IBM System Storage SAN Volume Controller

Hardware Installation Guide

Version 4.2.1

GC27-2132-01

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Note:
Before using this information and the product it supports, read the information in **Notices** and **Safety and Environmental Notices**.

This edition applies to the IBM System Storage SAN Volume Controller, release 4.2.1, and to all subsequent releases and modifications until otherwise indicated in new editions. This edition replaces GC27-2132-00.

Note: The IBM System Storage SAN Volume Controller Hardware Installation Guide was formerly titled IBM System Storage SAN Volume Controller Installation Guide.

Contents

Figures

About this guide

This guide provides an overview of the IBM System Storage SAN Volume Controller and detailed installation instructions.

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 master console hardware option, the redundant ac power switch, and the uninterruptible power supply.

After the IBM service representative has installed the SAN Volume Controller hardware, the customers 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 document contains terminology, maintenance, and editorial changes.

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.

Summary of changes for GC27-2132-01 SAN Volume Controller Hardware Installation Guide

The Summary of Changes provides a list of new, modified, and changed information since the last version of the guide.

New information

This topic describes the changes to this guide since the previous edition, GC27-2132-00. The following sections summarize the changes that have been implemented since the previous version.

This version includes the following new information:

- New topics:
  - Information to help you get started with learning about and installing the SAN Volume Controller.
  - Instructions for installing a new cable retention bracket for the SAN Volume Controller 2145-8G4.
  - An example for cabling redundant ac power switches.
  - A number of new glossary terms and definitions.
- This publication continues to document the SAN Volume Controller by model number.

Note: If text is referring to the SAN Volume Controller, it is referring to a generic SAN Volume Controller and can be referring to all SAN Volume Controller models. When the SAN Volume Controller is referred to as the SAN Volume Controller 2145-4F2, the SAN Volume Controller 2145-8F2, the SAN Volume Controller 2145-8F4, or the SAN Volume Controller 2145-8G4, the specific SAN Volume Controller is designated.

Changed information

This section lists the updates that were made in this document.

- Revised the cable numbers for the redundant ac power switch and the 2145 UPS-1U and the outlet type for the power distribution unit.
- Added information about sending and receiving Call Home and Inventory information e-mails.

Removed Information

This section lists information that was removed from this book.

- Moved most of the information about SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 to Appendix A, "SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2," on page 65 in the back of this book.
- Moved most of the information about SAN Volume Controller 2145-4F2 to Appendix B, "SAN Volume Controller 2145-4F2," on page 101 in the back of this book.
- Moved most of the information about the 2145 UPS to Appendix B, "SAN Volume Controller 2145-4F2," on page 101 in the back of this book.

Summary of changes for GC27-2132-00 SAN Volume Controller Hardware Installation Guide

The Summary of Changes provides a list of new, modified, and changed information since the last version of the guide.

New information

This topic describes the changes to this guide since the previous edition, GC26-7900-00. The following sections summarize the changes that have since been implemented from the previous version.

This version includes the following new information:

- New topics:
  - The SAN Volume Controller hardware has been updated. The new model is the SAN Volume Controller 2145-8G4. This guide describes the SAN Volume Controller 2145-8G4 hardware and installation in various topics.
  - Overview and installation of the redundant ac power switch
  - Installation checklists for the required installation tasks
  - Installation of the cable retention brackets for the SAN Volume Controller 2145-8G4, SAN Volume Controller 2145-8F4 and the 2145 UPS-1U
  - European and Taiwan contact information
  - Front panel indicators: charging and recovering

Changed information

This section lists the updates that were made in this document.

- There is a new SAN Volume Controller model, the SAN Volume Controller 2145-8G4. This publication continues to document the SAN Volume Controller by model number.

  Note: If text is referring to the SAN Volume Controller, it is referring to a generic SAN Volume Controller and can be referring to all SAN Volume Controller models. When the SAN Volume Controller is referred to as the SAN Volume Controller 2145-4F2, the SAN Volume Controller 2145-8F2, the SAN Volume Controller 2145-8F4, or the SAN Volume Controller 2145-8G4, the specific SAN Volume Controller is designated.
- The *IBM System Storage SAN Volume Controller Installation Guide* is now titled *IBM System Storage SAN Volume Controller: Hardware Installation Guide*.
- The *IBM System Storage SAN Volume Controller Configuration Guide* is now titled *IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide*.
- The *IBM System Storage Master Console for SAN Volume Controller: Installation and User's Guide* and the IBM System Storage Master Console for SAN Volume Controller Information Center are no longer updated and distributed. Instead, all pertinent information from those information units have been incorporated into other SAN Volume Controller publications.
- The procedure for checking the grounding of a SAN Volume Controller node.
- The description of the shutdown operation of the 2145 UPS-1U and the 2145 UPS
- "Using the front panel of the SAN Volume Controller" topics have moved to an appendix.

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 and 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 cluster.
`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

A list of other publications that are related to this product are provided to you for your reference.

The tables in this section list and describe the following publications:

- The publications that make up the library for the IBM System Storage SAN Volume Controller
- Other IBM publications that relate to the SAN Volume Controller

SAN Volume Controller library

The following table lists and describes the publications that make up the SAN Volume Controller library. Unless otherwise noted, these publications are available in Adobe portable document format (PDF) from the following Web site:

http://www.ibm.com/storage/support/2145

Title	Description	Order number
IBM System Storage SAN Volume Controller: CIM Agent Developer's Reference	This reference guide describes the objects and classes in a Common Information Model (CIM) environment.	SC26-7904
IBM System Storage SAN Volume Controller: Command-Line Interface User's Guide	This guide describes the commands that you can use from the SAN Volume Controller command-line interface (CLI).	SC26-7903
IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide	This guide provides guidelines for configuring your SAN Volume Controller.	SC23-6628
IBM System Storage SAN Volume Controller: Host Attachment Guide	This guide provides guidelines for attaching the SAN Volume Controller to your host system.	SC26-7905
IBM System Storage SAN Volume Controller: Hardware Installation Guide	This guide includes the instructions that the IBM service representative uses to install the SAN Volume Controller.	GC27-2132
IBM System Storage SAN Volume Controller: Planning Guide	This guide introduces the SAN Volume Controller and lists the features you can order. It also provides guidelines for planning the installation and configuration of the SAN Volume Controller.	GA32-0551
IBM System Storage SAN Volume Controller: Service Guide	This guide includes the instructions that the IBM service representative uses to service the SAN Volume Controller.	GC26-7901

Title	Description	Order number
IBM Systems 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 Systems Safety Notices* document.	G229-9054

Other IBM publications

The following table lists and describes other IBM publications that contain additional information that is related to the SAN Volume Controller.

