redundant ac-power switch. If a redundant ac-power switch is not used, you can connect the two uninterruptible power-supply units that are powering an I/O group to different, independent electrical power sources. If a single power source fails, the SAN Volume Controller system can then continue to operate with reduced performance.
- When connecting to the 2145 UPS-1U, use only the power cable assembly, part number 31P1294, that was supplied with the node. Power cable assemblies that

were supplied with previous SAN Volume Controller models do not work with the 2145-CG8 model because there are two power cables in the bundle for the 2145-CG8 model. The correct part is differentiated by the blue tape that binds the cables together.

Before you begin this task, see the completed customer's cable-connection table, which is described in the *IBM System Storage SAN Volume Controller Planning Guide* and can be downloaded from the Support for SAN Volume Controller (2145) website at www.ibm.com/storage/support/2145.

Use the information in this table to identify the 2145 UPS-1U unit to which this node is to be connected.

Perform the following steps to connect the SAN Volume Controller to the 2145 UPS-1U:

1. At the back of the SAN Volume Controller 2145-CG8 node, plug the power cables of the combined power and serial cable assembly into the power connector **2** , as shown in Figure 32.
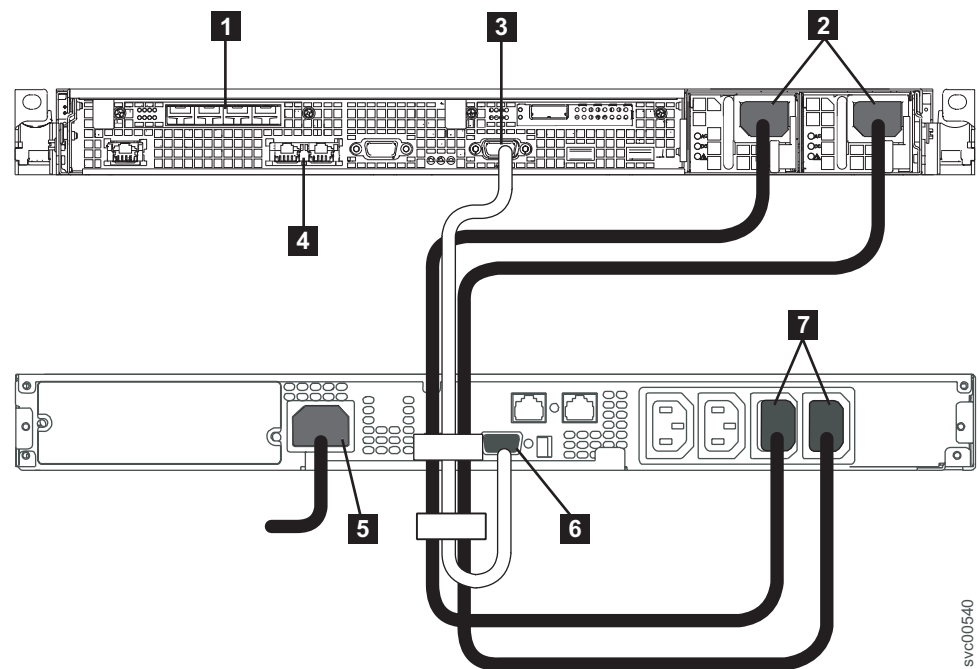
Figure 32. Connecting the SAN Volume Controller power cable to the 2145 UPS-1U

- **1** Fibre Channel ports
- **2** Power connector
- **3** Serial connector
- **4** Ethernet ports
- **5** Main-power connector
- **6** Communication port
- **7** Load-segment 2 receptacle

2. Place the other end of the power cables into the load-segment 2 receptacles **7** on the 2145 UPS-1U.

DANGER

> **You have already switched on the 2145 UPS-1U. The output sockets of the 2145 UPS-1U are live.**

3. Plug the signal cable into the serial connector **3** located on the SAN Volume Controller 2145-CG8 node.
4. Place the other end of the signal cable into the communication port **6** on the 2145 UPS-1U.

The SAN Volume Controller 2145-CG8 power is now connected to the 2145 UPS-1U.

Installing the SAN Volume Controller 2145-CG8 cable-retention brackets

Two power cords run from the uninterruptible power-supply to each of the two SAN Volume Controller 2145-CG8 power supplies. To anchor the power cords, install the two cable-retention brackets on the back of the SAN Volume Controller 2145-CG8.

The cable-retention brackets install without tools, as shown in Figure 33.
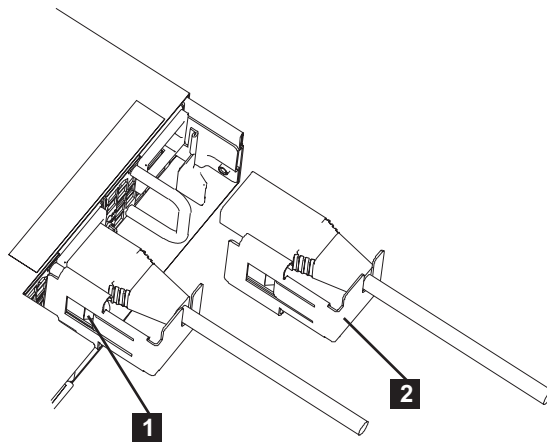
Figure 33. SAN Volume Controller 2145-CG8 cable-retention brackets

To attach the brackets, perform the following steps:

1. Loosely install the cable-retention bracket on a power cord by slipping the power cord into the notch on the rear of the bracket.
2. Align the cable-retention bracket on the power cord so that the bracket is to the left side of the cord, as shown by **2** in Figure 33.
3. Push both the bracket and the cable toward the SAN Volume Controller 2145-CG8 power supply (**2**), carefully aligning the power cord with the power connector on the power supply and the bracket with the power-supply handle.
4. Carefully push the bracket against the power-supply handle to force the spring clip (**1**) over the leading edge of the handle.
5. Push the cable and the bracket into place, as shown in Figure 33.

Connecting the SAN Volume Controller 2145-CG8 to the SAN and to the Ethernet network

Before you connect the SAN Volume Controller 2145-CG8 to the SAN, you must connect the Ethernet and Fibre Channel cables.

Before you begin this task, see the customer's cable-connection table to find out where to connect the Ethernet and Fibre Channel cables.

One or two 1 Gbps Ethernet cables can be connected to the SAN Volume Controller 2145-CG8. The customer's cable connection table indicates the number of cables to connect. If only one cable is connected, the cable must be connected to Ethernet port 1.