You can download IBM eServer xSeries, IBM xSeries, and IBM System x publications from the following Web site:

http://www-304.ibm.com/jct01004c/systems/support/

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 Version 1.6 for TotalStorage Products and how to use it with the SAN Volume Controller. This publication is referred to as the *IBM System Storage Multipath Subsystem Device Driver: User's Guide*.	GC27-2122
IBM TotalStorage DS4300 Fibre Channel Storage Subsystem Installation, User's, and Maintenance Guide	This guide describes how to install and configure the IBM TotalStorage DS4300 Fibre-Channel Storage Subsystem.	GC26-7722
IBM eServer xSeries 306m (Types 8849 and 8491) Installation Guide	This guide describes how to install the IBM eServer xSeries 306m, which is the hardware delivered for some versions of the hardware master console.	MIGR-61615
IBM xSeries 306m (Types 8849 and 8491) User's Guide	This guide describes how to use the IBM eServer xSeries 306m, which is the hardware delivered for some versions of the hardware master console.	MIGR-61901

Title	Description	Order number
IBM xSeries 306m (Types 8849 and 8491) Problem Determination and Service Guide	This guide can help you troubleshoot and resolve problems with the IBM eServer xSeries 306m, which is the hardware delivered for some versions of the hardware master console.	MIGR-62594
IBM eServer xSeries 306 (Type 8836) Installation Guide	This guide describes how to install the IBM eServer xSeries 306, which is the hardware delivered for some versions of the hardware master console.	MIGR-55080
IBM eServer xSeries 306 (Type 8836) User's Guide	This guide describes how to use the IBM eServer xSeries 306, which is the hardware delivered for some versions of the hardware master console.	MIGR-55079
IBM eServer xSeries 306 (Types 1878, 8489 and 8836) Hardware Maintenance Manual and Troubleshooting Guide	This guide can help you troubleshoot problems and maintain the IBM eServer xSeries 306, which is the hardware delivered for some versions of the hardware master console.	MIGR-54820
IBM eServer xSeries 305 (Type 8673) Installation Guide	This guide describes how to install the IBM eServer xSeries 305, which is the hardware delivered for some versions of the hardware master console.	MIGR-44200
IBM eServer xSeries 305 (Type 8673) User's Guide	This guide describes how to use the IBM eServer xSeries 305, which is the hardware delivered for some versions of the hardware master console.	MIGR-44199
IBM eServer xSeries 305 (Type 8673) Hardware Maintenance Manual and Troubleshooting Guide	This guide can help you troubleshoot problems and maintain the IBM eServer xSeries 305, which is the hardware delivered for some versions of the hardware master console.	MIGR-44094
IBM TotalStorage 3534 Model F08 SAN Fibre Channel Switch User's Guide	This guide introduces the IBM TotalStorage SAN Switch 3534 Model F08.	GC26-7454
IBM System x3250 (Types 4364 and 4365) Installation Guide	This guide describes how to install the IBM System x3250, which is the hardware delivered for some versions of the hardware master console.	MIGR-5069761

Title	Description	Order number
IBM System x3250 (Types 4364 and 4365) User's Guide	This guide describes how to use the IBM System x3250, which is the hardware delivered for some versions of the hardware master console.	MIGR-66373
IBM System x3250 (Types 4364 and 4365) Problem Determination and Service Guide	This guide can help you troubleshoot and resolve problems with the IBM System x3250, which is the hardware delivered for some versions of the hardware master console.	MIGR-66374
IBM TotalStorage SAN Switch 2109 Model F16 User's Guide	This guide introduces the IBM TotalStorage SAN Switch 2109 Model F16.	GC26-7439
IBM TotalStorage SAN Switch 2109 Model F32 User's Guide	This guide introduces the IBM TotalStorage SAN Switch 2109 Model F32. It also describes the features of the switch and tells you where to find more information about those features.	GC26-7517
IBM System Storage Productivity Center Introduction and Planning Guide	This guide introduces the IBM System Storage Productivity Center hardware and software.	SC23-8824
IBM System Storage Productivity Center Hardware Installation and Configuration Guide	This guide describes how to install and configure the IBM System Storage Productivity Center hardware.	SC23-8822
IBM System Storage Productivity Center Software Installation and User's Guide	This guide describes how to install and use the IBM System Storage Productivity Center software.	SC23-8823

Some related publications are available from the following SAN Volume Controller support Web site:

http://www.ibm.com/storage/support/2145

Related Web sites

The following Web sites provide information about the SAN Volume Controller or related products or technologies.

Type of information	Web site
SAN Volume Controller support	http://www.ibm.com/storage/support/2145
Technical support for IBM storage products	http://www.ibm.com/storage/support/

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 free of 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 Web site:

http://www.ibm.com/shop/publications/order/

How to send your comments

Your feedback is important to help us provide the highest quality information. If you have any comments about this book or any other documentation, you can submit them in one of the following ways:

- e-mail

  Submit your comments electronically to the following e-mail address:

  starpubs@us.ibm.com

  Be sure to include the name and order number of the book and, if applicable, the specific location of the text you are commenting on, such as a page number or table number.
- Mail

  Fill out the Readers' Comments form (RCF) at the back of this book. If the RCF has been removed, you can address your comments to:

  International Business Machines Corporation
  RCF Processing Department
  Department 61C
  9032 South Rita Road
  Tucson, Arizona 85775-4401
  U.S.A.

Safety and environmental notices

Safety must be a concern for anyone using a SAN Volume Controller, redundant ac power switch, or an uninterruptible power supply (UPS).

The **Danger** and **Caution** notices for the SAN Volume Controller and any related UPSs can be found in the *IBM Systems Safety Notices*. Please review the topics concerning the safety notices to ensure that you are in compliance.

Important: Be sure to read the multilingual safety instructions on the SAN Volume Controller web site before you use the product. Go to http://www.ibm.com/storage/support/2145, click the current product documentation link, and then click **Multi-language**.

Definitions of notices

Ensure that you understand the typographic conventions that are used to indicate special notices.

The notices throughout the SAN Volume Controller documentation and in the *IBM Systems Safety Notices* document follow specific guidelines for their content.

The following notices are used throughout this library to convey specific meanings:

Note: These notices provide important tips, guidance, or advice.

Attention: These notices indicate possible damage to programs, devices, or data. An attention notice appears before the instruction or the situation in which damage might occur.

CAUTION:
These notices indicate situations that can be potentially hazardous to you. A caution notice precedes the description of a potentially hazardous procedural step or situation.

DANGER

These notices indicate situations that can be potentially lethal or extremely hazardous to you. A danger notice precedes the description of a potentially lethal or extremely hazardous procedural step or situation.

The caution and danger notices that appear in this document are also in the multilingual *IBM Systems Safety Notices* document. Use the reference numbers in parentheses; for example (1), at the end of each notice to find the matching translated notice.

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 the power is off, and the power cord is disconnected.

Each machine 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 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.

Perform the following steps to inspect each SAN Volume Controller node for unsafe conditions. If necessary, see any suitable safety publications.

1. Turn off the 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 machine. Use good judgment about the safety of any such changes.
5. Check inside the 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 the SAN Volume Controller to the SAN, check the grounding.

External machine check

Ensure that you perform an external machine check before you install the SAN Volume Controller.

Perform the following steps to conduct an external machine check:

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 the 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 machine checks

Ensure that you perform an internal machine check before you install the SAN Volume Controller.

Perform the following steps to conduct the internal machine check:

1. Check for any non-IBM changes that might have been made to the machine. 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 machine for any metal or other contaminants, or any indications of water, other fluid, fire, or smoke damage.
3. Check for any obvious mechanical problems, such as loose components.
4. Check any exposed cables and connectors for wear, cracks, or pinching.

Checking the grounding of a SAN Volume Controller, the UPS, and the redundant ac power switch

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

All SAN Volume Controller models support the use of the 2145 uninterruptible power supply-1U (2145 UPS-1U) and the optional redundant ac power switch. The SAN Volume Controller 2145-4F2 also supports the use of the 2145 UPS.