To connect the SAN Volume Controller 2145-CG8 to the SAN and to the Ethernet network, perform the following steps:

1. Connect the Ethernet cables to Ethernet port 1, as shown by **9**, and Ethernet port 2 (**8**), in Figure 34.
2. Optional: If the 10 Gbps Ethernet feature is installed, you can connect Ethernet optical cables to Ethernet port 3, as shown by **1**, and Ethernet port 4 (**2**), in Figure 35.
3. Connect the other end of the Ethernet cable to the proper connector on the Ethernet hub or switch.
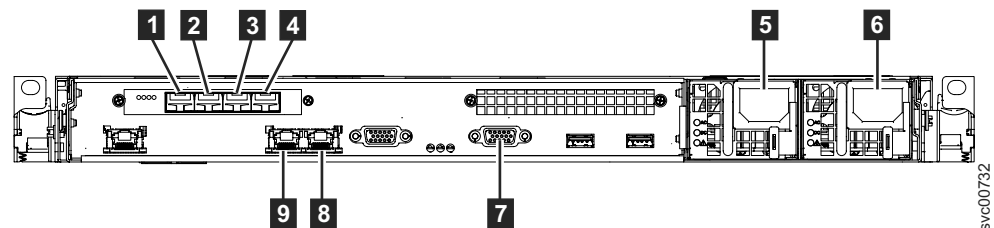
Figure 34. Connectors on the rear of the SAN Volume Controller 2145-CG8

1 Fibre Channel port 1
2 Fibre Channel port 2
3 Fibre Channel port 3
4 Fibre Channel port 4
5 Power-cord connector for power supply 1
6 Power-cord connector for power supply 2
7 Serial connection for UPS communication cable
8 Ethernet port 2
9 Ethernet port 1
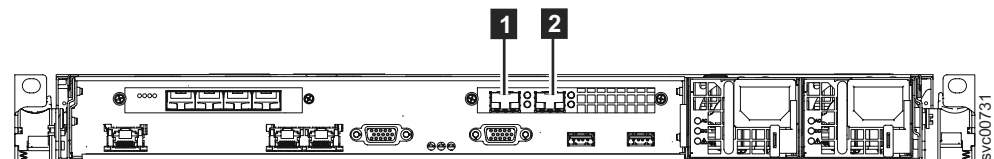
Figure 35. 10 Gbps Ethernet ports on the rear of the SAN Volume Controller 2145-CG8

1 10 Gbps Ethernet port 3
2 10 Gbps Ethernet port 4

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 Fibre Channel cables to the Fibre Channel ports as required by the user's configuration.
5. Connect the other ends of the Fibre Channel cables to the proper connectors of the Fibre Channel switches.

Verifying the SAN Volume Controller 2145-CG8 installation

You must verify the SAN Volume Controller installation after the installation has completed.

This task shows you how to verify the installation after you install the SAN Volume Controller in the rack and connect it to the uninterruptible power supply, the storage area network (SAN), and the Ethernet.

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

Perform the following steps to verify installation:

1. Press the SAN Volume Controller power-control button. Because the button is recessed, you might need a pointed device, such as a screwdriver, to press the power-control button. Verify that the green power LED is lit. If the LED is not illuminated, see MAP 5000: Start in the *IBM System Storage 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-CG8 runs an extended series of power-on self tests. The node might appear to be idle for up to five minutes after powering on.

   Figure 36 illustrates the controls and indicators on the front panel that verify the installation.
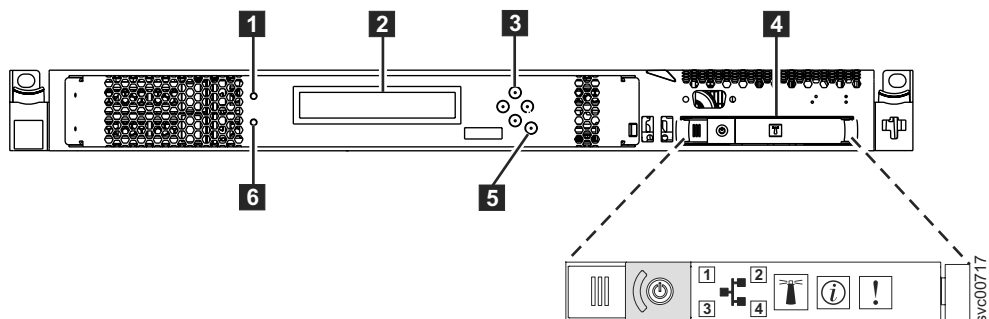
Figure 36. SAN Volume Controller 2145-CG8 front panel

1 Node-status LED
2 Front-panel display
3 Navigation buttons
4 Operator-information panel

5 Select button

6 Error LED

Verify that the node is booting without error. If it boots without error, either the `Charging`, `Recovering`, or the `Cluster:` message is displayed in the first line of the front-panel display.

2. Press and hold the select button for five seconds. The check light comes on and a display test is performed. Check that all display cells light and that a bar scrolls horizontally and vertically across the display. When the display test is complete, the check light goes off and a button test is started.

3. Press the up, down, left, and right buttons to verify that they are working. Figure 37 shows four examples of what the front panel might display when you press the buttons. After you finish testing the buttons, press and hold the select button for five seconds to exit the test.

No button pressed (border only)

Up button pressed

Left and right button pressed

Select button pressed
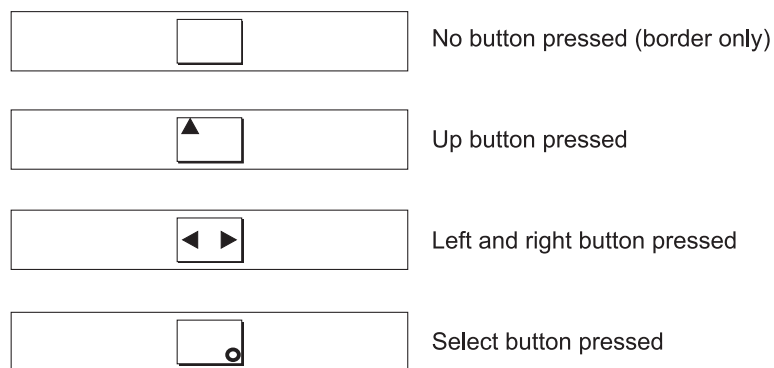
Figure 37. Front-panel display when push buttons are pressed

4. If the `Charging` or `Recovering` message is displayed on the front-panel display, press the select button to switch to the menu. The menu continues to be displayed while you press the buttons on the front panel. If you do not press any buttons within 60 seconds, the menu changes to display the charging progress. You can switch the front-panel display to the menu at any time by pressing the select button again.

5. Press and release the up button or down button until the `Node:` option is displayed on the first line of the front-panel display.

6. Verify that the node number that is displayed on the second line of the front-panel display is the same as the node number that is printed on the front panel of the node. Figure 38 shows how the node number is displayed on the front panel. If the node number is not the same, contact the IBM Support Center.

Figure 38. Node number

7. Press and release the up button or down button until the `Ethernet` option is shown on the front-panel display. The second line of the front-panel display in Figure 39 on page 40 shows the message `No Cluster`.

```
Ethernet:
No Cluster
```

Figure 39. Ethernet: No Cluster

8. Press and release the right button to view the values given on the second line of the front panel display for the `Ethernet Port-1` option, the `Speed-1` option, the `MAC Address-1` option, the `Ethernet Port-2` option, the `Speed-2` option, and the `MAC Address-2` option.