Perform the following steps to test the grounding of a SAN Volume Controller. Follow the steps for the SAN Volume Controller configuration you are using. Before you start, confirm you know the SAN Volume Controller model type, the UPS type, and whether you are using redundant ac power. Note 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: Service Guide*.
2. If the UPS is a 2145 UPS, ensure that other SAN Volume Controller nodes that are powered from the UPS are powered off.
3. Use the power button to power off the UPS.
4. Disconnect all signal cables from the SAN Volume Controller node, which includes the following cables:
   - The fibre channel cables
   - The Ethernet cable
   - The serial cable that is connected to the UPS.
5. Disconnect all signal cables from the UPS. If the UPS is a 2145 UPS, there might be multiple signal cables.
6. If the UPS 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 UPS power cable from the site power distribution unit.
8. If redundant ac power is used, power 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 UPS 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 UPSs 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 xix. 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 UPS 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 UPS power cable assembly, between the two ground conductors of the power cable.
        e. The UPS 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 UPS for unsafe conditions

Ensure that you take the time to inspect the uninterruptible power supply (UPS) 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 UPS 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. Perform the following steps to file a claim for the shipping damage:
   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.

Emergency power-off shutdown

The SAN Volume Controller and each uninterruptible power supply (UPS) support emergency power-off (EPO) shutdowns.

In the event of a room EPO shutdown, the 2145 uninterruptible power supply (2145 UPS) detects a loss of input power. This power loss is reported to the SAN Volume Controller 2145-4F2, which completes the process of shutting down the UPS within five minutes.

Attention: The 2145 UPS power off shutdown is normally controlled by the SAN Volume Controller 2145-4F2. If an EPO event occurs, but no SAN Volume Controller 2145-4F2 nodes that are connected to a 2145 UPS have been powered on since the 2145 UPS was powered on, you must remove output power from the UPS. To do this, press and hold the off button on the front panel of the 2145 UPS for at least four seconds.

Checking the safety labels on the SAN Volume Controller

Before you install, use, or service the SAN Volume Controller, you must ensure that you understand the safety labels.

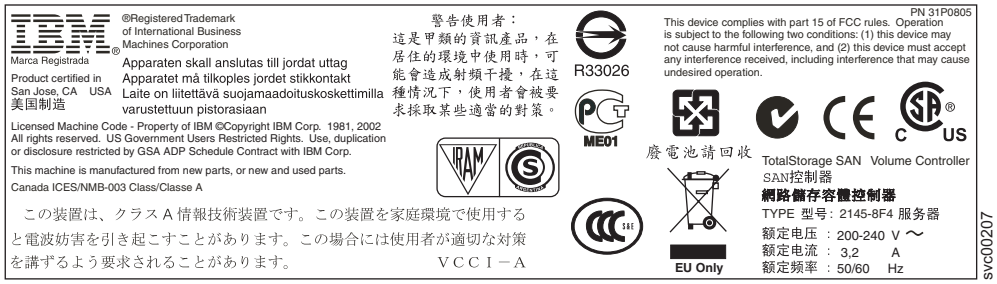
1. Locate the following labels for the SAN Volume Controller:
   - **Agency/ratings label for the SAN Volume Controller 2145-8G4**
     – Certified in San Jose, CA USA

svc00280

     – Certified in Vac, Hungary

svc00279

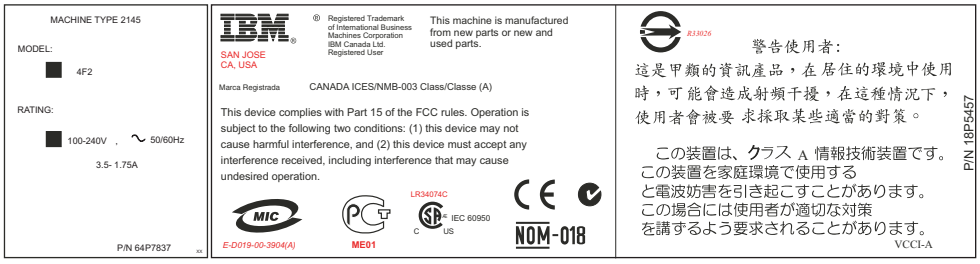
- **Agency/ratings label for the SAN Volume Controller 2145-8F4**



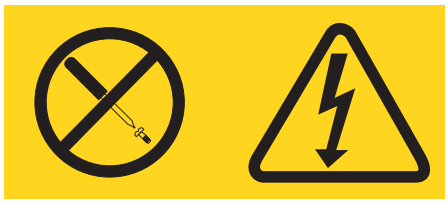
svc00207

- **Agency/ratings label for the SAN Volume Controller 2145-8F2**

- **Agency/ratings label for the SAN Volume Controller 2145-4F2**



- **No user access label**



- **Class 1 laser label**

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

svc00334

2. Before you continue, ensure that you understand each of these labels.

Checking the labels on the redundant ac power switch

Before you install, use, or service the redundant ac power switch, you must ensure that you understand the safety labels.

Locate the following labels on the redundant ac power switch.

- **Agency label**

Manufactured for IBM®

® Registered Trademark of international Business Machines Corporation
Marca Registrada

BY
DELTA ELECTRONICS, INC.
3,Tung Yuan Road, Chungli Industrial Zone
Taoyuan Shien, Taiwan, R.O.C.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference received including interference that may cause undesired operation.
警告使用者:
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

100–127 VAC 15 A
200–240 VAC 10 A
50/60 Hz

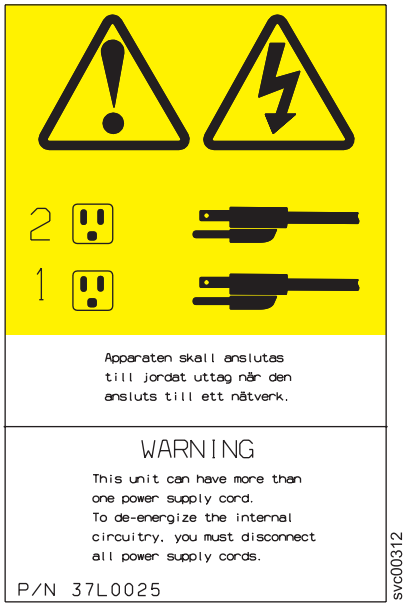
IBM P/N: 95P5083
IBM Option P/N (Cordless Version): 37L6863
Model: Dual Line Cord PDU
IBM FRU P/Ns – Unit Only: 95P5083
Hardware Kit Only: 09N9671
MFG DATE:XXXX Manufacturer S/N:YMD001
MADE IN CHINA

NRTL/C

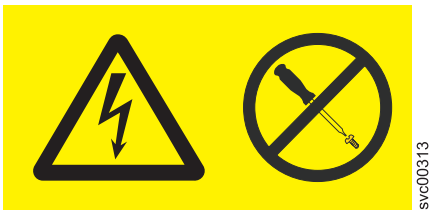
11S95P5083ZN10H0YMD001

svc00316

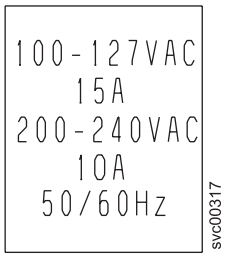
- **Dual power cord warning label**



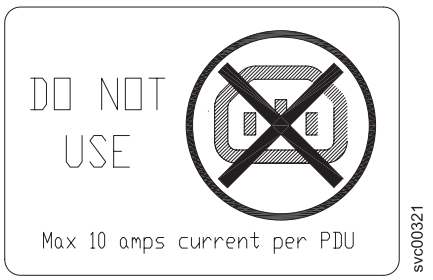
- **No user access label**



- **Input ratings label**



- **Output port warning label**



Checking the labels on the outside of the UPS

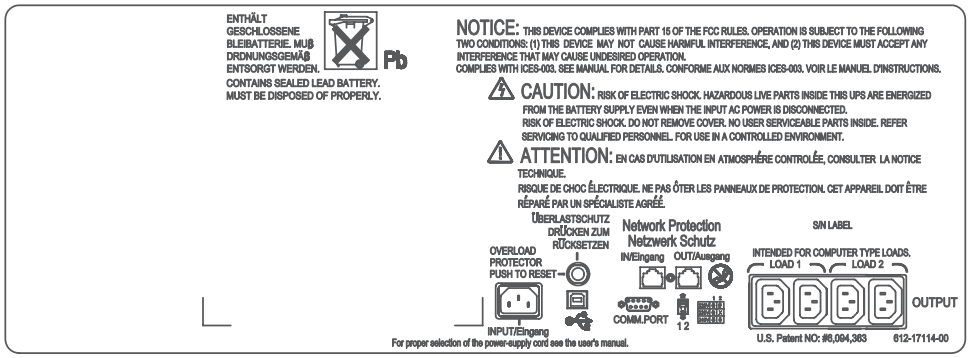
Before you install, use, or service the uninterruptible power supply (UPS), you must ensure that you understand the safety labels.