   If the second line of each option for either Ethernet Port-1 or Ethernet Port-2 does not show `Link Online` when there is an Ethernet cable attached, perform each of the following actions and check the display to see if the action fixed the problem. If an action corrects the problem, you do not need to perform the remaining actions.

   • Verify that an Ethernet cable is plugged into the node port.
   • Verify that the other end of the Ethernet cable is plugged into the Ethernet switch port and that the switch is operating correctly at a supported speed.
   • Replace the Ethernet cable with a new cable.
   • Replace the node system board.

   When the required ports are online, check that the speed and duplex operation are as expected. If either the speed or the duplex operation is not what you expect, check the configuration of the Ethernet switch and check for damage to the Ethernet cables.

   Retain the MAC addresses as reference information.

9. Optional: If you have the 10 Gbps Ethernet feature installed, press and release the right button to view the values given on the second line of the front panel display for the `Ethernet Port-3` option, the `Speed-3` option, the `MAC Address-3` option, the `Ethernet Port-4` option, the `Speed-4` option, and the `MAC Address-4` option.

   If the second line of each option for either Ethernet Port-3 or Ethernet Port-4 does not show `Link Online` when there is an Ethernet optical cable attached, perform each of the following actions and check the display to see if the action fixed the problem. If an action corrects the problem, you do not need to perform the remaining actions.

   • Verify that an Ethernet cable is plugged into the node port.
   • Verify that the other end of the Ethernet cable is plugged into the Ethernet switch port and that the switch is operating correctly at a supported speed.
   • Replace the Ethernet cable with a new cable.
   • Replace the 10 Gbps SFP.

   When the required ports are online, check that the speed and duplex operation are as expected. If either the speed or the duplex operation is not what you expect, check the configuration of the Ethernet switch and check for damage to the Ethernet cables.

   Retain the MAC addresses as reference information.

10. Press and release the up button or down button until the `FC Port-1` option shows in the display.

11. Check whether the second line of the front-panel display shows the message `Active`. If `Active` is not shown on the second line, go to MAP 5600: Fibre Channel in the *IBM System Storage SAN Volume Controller Troubleshooting Guide* to repair the fault.

12. To display the current Fibre Channel port speed, press and release the right button.
    a. Press and release the right button to display the `FC Port-2` status.
    b. Press and release the right button to display the `FC Port-2` speed.
    c. Press and release the right button to display the `FC Port-3` status.
    d. Press and release the right button to display the `FC Port-3` speed.
    e. Press and release the right button to display the `FC Port-4` status.
    f. Press and release the right button to display the `FC Port-4` speed.

       The operational speed of the Fibre Channel link is displayed. Use the cable connection table that is provided by the customer to verify that the Fibre Channel links are operating at the expected speed. If the operational speeds do not match the expected speeds, go to MAP 5600: Fibre Channel in the *IBM System Storage SAN Volume Controller Troubleshooting Guide* to repair the fault.

13. To select a language other than English, perform the following steps:
    a. Press and release the up button or down button until the `Select Language?` option is displayed.
    b. Press and release the select button.
    c. Press the left button or right button until the required language is displayed.

       The translated language names are displayed in their own character set. If you do not understand the language that is displayed, wait for at least 60 seconds for the menu to reset to the default option.
    d. Press and release the select button to select the language that is displayed.

       If the selected language uses the Latin alphabet, the front panel display shows two lines. The panel text is displayed on the first line and additional data is displayed on the second line.

       If the selected language does not use the Latin alphabet, the display shows only one line at a time to clearly display the character font. For those languages, you can switch between the panel text and the additional data by pressing and releasing the select button.

       Additional data is unavailable when the front panel displays a menu option, which ends with a question mark (?). In this case, press and release the select button to choose the menu option.

    If the battery needed to be charged, the `Charging` or `Recovering` message is replaced by the `Cluster:` message when the battery is fully charged. The progress bar no longer displays. The installation of the SAN Volume Controller hardware is now complete. No software installation is required.

    Continue with the instructions in the *IBM System Storage SAN Volume Controller Software Installation and Configuration Guide* to create, if necessary, a new SAN Volume Controller clustered system and to add the nodes into a SAN Volume Controller system.

    The *IBM System Storage SAN Volume Controller Software Installation and Configuration Guide* and other publications in the SAN Volume Controller library are available in Adobe portable document format (PDF) from the following website:

    Support for SAN Volume Controller (2145) website at www.ibm.com/storage/support/2145

Appendix A. Accessibility

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully.

Features

This list includes the major accessibility features in the management GUI:

- You can use screen-reader software and a digital speech synthesizer to hear what is displayed on the screen. The following screen reader has been tested: JAWS 11.
- Most of the GUI features are accessible by using the keyboard. For those features that are not accessible, equivalent function is available by using the command-line interface (CLI).
- When setting or changing an IP address on the SAN Volume Controller front panel, you can disable the fast increase function to reduce the address scrolling speed of the up and down buttons to two seconds. This feature is documented in the topic that discusses initiating cluster (system) creation from the front panel, which is located in the IBM System Storage SAN Volume Controller Information Center and the *IBM System Storage SAN Volume Controller Software Installation and Configuration Guide*.

Navigating by keyboard

You can use keys or key combinations to perform operations and initiate many menu actions that can also be done through mouse actions. You can navigate the management GUI and help system from the keyboard by using the following key combinations:

- To navigate between different GUI panels, select the `Low-graphics mode` option on the GUI login panel. You can use this option to navigate to all the panels without manually typing the web addresses.
- To go to the next frame, press Ctrl+Tab.
- To move to the previous frame, press Shift+Ctrl+Tab.
- To navigate to the next link, button, or topic within a panel, press Tab inside a frame (page).
- To move to the previous link, button, or topic within a panel, press Shift+Tab.
- To select GUI objects, press Enter.
- To print the current page or active frame, press Ctrl+P.
- To expand a tree node, press the Right Arrow key. To collapse a tree node, press the Left Arrow key.
- To scroll all the way up, press Home; to scroll all the way down, press End.
- To go back, press Alt+Left Arrow key.
- To go forward, press Alt+Right Arrow key.
- For actions menus:
  - Press Tab to navigate to the grid header.
  - Press the Left or Right Arrow keys to reach the drop-down field.
  - Press Enter to open the drop-down menu.
  - Press the Up or Down Arrow keys to select the menu items.

- Press Enter to launch the action.
- For filter panes:
  - Press Tab to navigate to the filter panes.
  - Press the Up or Down Arrow keys to change the filter or navigation for nonselection.
  - Press Tab to navigate to the magnifying glass icon in the filter pane and press Enter.
  - Type the filter text.
  - Press Tab to navigate to the red X icon and press Enter to reset the filter.
- For information areas:
  - Press Tab to navigate to information areas.
  - Press Tab to navigate to the fields that are available for editing.
  - Type your edit and press Enter to issue the change command.

Accessing the publications

You can find the HTML version of the IBM System Storage SAN Volume Controller information at the following website:

publib.boulder.ibm.com/infocenter/svc/ic/index.jsp

You can access this information using screen-reader software and a digital speech synthesizer to hear what is displayed on the screen. The information was tested using the following screen reader: JAWS Version 10 or later.

Appendix B. SAN Volume Controller physical installation planning

Before the IBM service representative can set up your SAN Volume Controller environment, you must verify that the prerequisite conditions for SAN Volume Controller, the uninterruptible power supply, and optional redundant ac-power switch installation are met.

SAN Volume Controller 2145-CG8 environment requirements

Before the SAN Volume Controller 2145-CG8 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 following voltage requirements.

Voltage	Frequency
200 V to 240 V single phase ac	50 Hz or 60 Hz

Attention:
- If the uninterruptible power supply is cascaded from another uninterruptible power supply, the source uninterruptible power supply must have at least three times the capacity per phase and the total harmonic distortion must be less than 5%.
- The uninterruptible power supply also must have input voltage capture that has a slew rate of no more than 3 Hz per second.

Maximum power requirements for each node

Ensure that your environment meets the following power requirements.

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

Table 6. Maximum power consumption

Components	Power requirements
SAN Volume Controller 2145-CG8 and 2145 UPS-1U	200 W

For each redundant ac-power switch, add 20 W to the power requirements.

For the high-speed SAS adapter with from one to four solid-state drives, add 50 W to the power requirements.

Circuit breaker requirements

The 2145 UPS-1U has an integrated circuit breaker and does not require additional protection.

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Environment requirements without redundant ac power

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

Table 7. Physical specifications

Environment	Temperature	Altitude	Relative humidity	Maximum wet bulb temperature
Operating in lower altitudes	10°C to 35°C (50°F to 95°F)	0 m to 914 m (0 ft to 3000 ft)	8% to 80% noncondensing	23°C (73°F)
Operating in higher altitudes	10°C to 32°C (50°F to 90°F)	914 m to 2133 m (3000 ft to 7000 ft)	8% to 80% noncondensing	23°C (73°F)
Turned off	10°C to 43°C (50°F to 109°F)	0 m to 2133 m (0 ft to 7000 ft)	8% to 80% noncondensing	27°C (81°F)
Storing	1°C to 60°C (34°F to 140°F)	0 m to 2133 m (0 ft to 7000 ft)	5% to 80% noncondensing	29°C (84°F)
Shipping	-20°C to 60°C (-4°F to 140°F)	0 m to 10668 m (0 ft to 34991 ft)	5% to 100% condensing, but no precipitation	29°C (84°F)

Environment requirements with redundant ac power

Ensure that your environment falls within the following ranges if you are using redundant ac power.

Table 8. Environment requirements with redundant ac power

Environment	Temperature	Altitude	Relative humidity	Maximum wet bulb temperature
Operating in lower altitudes	15°C to 32°C (59°F to 90°F)	0 m to 914 m (0 ft to 3000 ft)	20% to 80% noncondensing	23°C (73°F)
Operating in higher altitudes	15°C to 32°C (59°F to 90°F)	914 m to 2133 m (3000 ft to 7000 ft)	20% to 80% noncondensing	23°C (73°F)
Turned off	10°C to 43°C (50°F to 109°F)	0 m to 2133 m (0 ft to 7000 ft)	20% to 80% noncondensing	27°C (81°F)
Storing	1°C to 60°C (34°F to 140°F)	0 m to 2133 m (0 ft to 7000 ft)	5% to 80% noncondensing	29°C (84°F)
Shipping	-20°C to 60°C (-4°F to 140°F)	0 m to 10668 m (0 ft to 34991 ft)	5% to 100% condensing, but no precipitation	29°C (84°F)

Preparing your environment

The following tables list the physical characteristics of the SAN Volume Controller 2145-CG8 node.

Dimensions and weight

Ensure that space is available in a rack that is capable of supporting the node.

Table 9. Dimensions and weight

Height	Width	Depth	Maximum weight
4.3 cm (1.7 in.)	44 cm (17.3 in.)	73.7 cm (29 in.)	15 kg (33 lb)

Additional space requirements

Ensure that space is also available in the rack for the following additional space requirements around the node.

Table 10. Additional space requirements

Location	Additional space requirements	Reason
Left side and right side	Minimum: 50 mm (2 in.)	Cooling air flow
Back	Minimum: 100 mm (4 in.)	Cable exit

Maximum heat output of each SAN Volume Controller 2145-CG8 node

The node dissipates the following maximum heat output.

Table 11. Maximum heat output of each SAN Volume Controller 2145-CG8 node

Model	Heat output per node
SAN Volume Controller 2145-CG8	160 W (546 Btu per hour)
SAN Volume Controller 2145-CG8 plus solid-state drives (SSDs)	210 W (717 Btu per hour)

Maximum heat output of each 2145 UPS-1U

The 2145 UPS-1U dissipates the following maximum heat output.

Table 12. Maximum heat output of each 2145 UPS-1U

Model	Heat output per node
Maximum heat output of 2145 UPS-1U during normal operation	10 W (34 Btu per hour)
Maximum heat output of 2145 UPS-1U during battery operation	100 W (341 Btu per hour)

Redundant ac-power environment requirements

Ensure that your physical site meets the installation requirements for the redundant ac-power switch.

The redundant ac-power switch requires two independent power sources that are provided through two rack-mounted power distribution units (PDUs). The PDUs must have IEC320-C13 outlets.

The redundant ac-power switch comes with two IEC 320-C19 to C14 power cables to connect to rack PDUs. There are no country-specific cables for the redundant ac-power switch.

The power cable between the redundant ac-power switch and the 2145 UPS-1U is rated at 10 A.

Redundant ac-power switch specifications

The following tables list the physical characteristics of the redundant ac-power switch.

Dimensions and weight

Ensure that space is available in a rack that is capable of supporting the redundant ac-power switch.

Height	Width	Depth	Maximum weight
43 mm (1.69 in.)	192 mm (7.56 in.)	240 mm	2.6 kg (5.72 lb)

Additional space requirements

Ensure that space is also available in the rack for the side mounting plates on either side of the redundant ac-power switch.

Location	Width	Reason
Left side	124 mm (4.89 in.)	Side mounting plate
Right side	124 mm (4.89 in.)	Side mounting plate

Heat output (maximum)

The maximum heat output that is dissipated inside the redundant ac-power switch is approximately 20 watts (70 Btu per hour).

Uninterruptible power-supply environment requirements

An uninterruptible power-supply environment requires that certain specifications for the physical site of the SAN Volume Controller must be met.

2145 UPS-1U environment

All SAN Volume Controller models are supported with the 2145 UPS-1U.