Checking the 2145 UPS-1U labels

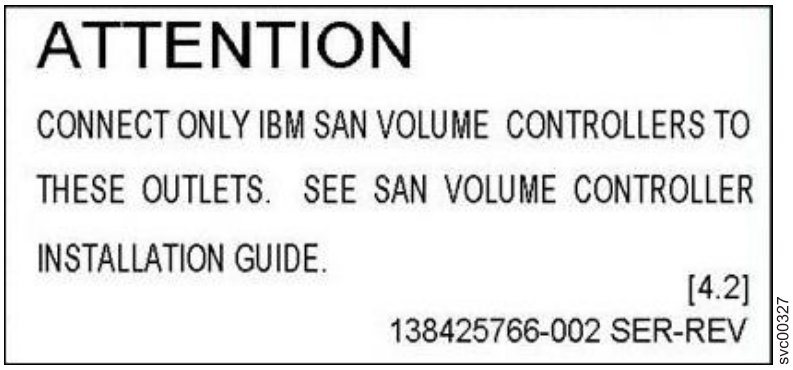
Before you continue, ensure that you locate and understand each of the following 2145 uninterruptible power supply-1U (2145 UPS-1U) labels:

- **Weight caution label**

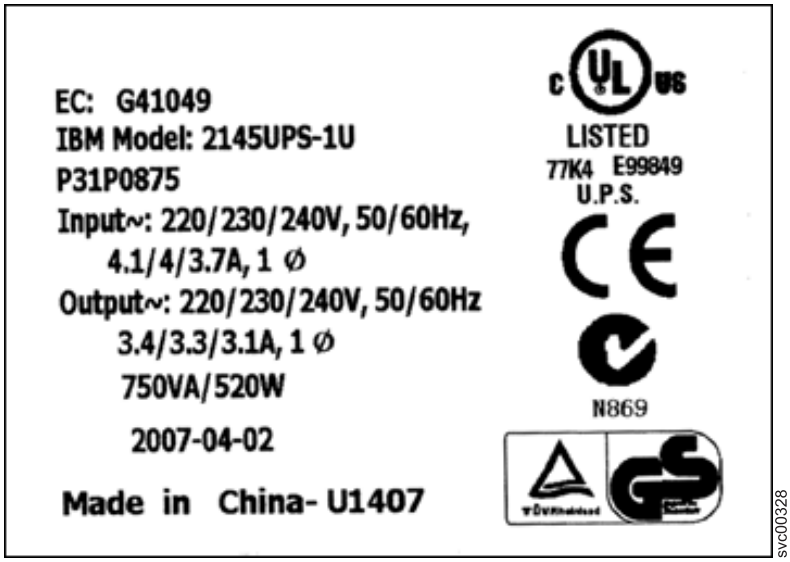
- **Safety label**



- **Power output warning label**



- **Agency label**



- **People's Republic of China Electronic Information Products (EIP) mark - 20 years**

- **Taiwan agency label**

- **IT compatible label**

IT
COMPATIBLE

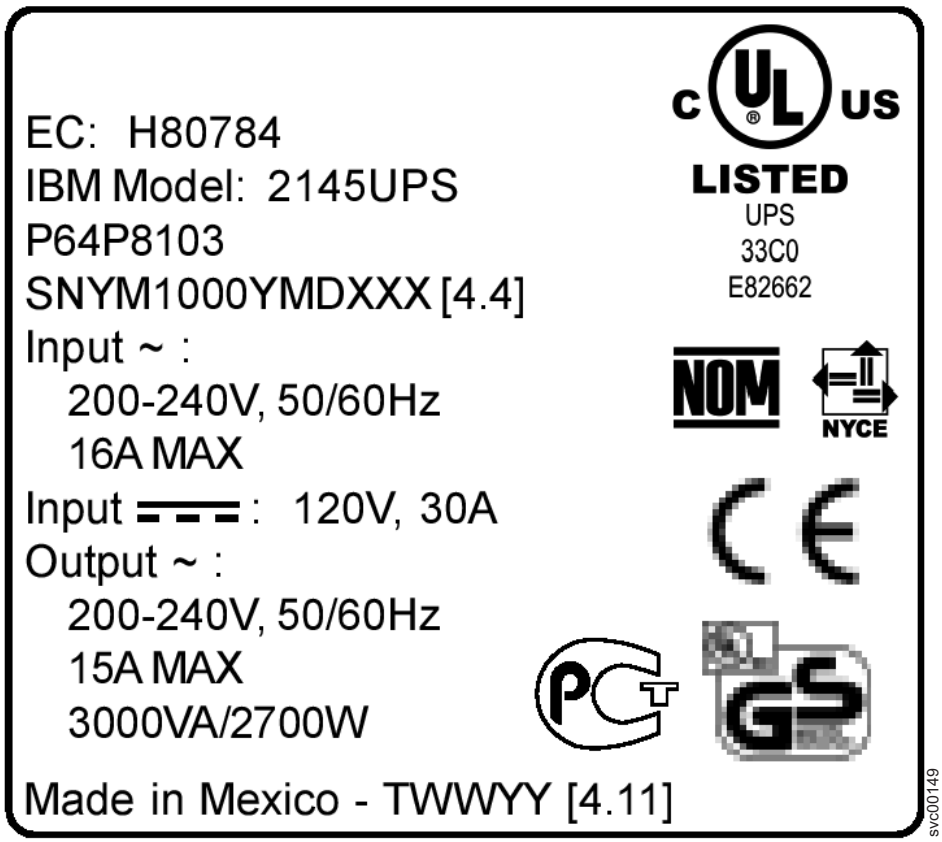
- **Do not discard the UPS or the UPS batteries in the trash label**

  Note: The UPS can contain sealed, lead-acid batteries, which must be recycled.

Checking the 2145 UPS labels

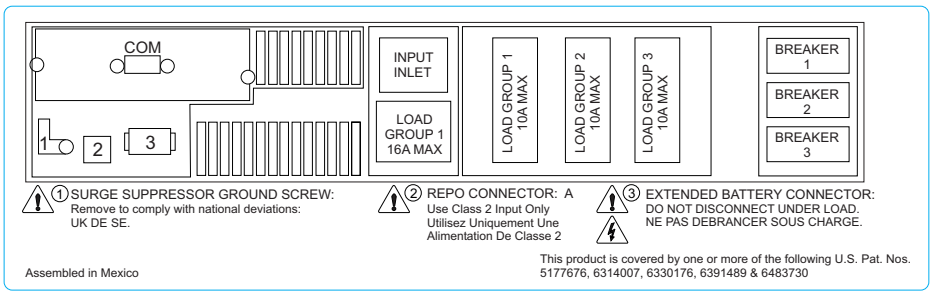
Ensure that you locate and understand each of the following 2145 uninterruptible power supply (2145 UPS) labels:

- **Agency label**



- **Rear panel configuration label**

  Note: This label is installed on the cover of the power supply of the SAN Volume Controller.