2145 UPS-1U specifications

The following tables describe the physical characteristics of the 2145 UPS-1U.

2145 UPS-1U dimensions and weight

Ensure that space is available in a rack that is capable of supporting the 2145 UPS-1U.

Height	Width	Depth	Maximum weight
44 mm (1.73 in.)	439 mm (17.3 in.)	579 mm (22.8 in.)	16 kg (35.3 lb)
Note: The 2145 UPS-1U package, which includes support rails, weighs 18.8 kg (41.4 lb).			

Heat output

The 2145 UPS-1U unit produces the following approximate heat output.

Model	Heat output during normal operation	Heat output during battery operation
2145 UPS-1U	10 W (34 Btu per hour)	150 W (512 Btu per hour)

Power cables for the 2145 UPS-1U

If you do not connect the 2145 UPS-1U to a rack power-distribution unit (PDU) or redundant ac-power switch, you must follow your country or region's power requirements to choose the appropriate power cable for the 2145 UPS-1U.

The 2145 UPS-1U is supplied with an IEC 320-C13 to C14 jumper to connect it to a rack PDU. You can also use this cable to connect the 2145 UPS-1U to the redundant ac-power switch.

The following table lists the power cable options for your country or region.

Country or region	Length	Connection type (attached plug designed for 200 - 240 V ac input)	Part number
United States of America (Chicago), Canada, Mexico	1.8 m (6 ft)	NEMA L6-15P	39M5115
Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela	2.8 m (9 ft)	NEMA L6-15P	39M5116

Country or region	Length	Connection type (attached plug designed for 200 - 240 V ac input)	Part number
Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Macao S.A.R. of China, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe	2.8 m (9 ft)	CEE 7-VII	39M5123
Antigua, Bahrain, Brunei, Channel Islands, Hong Kong S.A.R. of China, Cyprus, Dubai, Fiji, Ghana, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia	2.8 m (9 ft)	BS 1363/A	39M5151
Argentina	2.8 m (9 ft)	IRAM 2073	39M5068
Argentina, Australia, New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	2.8 m (9 ft)	AS/NZS 3112/2000	39M5102
Bangladesh, Burma, Pakistan, South Africa, Sri Lanka	2.8 m (9 ft)	SABS 164	39M5144
Chile, Ethiopia, Italy, Libya, Somalia	2.8 m (9 ft)	CEI 23-16	39M5165
People's Republic of China	2.8 m (9 ft)	GB 2099.1	39M5206
Denmark	2.8 m (9 ft)	DK2-5a	39M5130
Israel	2.8 m (9 ft)	SI 32	39M5172
Liechtenstein, Switzerland	2.8 m (9 ft)	IEC 60884 Stnd. Sheet 416534?2 (CH Type 12)	39M5158
Thailand	2.8 m (9 ft)	NEMA 6-15P	39M5095

Appendix C. SAN Volume Controller hardware controls, indicators, and connectors

Ensure that you understand the purpose for the controls, indicators, and connectors on each SAN Volume Controller node and related hardware components, such as uninterruptible power-supply units and, optionally, redundant ac-power switches.

SAN Volume Controller 2145-CG8 controls and indicators

The controls and indicators are used for power and navigation and to indicate information such as system activity, service and configuration options, service controller failures, and node identification.

Figure 40 shows the controls and indicators on the front panel of the SAN Volume Controller 2145-CG8.
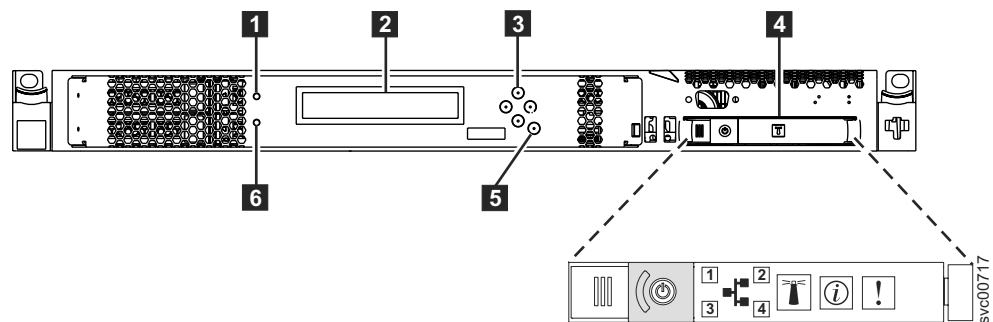
Figure 40. SAN Volume Controller 2145-CG8 front panel

1 Node-status LED
2 Front-panel display
3 Navigation buttons
4 Operator-information panel
5 Select button
6 Error LED

Node status LED

System activity is indicated through the green node-status LED.

The node status LED provides the following system activity indicators:

Off   The node is not operating as a member of a system.

On   The node is operating as a member of a system.

Flashing
    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.

Front-panel display

The front-panel display shows service, configuration, and navigation information.

You can select the language that is displayed on the front panel. The display can show both alphanumeric information and graphical information (progress bars).

The front-panel display shows configuration and service information about the node and the system, including the following items:
- Boot progress indicator
- Boot failed
- Charging
- Hardware boot
- Node rescue request
- Power failure
- Powering off
- Recovering
- Restarting
- Shutting down
- Error codes
- Validate WWNN?

Navigation buttons

You can use the navigation buttons to move through menus.

There are four navigational buttons that you can use to move throughout a menu: up, down, right, and left.

Each button corresponds to the direction that you can move in a menu. For example, to move right in a menu, press the navigation button that is located on the right side. If you want to move down in a menu, press the navigation button that is located on the bottom.

Note: The select button is used in tandem with the navigation buttons.

SAN Volume Controller 2145-CG8 operator-information panel

The operator-information panel contains buttons and indicators such as the power-control button, and LEDs that indicate information such as system-board errors, hard-drive activity, and power status.

Figure 41 on page 53 shows the operator-information panel for the SAN Volume Controller 2145-CG8.
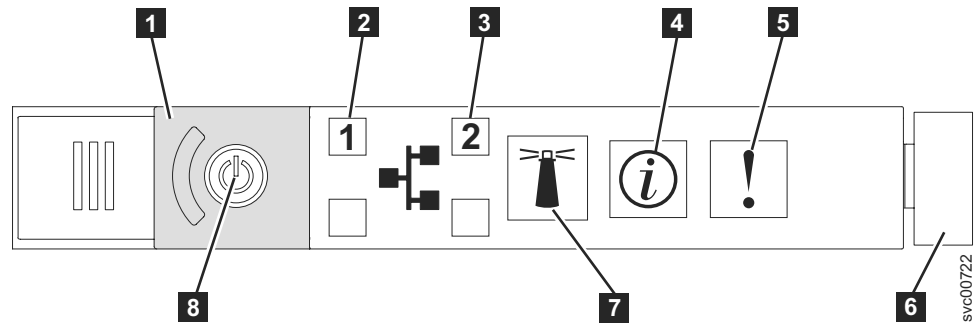
Figure 41. SAN Volume Controller 2145-CG8 or 2145-CF8 operator-information panel

1 Power-button cover

2 Ethernet 1 activity LED. The operator-information panel LEDs refer to the Ethernet ports that are mounted on the system board.

3 Ethernet 2 activity LED. The operator-information panel LEDs refer to the Ethernet ports that are mounted on the system board.

4 System-information LED

5 System-error LED

6 Release latch

7 Locator button and LED

8 Power button and LED

Note: If you install the 10 Gbps Ethernet feature, the port activity is not reflected on the activity LEDs.

Ethernet-activity LEDs

When Ethernet-activity LED 2 is lit, the node is transmitting or receiving data on Ethernet port 1.

When Ethernet-activity LED 3 is lit, the node is transmitting or receiving data on Ethernet port 2.

System-information LED

When the system-information LED is lit, a noncritical event has occurred.

Check the light path diagnostics panel and the event log. Light path diagnostics are described in more detail in the light path maintenance analysis procedure (MAP).

System-error LED

When it is lit, the system-error LED indicates that a system-board error has occurred.

This amber LED lights up if the SAN Volume Controller hardware detects a fatal error that requires a new field-replaceable unit (FRU).

Note: See MAP 5800: Light path to help you isolate the faulty FRU.

Release latch

The release latch on the SAN Volume Controller 2145-CG8 gives you access to the light-path diagnostics panel, which provides a method for determining the location of a problem.

After pressing the release latch on the operator-information panel, you can slide the light-path diagnostics panel out to view the lit LEDs. The LEDs indicate the type of error that has occurred. See "MAP 5800: Light path" for more detail.

To retract the panel, push it back into the node and snap it into place.

Locator LED
The SAN Volume Controller does not use the locator LED.

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. You must have a pointed device, such as a pen, to press the button.

To turn off the power, press and release the power button. For more information about how to turn off the SAN Volume Controller node, see MAP 5350: Powering off a SAN Volume Controller node.

Attention: When the node is operational and you press and immediately release the power button, the SAN Volume Controller indicates on its front panel that it is turning off and writes its control data to its internal disk. This can take up to five minutes. If you press the power button but do not release it, the node turns off immediately without the SAN Volume Controller control data being written to disk. Service actions are then required to make the SAN Volume Controller operational again. Therefore, during a power-off operation, do not press and hold the power button for more than two seconds.

Note: The 2145 UPS-1U does not turn off when the SAN Volume Controller is shut down from the power button.

Power LED
The green power LED indicates the power status of the SAN Volume Controller.

The power LED has the following properties:

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 SAN Volume Controller node is turned on.

Flashing
   The SAN Volume Controller node is turned off, but is still connected to a power source.

Select button
Use the select button to select an item from a menu.

The select button and navigation buttons help you to navigate and select menu and boot options, and start a service panel test. The select button is located on the front panel of the SAN Volume Controller, near the navigation buttons.

Error LED

Critical faults on the service controller are indicated through the amber error LED.

The error LED has the following two states:

OFF The service controller is functioning correctly.

ON A critical service-controller failure was detected and you must replace the service controller.

The error LED can light temporarily when the node is powered on. If the error LED is on, but the front panel display is completely blank, wait five minutes to allow the LED time to turn off before performing any service action.

SAN Volume Controller 2145-CG8 rear-panel indicators

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

Figure 42 shows the rear-panel indicators on the SAN Volume Controller 2145-CG8 back-panel assembly.
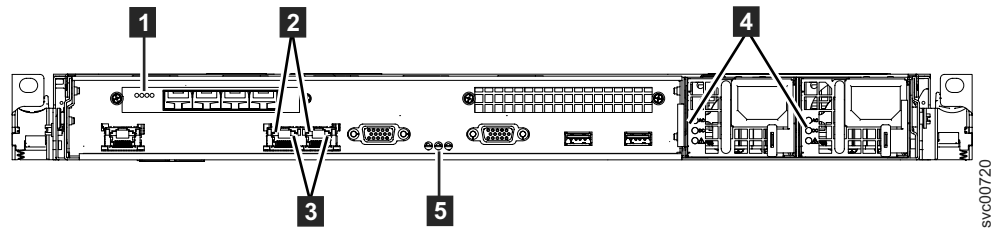
Figure 42. SAN Volume Controller 2145-CG8 rear-panel indicators

1 Fibre Channel LEDs
2 Ethernet-link LEDs
3 Ethernet-activity LEDs
4 Ac, dc, and power-supply error LEDs
5 Power, location, and system-error LEDs

Figure 43 shows the rear-panel indicators on the SAN Volume Controller 2145-CG8 back-panel assembly that has the 10 Gbps Ethernet feature.
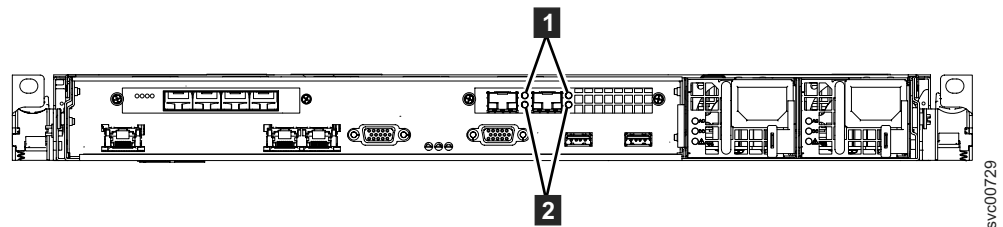
Figure 43. SAN Volume Controller 2145-CG8 rear-panel indicators for the 10 Gbps Ethernet feature

1 10 Gbps Ethernet-link LEDs. The amber link LED is on when this port is connected to a 10 Gbps Ethernet switch and the link is online.

2 10 Gbps Ethernet-activity LEDs. The green activity LED is on while data is being sent over the link.

Fibre Channel LEDs

The Fibre Channel LEDs indicate the status of the Fibre Channel ports on the SAN Volume Controller 2145-CG8 node.

The SAN Volume Controller 2145-CG8 uses two Fibre Channel LEDs per Fibre Channel port, which are arranged one above the other. The LEDs are arranged in the same order as the ports.

The Fibre Channel LEDs indicate the following link status:

Top LED (link speed)	Bottom LED (link activity) Blinking indicates I/O activity.	Link status
Off	Off	Inactive
Off	On / Blinking	Active 2 Gbps
Blinking	On / Blinking	Active 4 Gbps
On	On / Blinking	Active 8 Gbps
Note: To accommodate the different Fibre Channel speed ranges, LEDs are effectively OFF=slow, BLINKING=medium, and ON=fast. This means that 4Gbps is indicated differently on different models.		