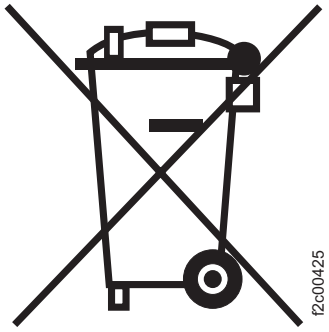


- **Do not discard the UPS or the UPS batteries in the trash label**

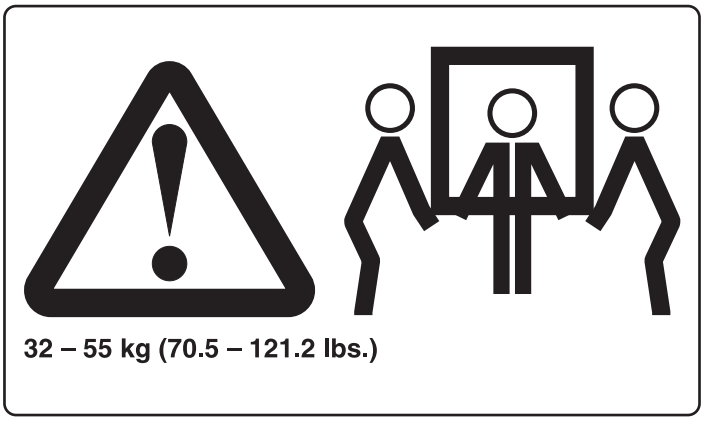
  Notes:

  – The UPS can contain sealed, lead-acid batteries, which must be recycled.

  – If you have a 2145 UPS unit that is already installed, you might not have this label affixed to the outside of the UPS due to changing labeling requirements.

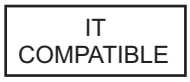


- **Three-person lift label**

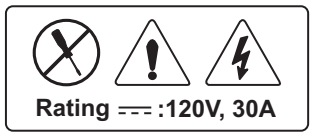


- **Weight caution label**

- **IT compatible label**



- **Power ratings and no user access label**



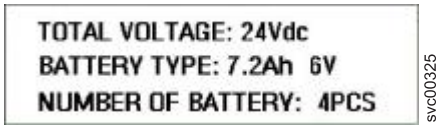
Checking the labels on the battery of the UPS

Before you install, use, or service the battery of the uninterruptible power supply (UPS), you must ensure that you understand the safety labels.

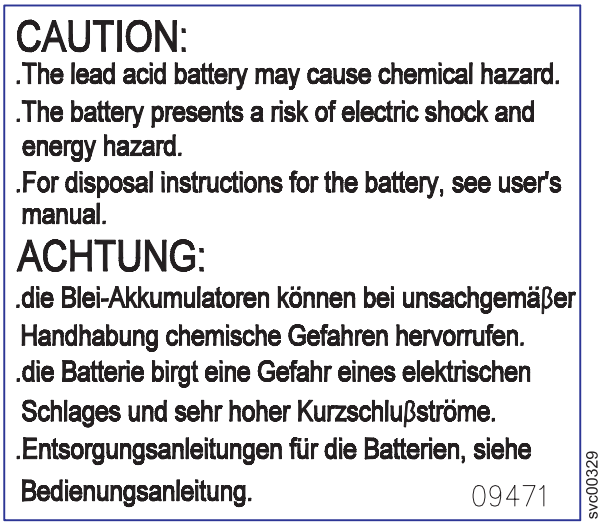
Checking the battery label of the 2145 UPS-1U

Locate the following labels for the battery of the 2145 uninterruptible power supply-1U (2145 UPS-1U).

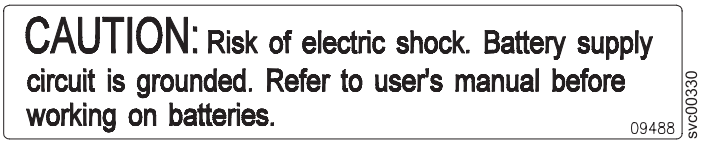
- Battery rating label



- Battery safety label



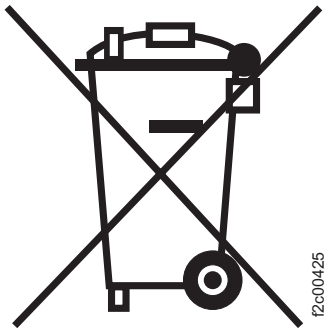
- Electric shock hazard



- **People's Republic of China Electronic Information Products (EIP) mark - 5 years**

- **Do not discard the UPS or the UPS batteries in the trash label**

  Note: The UPS can contain sealed, lead-acid batteries, which must be recycled.

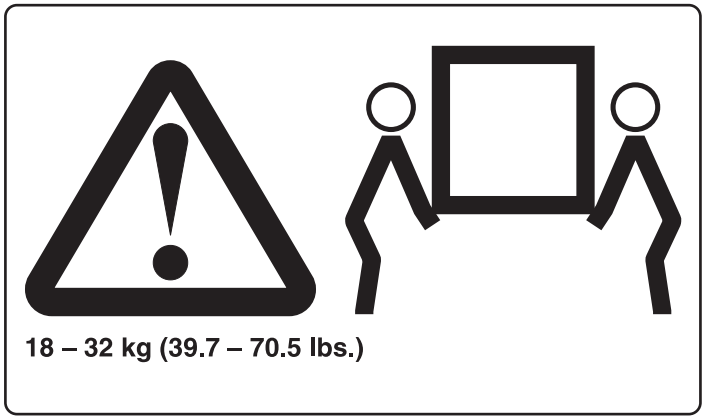


- **Recycling label**

Checking the battery labels of the 2145 UPS

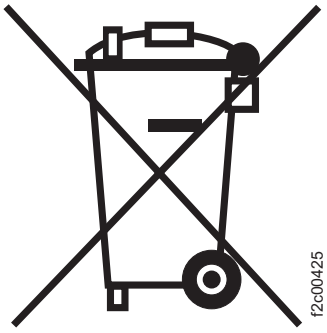
Ensure that you can locate and understand the battery labels for the 2145 uninterruptible power supply (2145 UPS).

- **Two-man lift label**



- **Do not discard the UPS or the UPS batteries in the trash label**

  Note: The UPS can contain sealed, lead-acid batteries, which must be recycled.



- **Recycling label**

- **Weight label**

- **Power ratings and no user access label**

- **Battery faceplate label**

  Note: You must remove the front panel to see the faceplate.

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.

1089CORE

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

The following comments apply to the IBM® servers that have been designated as conforming to NEBS (Network Equipment-Building System) GR-1089-CORE:

The equipment is suitable for installation in the following:

- Network telecommunications facilities

- Locations where the NEC (National Electrical Code) applies

The intrabuilding ports of this equipment are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding ports of this equipment *must not* be metallically connected to the interfaces that connect to the OSP (outside plant) or its wiring. These interfaces are designed for use as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metallically to OSP wiring.

Note: All Ethernet cables must be shielded and grounded at both ends.

The ac-powered system does not require the use of an external surge protection device (SPD).

The dc-powered system employs an isolated DC return (DC-I) design. The DC battery return terminal *shall not* be connected to the chassis or frame ground.