Ac, dc, and power-supply error LEDs

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

Figure 44 shows the location of the SAN Volume Controller 2145-CG8 ac, dc, and power-supply error LEDs.
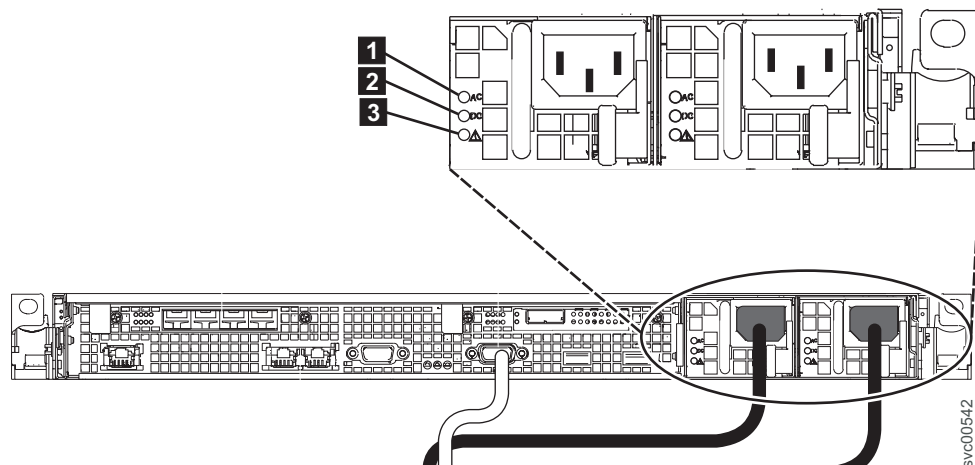
Figure 44. SAN Volume Controller 2145-CG8 or 2145-CF8 ac, dc, and power-error LEDs

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

Ac LED
> The upper LED (**1**) on the left side of the power supply, indicates that ac current is present on the node.

Dc LED
> The middle LED (**2**) to the left side of the power supply, indicates that dc current is present on the node.

Power-supply error LED
> The lower LED (**3**) to the left side of the power supply, indicates a problem with the power supply.

Power, location, and system-error LEDs

The power, location, and system-error LEDs are housed on the rear of the SAN Volume Controller.

The following terms describe the power, location, and system-error LEDs:

Power LED
> This LED is the leftmost of the three LEDs and indicates the following states:
>
> **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 SAN Volume Controller is on.
>
> **Flashing**
> > The SAN Volume Controller is turned off but is still connected to a power source.

Location LED
> The SAN Volume Controller does not use this LED, which is the middle of the three LEDs.

System-error LED
> This LED is the rightmost of the three LEDs. The LED indicates that a system board error has occurred. Light path diagnostics provide more information about the error.

Ethernet-link LED

The Ethernet-link LED indicates that there is an active connection on the Ethernet port.

An Ethernet-link LED is located beside each Ethernet port.

Ethernet-activity LED

An Ethernet-activity LED beside each Ethernet port indicates that theSAN Volume Controller node is communicating on the Ethernet network that is connected to the Ethernet port.

The operator-information panel LEDs refer to the Ethernet ports that are mounted on the system board. If you install the 10 Gbps Ethernet card on a SAN Volume Controller 2145-CG8, the port activity is not reflected on the activity LEDs.

SAN Volume Controller 2145-CG8 connectors

External connectors that the SAN Volume Controller 2145-CG8 uses include four Fibre Channel ports, a serial port, two Ethernet ports, and two power connectors. The 2145-CG8 also has external connectors for the 10 Gbps Ethernet feature.

These figures show the external connectors on the SAN Volume Controller 2145-CG8 back panel assembly.
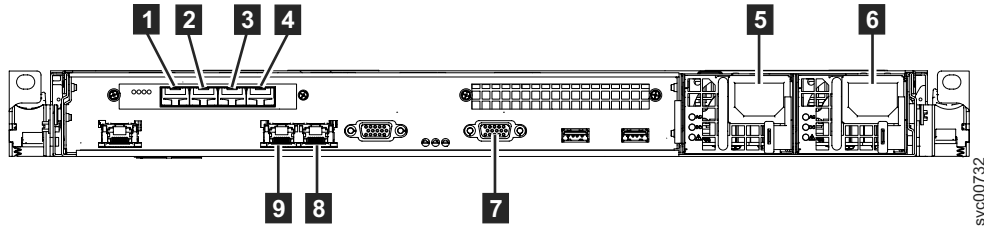
Figure 45. Connectors on the rear of the SAN Volume Controller 2145-CG8

1 Fibre Channel port 1
2 Fibre Channel port 2
3 Fibre Channel port 3
4 Fibre Channel port 4
5 Power-cord connector for power supply 1
6 Power-cord connector for power supply 2
7 Serial connection for UPS communication cable
8 Ethernet port 2
9 Ethernet port 1
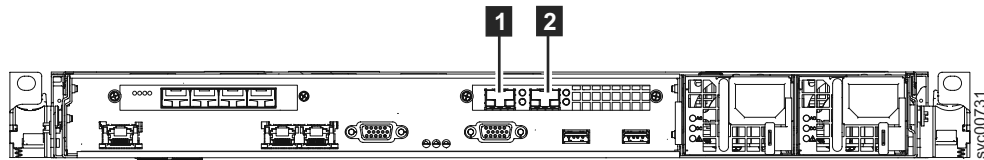
Figure 46. 10 Gbps Ethernet ports on the rear of the SAN Volume Controller 2145-CG8

1 10 Gbps Ethernet port 3
2 10 Gbps Ethernet port 4

Figure 47 on page 59 shows the type of connector that is located on each power-supply assembly. Use these connectors to connect the SAN Volume Controller 2145-CG8 to the two power cables from the uninterruptible power supply.
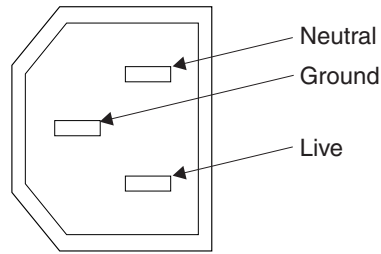
Figure 47. Power connector

SAN Volume Controller 2145-CG8 ports used during service procedures

The SAN Volume Controller 2145-CG8 contains a number of ports that are only used during service procedures.

Figure 48 shows ports that are used only during service procedures.
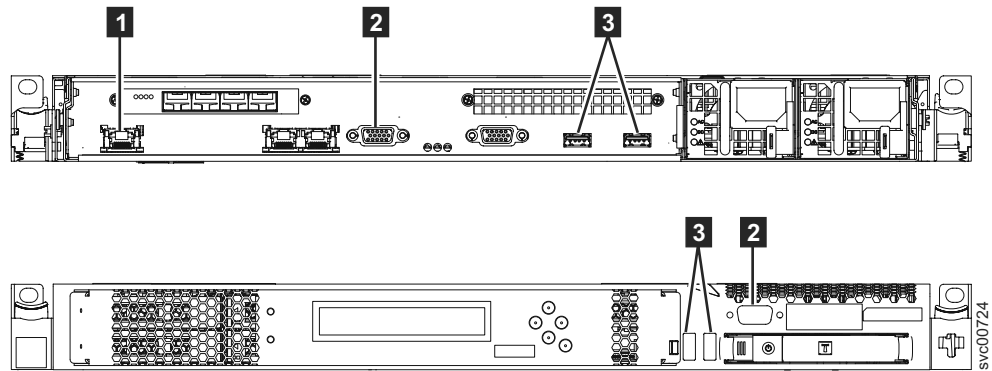
Figure 48. Service ports of the SAN Volume Controller 2145-CG8

1 System management port

2 Two monitor ports, one on the front and one on the rear

3 Four USB ports, two on the front and two on the rear

During normal operation, none of these ports are used. Connect a device to any of these ports only when you are directed to do so by a service procedure or by an IBM service representative.

SAN Volume Controller 2145-CG8 unused ports

The SAN Volume Controller 2145-CG8 can contain one port that is not used.

Figure 49 on page 60 shows the one port that is not used during service procedures or normal use.
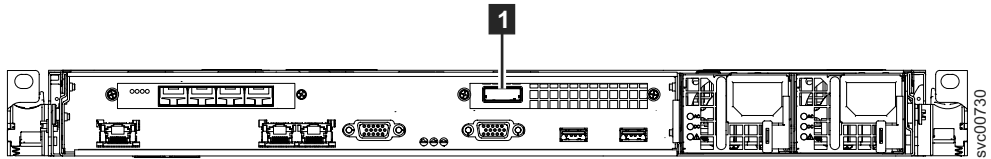
Figure 49. SAN Volume Controller 2145-CG8 port not used

1 Serial-attached SCSI (SAS) port

When present, this port is disabled in software to make the port inactive.

The SAS port is present when the optional high-speed SAS adapter is installed with one or more solid-state drives (SSDs).

SAN Volume Controller 2145-CG8 Fibre Channel port numbers
The physical port numbers are 1 - 4, counting from the left side to the right side when you view the rear panel of the SAN Volume Controller 2145-CG8.

Figure 50 provides a view of the rear of the SAN Volume Controller 2145-CG8.
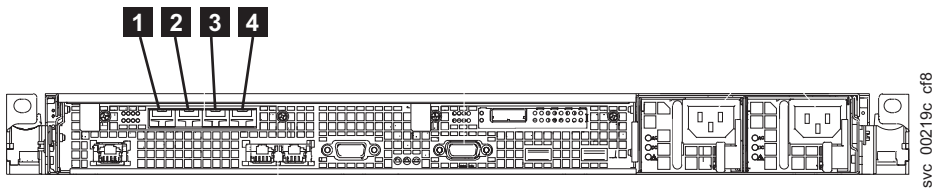
Figure 50. Physical Fibre Channel port numbers for the SAN Volume Controller 2145-CG8

2145 UPS-1U controls and indicators

All controls and indicators for the 2145 UPS-1U are located on the front-panel assembly.
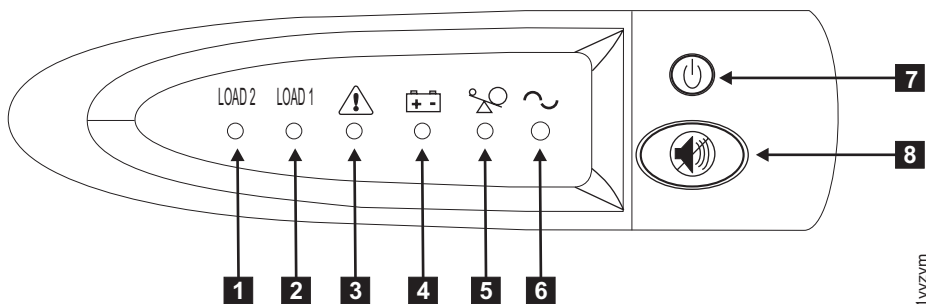
Figure 51. 2145 UPS-1U front-panel assembly

1 Load segment 2 indicator
2 Load segment 1 indicator
3 Alarm or service indicator
4 On-battery indicator
5 Overload indicator
6 Power-on indicator

7 On/off button

8 Test and alarm reset button

Load segment 2 indicator

The load segment 2 indicator on the 2145 UPS-1U is lit (green) when power is available to load segment 2.

When the load segment 2 indicator is green, the 2145 UPS-1U is running normally and power is available to this segment.

Load segment 1 indicator

The load segment 1 indicator on the 2145 UPS-1U is not currently used by the SAN Volume Controller.

Note: When the 2145 UPS-1U is configured by the SAN Volume Controller, this load segment is disabled. During normal operation, the load segment 1 indicator is off. A "Do not use" label covers the receptacles.

Alarm indicator

If the alarm on the 2145 UPS-1U is flashing red, maintenance is required.

If the alarm is on, go to the 2145 UPS-1U MAP to resolve the problem.

On-battery indicator

The amber on-battery indicator is on when the 2145 UPS-1U is powered by the battery. This indicates that the main power source has failed.

If the on-battery indicator is on, go to the 2145 UPS-1U MAP to resolve the problem.

Overload indicator

The overload indicator lights up when the capacity of the 2145 UPS-1U is exceeded.

If the overload indicator is on, go to MAP 5250: 2145 UPS-1U repair verification to resolve the problem.

Power-on indicator

The power-on indicator is displayed when the 2145 UPS-1U is functioning.

When the power-on indicator is a steady green, the 2145 UPS-1U is active.

On or off button

The on or off button turns the power on or off for the 2145 UPS-1U.

Turning on the 2145 UPS-1U

After you connect the 2145 UPS-1U to the outlet, it remains in `standby` mode until you turn it on. Press and hold the on or off button until the power-on indicator is illuminated (approximately five seconds). On some versions of the 2145 UPS-1U, you might need a pointed device, such as a screwdriver, to press the on or off button. A self-test is initiated that takes approximately 10 seconds, during which

time the indicators are turned on and off several times. The 2145 UPS-1U then enters `normal` mode.

Turning off the 2145 UPS-1U

Press and hold the on or off button until the power-on light is extinguished (approximately five seconds). On some versions of the 2145 UPS-1U, you might need a pointed device, such as a screwdriver, to press the on or off button. This places the 2145 UPS-1U in `standby` mode. You must then unplug the 2145 UPS-1U to turn off the unit.

Attention: Do not turn off the uninterruptible power supply before you shut down the SAN Volume Controller node that it is connected to. Always follow the instructions that are provided in MAP 5350 to perform an orderly shutdown of a SAN Volume Controller node.

Test and alarm reset button

Use the test and alarm reset button to start the self-test.

To start the self-test, press and hold the test and alarm reset button for three seconds. This button also resets the alarm.

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