Product recycling and disposal

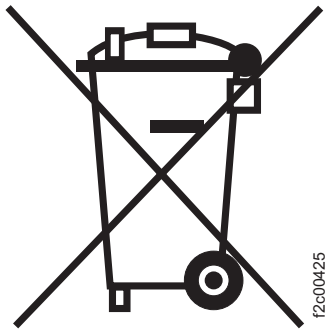
Ensure that you are aware of the materials of the product that can be recycled.

This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at

http://www.ibm.com/ibm/environment/products/prp.shtml

Esta unidad debe reciclarse o desecharse de acuerdo con lo establecido en la normativa nacional o local aplicable. IBM recomienda a los propietarios de equipos de tecnología de la información (TI) que reciclen responsablemente sus equipos cuando éstos ya no les sean útiles. IBM dispone de una serie de programas y servicios de devolución de productos en varios países, a fin de ayudar a los propietarios de equipos a reciclar sus productos de TI. Se puede encontrar información sobre las ofertas de reciclado de productos de IBM en el sitio web de IBM.

http://www.ibm.com/ibm/environment/products/prp.shtml



Note:

This mark applies only to countries within the European Union (EU) and Norway.

Appliances are labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the EU. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown previously, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and recovery of WEEE. Customer participation is important to minimize any potential affects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'étiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

Battery return program

Ensure that you understand the precautions you need to take when disposing of batteries.

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, contact your local waste disposal facility or go to the following Web site:

http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml

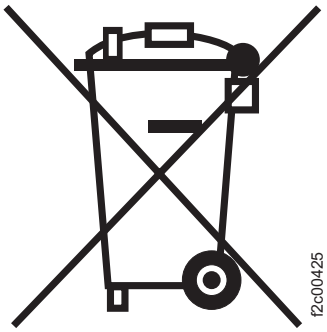
In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and other battery packs from IBM Equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Please have the IBM part number listed on the battery available prior to your call.

For Taiwan:

Please recycle batteries

廢電池請回收

For the European Union:



Note: This mark applies only to countries within the European Union (EU).

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

Les batteries ou emballages pour batteries sont étiquetés conformément aux directives européennes 2006/66/EC, norme relative aux batteries et accumulateurs en usage et aux batteries et accumulateurs usés. Les directives déterminent la marche à suivre en vigueur dans l'Union Européenne pour le retour et le recyclage des batteries et accumulateurs usés. Cette étiquette est appliquée sur diverses batteries pour indiquer que la batterie ne doit pas être mise au rebut mais plutôt récupérée en fin de cycle de vie selon cette norme.

バッテリーあるいはバッテリー用のパッケージには、EU 諸国に対する廃電気電子機器指令 2006/66/EC のラベルが貼られています。この指令は、バッテリーと蓄電池、および廃棄バッテリーと蓄電池に関するものです。この指令は、使用済みバッテリーと蓄電池の回収とリサイクルの骨子を定めているもので、EU 諸国にわたって適用されます。このラベルは、使用済みになったときに指令に従って適正な処理をする必要があることを知らせるために種々のバッテリーに貼られています。

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling and treatment of batteries and accumulators. Customer

participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, contact your local IBM representative.

For California:

Perchlorate Material - special handling may apply. See http://www.dtsc.ca.gov/hazardouswaste/perchlorate.

The foregoing notice is provided in accordance with California Code of Regulations Title 22, Division 4.5, Chapter 33. Best Management Practices for Perchlorate Materials. This product, part, or both may include a lithium manganese dioxide battery which contains a perchlorate substance.

Flat panel display

The fluorescent lamp or lamps in the liquid crystal display contain mercury.

Dispose of it as required by local ordinances and regulations.

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 anti-static bag, touch it to an unpainted metal part of the system unit for at least 2 seconds. (This action removes static electricity from the package and from your body.)
- Remove the device from its package and install it directly into your 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.

Chapter 1. Getting started with the SAN Volume Controller

This book provides information about the SAN Volume Controller node and related components. It also describes the physical characteristics and requirements of a SAN Volume Controller system and the steps that you must follow to complete an installation.

You might find this book helpful if you plan to do any of the following activities:

- Install a new SAN Volume Controller system or extend an existing system.
- Install one or more SAN Volume Controller nodes as well as related hardware components, such as an uninterruptible power supply (UPS) and, optionally, a redundant ac power switch. Note that nodes and UPS units are installed in pairs.
- Install the master console when you install a new system.
- Connect SAN Volume Controller components to a SAN.
- Manage connections to an Ethernet network.
- Verify the completeness of a SAN Volume Controller installation.

The chapters within this book provide conceptual, planning, and installation information for the SAN Volume Controller 2145-8G4. Appendix A, "SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2," on page 65 provides conceptual information and installation instructions for the SAN Volume Controller 2145-8F4 and the SAN Volume Controller 2145-8F2. Appendix B, "SAN Volume Controller 2145-4F2," on page 101 provides conceptual information and installation instructions for the SAN Volume Controller 2145-4F2.

Learning more about the SAN Volume Controller hardware components

Before you install the SAN Volume Controller hardware, use this information to become more familiar with the characteristics, requirements, and purpose of each hardware component.

To learn more about the	Go to ...
SAN Volume Controller software and hardware features	Chapter 2, "SAN Volume Controller overview," on page 3
Redundant ac power switch	Chapter 3, "Redundant ac power switch," on page 19
2145 UPS-1U	Chapter 4, "Using the 2145 UPS-1U," on page 23
2145 UPS	"Using the 2145 UPS" on page 107
Master console	Chapter 5, "Master console," on page 31

Installing the SAN Volume Controller hardware components

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

You will install one or more SAN Volume Controller nodes as well as related hardware components, such as an uninterruptible power supply (UPS) and, optionally, a redundant ac power switch, and then connect the system to the SAN and Ethernet. The following sections provide full details.

If you want to install ...	Go to ...
SAN Volume Controller 2145-8G4 hardware components	Chapter 6, "Installing the SAN Volume Controller 2145-8G4 hardware," on page 35
SAN Volume Controller 2145-8F4 or SAN Volume Controller 2145-8F2 hardware components	Appendix A, "SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2," on page 65
SAN Volume Controller 2145-4F2 hardware components	Appendix B, "SAN Volume Controller 2145-4F2," on page 101

After you verify that the installation of the SAN Volume Controller hardware is complete, continue with the *IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide* to, if necessary, create a new SAN Volume Controller cluster and to add the nodes into a SAN Volume Controller cluster.

Chapter 2. SAN Volume Controller overview

The SAN Volume Controller combines hardware and software 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 subsystems. Those storage systems are then mapped to a set of virtual disks (VDisks) for use by attached host systems. System administrators can view and access a common pool of storage on the SAN. This lets the administrators use storage resources more efficiently and provides a common base for advanced functions.

A *SAN* is a high-speed fibre-channel network that connects host systems and storage devices. It allows a host system to be connected to a storage device across the network. The connections are made through units such as routers, gateways, hubs, and switches. The area of the network that contains these units is known as the *fabric* of the network.

The SAN Volume Controller is analogous to a logical volume manager on a SAN. The SAN Volume Controller performs the following functions for the SAN storage that it controls:

- Creates a single pool of storage
- Provides logical unit virtualization
- Manages logical volumes
- Provides the following advanced functions for the SAN:
  - Large scalable cache
  - Copy Services
    - FlashCopy® (point-in-time copy)
    - Metro Mirror (synchronous copy)
    - Global Mirror (asynchronous copy)
    - Data migration
  - Space management
    - Mapping that is based on desired performance characteristics
    - Metering of service quality

Each SAN Volume Controller node is a rack-mounted unit that you can install in a standard Electrical Industries Alliance (EIA) 19-inch rack. The nodes are always installed in pairs, with one-to-four pairs of nodes constituting a *cluster*. 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. Each virtual volume is defined to an I/O group. I/O groups take the storage that is presented to the SAN by the storage subsystems as MDisks and translates the storage into logical disks, known as VDisks, that are used by applications on the hosts. Each node must reside in only one I/O group and provide access to the VDisks in that I/O group.

There are four models of SAN Volume Controller nodes:

- SAN Volume Controller 2145-8G4

- SAN Volume Controller 2145-8F4
- SAN Volume Controller 2145-8F2
- SAN Volume Controller 2145-4F2

SAN fabric overview

The SAN fabric is an area of the network that contains routers, gateways, hubs, and switches. A single cluster SAN contains two distinct types of zones: a host zone and a disk zone.

In the host zone, the host systems can identify and address the SAN Volume Controller nodes. You can have more than one host zone. Generally, you create one host zone for each host type. In the disk zone, the SAN Volume Controller nodes identify the disk drives. Host systems cannot operate on the disk drives directly; all data transfer occurs through the SAN Volume Controller nodes. Figure 1 shows several host systems that are connected in a SAN fabric.

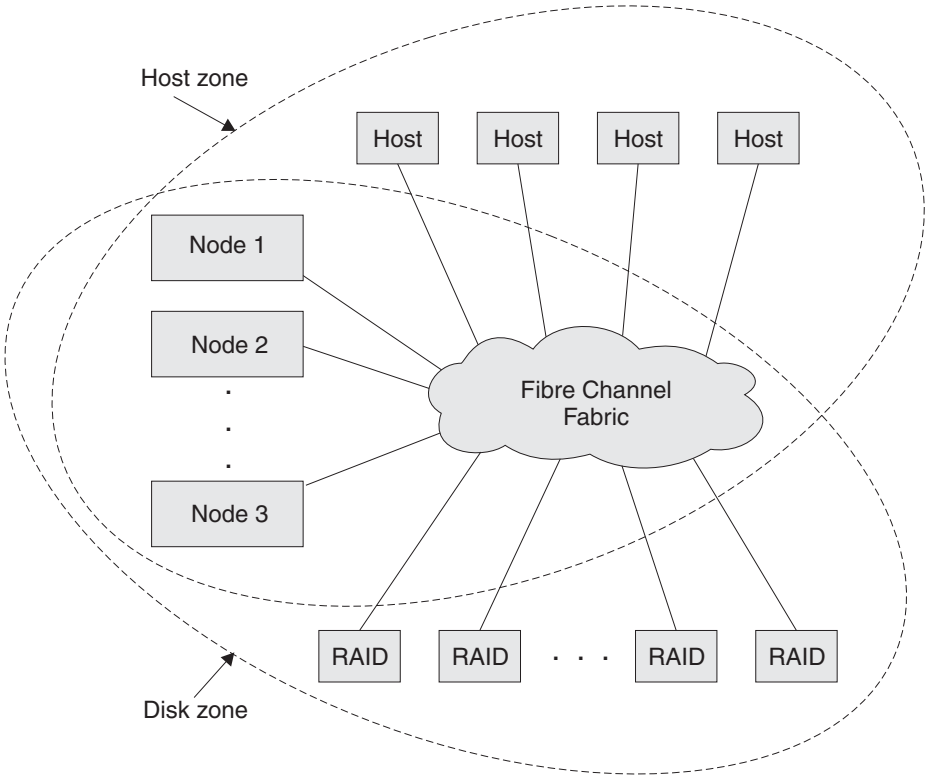


Figure 1. Example of a SAN Volume Controller cluster in a fabric

A cluster of SAN Volume Controller nodes is connected to the same fabric and presents virtual disks (VDisks) to the host systems. You create these VDisks from units of space within a managed disk (MDisk) group. An MDisk group is a collection of MDisks that are presented by the storage subsystems (RAID controllers). The MDisk group provides a storage pool. You specify how each group is created, and you can combine MDisks from different manufacturers' controllers in the same MDisk group.

Note: Some operating systems cannot tolerate other operating systems in the same host zone, although you might have more than one host type in the SAN

fabric. For example, you can have a SAN that contains one host that runs on an AIX® operating system and another host that runs on a Windows® operating system.

You can remove one SAN Volume Controller node in each I/O group from a cluster when hardware service or maintenance is required. After you remove the SAN Volume Controller node, you can replace the field replaceable units (FRUs) in the SAN Volume Controller node. All communication between disk drives and all communication between SAN Volume Controller nodes is performed through the SAN. All SAN Volume Controller node configuration and service commands are sent to the cluster through an Ethernet network.

Each SAN Volume Controller node contains its own vital product data (VPD). Each cluster contains VPD that is common to all the SAN Volume Controller nodes in the cluster, and any system that is connected to the Ethernet network can access this VPD.

Cluster configuration information is stored on every SAN Volume Controller node that is in the cluster to allow concurrent replacement of FRUs. When a new FRU is installed and when the SAN Volume Controller node is added back into the cluster, configuration information that is required by that SAN Volume Controller node is read from other SAN Volume Controller nodes in the cluster.

SAN Volume Controller operating environment

You must set up your SAN Volume Controller operating environment using the supported multipathing software and hosts.

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 supplies
- One master console per SAN installation for configuration

Note: You can order the master console for the SAN Volume Controller as a master console hardware option that comes preloaded with the master console software or a master console software option that you install on your own hardware.

Features of a SAN Volume Controller 2145-8G4 node

The SAN Volume Controller 2145-8G4 node has the following features:

- 19-inch rack mounted enclosure
- One 4-port 4 Gbps fibre-channel adapter (four fibre-channel ports)
- 8 GB cache memory
- Two dual-core processors

Supported hosts

See the following Web site for a list of the supported operating systems:

http://www.ibm.com/servers/storage/software/virtualization/svc

Multipathing software

See the following Web site for the latest support and coexistence information:

http://www.ibm.com/servers/storage/software/virtualization/svc

User interfaces

The SAN Volume Controller provides the following user interfaces through the master console:

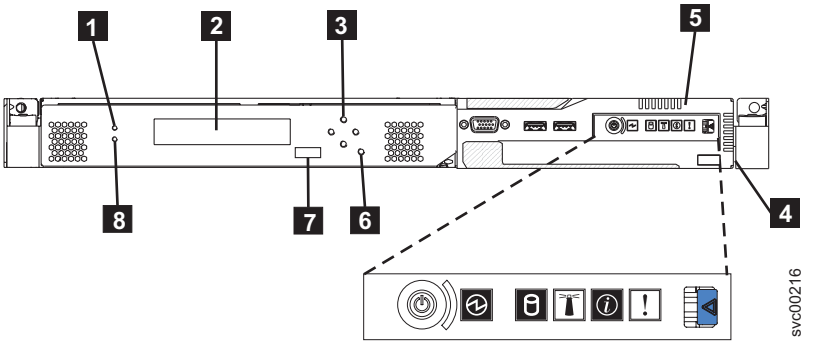
- The SAN Volume Controller Console, a Web-accessible graphical user interface (GUI) that supports flexible and rapid access to storage management information
- A command-line interface (CLI) that uses Secure Shell (SSH)

Application programming interfaces

The SAN Volume Controller provides an application programming interface called the Common Information Model (CIM) agent, which supports the Storage Management Initiative Specification (SMI-S) of the Storage Network Industry Association.

SAN Volume Controller 2145-8G4 controls and indicators

The following figure shows the controls and indicators on the front panel of the SAN Volume Controller 2145-8G4.



1. Cache LED
2. Front panel display
3. Navigation buttons
4. Serial number label
5. Operator information panel (see the operator information panel topic)
6. Select button
7. Node identification label
8. Error LED

Cache LED

System activity is indicated through the green, cache LED.

Table 1 describes the system activity indicators.

Table 1. Cache LED settings

Cache LED status	Result
Off	The system has not yet started processing.
On	The system is functionally active, has joined a working cluster, and is processing data.
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). Do not remove the power cable or force a power-off action while this LED is flashing.

Front panel display

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

Information on the front panel display is available in several languages. The display can show both alphanumeric information and graphical information (progress bars).

The front panel displays configuration and service information about the SAN Volume Controller and the SAN Volume Controller cluster, 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

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.

Product serial number

The node contains a SAN Volume Controller product serial number that is imbedded on the system board hardware.

This number is used for warranty and service entitlement checking and is included in the data sent with error reports. It is essential that this number is *not* changed during the life of the product. If the system board is replaced, you must follow the system board replacement instructions carefully and rewrite the serial number on the system board.

SAN Volume Controller 2145-8G4 operator information panel

The operator information panel contains indicators and buttons for the SAN Volume Controller 2145-8G4.

Figure 2 shows the operator information panel for the SAN Volume Controller 2145-8G4.

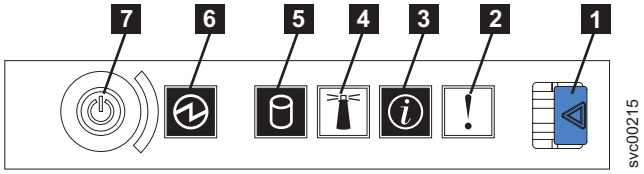


Figure 2. SAN Volume Controller 2145-8G4 operator information panel

1. Release latch for light path diagnostics panel
2. System-error LED (amber)
3. System-information LED (amber)
4. Location LED (blue)
5. Hard disk drive activity LED (green)
6. Power LED (green)
7. Power-control button

Release latch

The release latch gives you access to the light path diagnostics panel, which provides a preliminary method of determining the location of a problem.

After pressing the release latch on the 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" in the *IBM System Storage SAN Volume Controller: Service Guide* for more detail.

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

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" in the *IBM System Storage SAN Volume Controller: Service Guide* to help you to isolate the faulty FRU.

A system-led error LED is also on the rear of the SAN Volume Controller.

Information-Error LED

When the information-error LED is lit, a non-critical event has occurred.

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

Location LED

The SAN Volume Controller does not use the location LED.

Hard disk drive activity LED

When it is lit, the green hard disk drive activity LED indicates that the hard disk drive is in use.

Power LED

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

The properties of the green power LED are as follows:

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 powered on.

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

Note: A power LED is also on the rear of the server.

Power control button

The power control button switches on or switches off the main power to the SAN Volume Controller.

To turn on the power, press and release the power control button.

To turn off the power, press and release the power control button. For more information about how to power off the SAN Volume Controller node, see "MAP 5350: Powering off a SAN Volume Controller node" in the *IBM System Storage SAN Volume Controller: Service Guide*.

Note: When the node is operational and the power control button is pressed, the SAN Volume Controller indicates on its front panel that it is powering off and writes its control data to its internal disk. This can take up to five minutes. If the power control button is pressed and not released, an immediate power off is performed without writing the SAN Volume Controller control data to disk. Service actions are then required to make the SAN Volume Controller operational again. Therefore, when powering off, you should not press and hold the power control button for more than two seconds.

Note: The 2145 uninterruptible power supply-1U (2145 UPS-1U) does not power off when the SAN Volume Controller is shut down from the power control button.

Select button

You can 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.

Node identification label

The node identification label on the front panel displays a six-digit node identification number.

The node identification label is the same as the six-digit number that is used in the **svctask addnode** command. It is readable by system software and is used by configuration and service software as a node identifier. The node identifier can also be displayed on the front panel display when `node` is selected from the menu.

If the service controller assembly front panel is replaced, the configuration and service software displays the number that is printed on the front of the replacement panel. Future error reports contain the new number. No cluster reconfiguration is necessary when the front panel is replaced.

Error LED

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

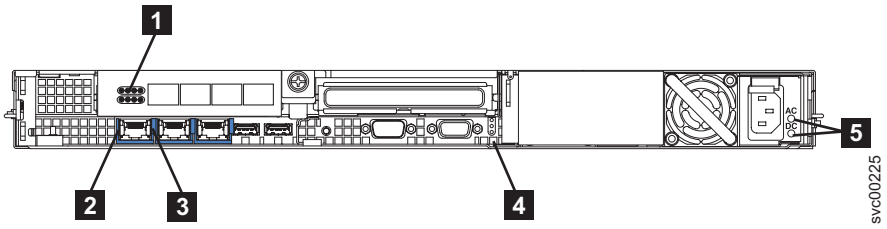
The error LED has the following two states:

OFF The service controller is functioning correctly.

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

SAN Volume Controller 2145-8G4 rear panel indicators

The following figure shows the rear panel indicators on the SAN Volume Controller 2145-8G4 back panel assembly.



1 Fibre-channel LEDs

2 Ethernet activity LED

3 Ethernet link LED

4 Power, location, and system error LEDs

5 Ac and dc LEDs

Fibre-channel LEDs on the SAN Volume Controller 2145-8G4

The fibre-channel LEDs on the SAN Volume Controller 2145-8G4 indicate the status of the fibre-channel ports.

Figure 3 shows the fibre-channel LEDs on the SAN Volume Controller 2145-8G4.

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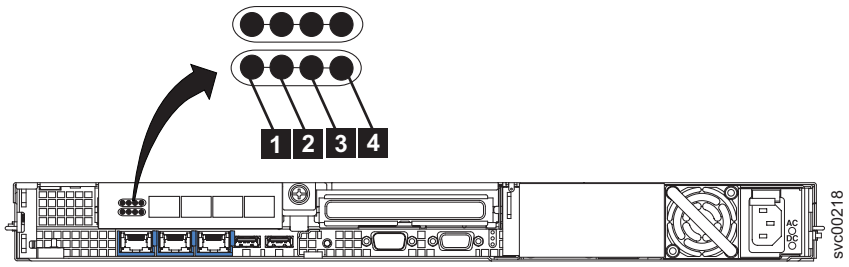


Figure 3. SAN Volume Controller 2145-8G4 fibre-channel LEDs

Ethernet activity LED

The Ethernet activity LED indicates that the SAN Volume Controller 2145-8G4 is communicating with the Ethernet network that is connected to the Ethernet port.

The Ethernet activity LED is located on each Ethernet port; Ethernet port 2 is used only during Ethernet troubleshooting.

Ethernet link LED

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

The Ethernet link LED is located on each Ethernet port; however, only Ethernet port 1 is used during normal operation.

Power, location, and system error LEDs

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

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

Power LED

This is the top of the three LEDs and indicates the following:

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 powered on.

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

Location LED
This is the middle of the three LEDs and is not used by the SAN Volume Controller.

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

Ac and dc LEDs

The ac and dc LEDs indicate whether the node is receiving electrical current.

Ac LED
The upper LED **1** next to the power supply, indicates that ac current is present on the node.

Dc LED
The lower LED **2** next to the power supply, indicates that dc current is present on the node.

Ac and dc LEDs on the SAN Volume Controller 2145-8G4

The ac LED and dc LED are located on the rear of the SAN Volume Controller 2145-8G4.

Figure 4 shows the location of the ac and dc LEDs.

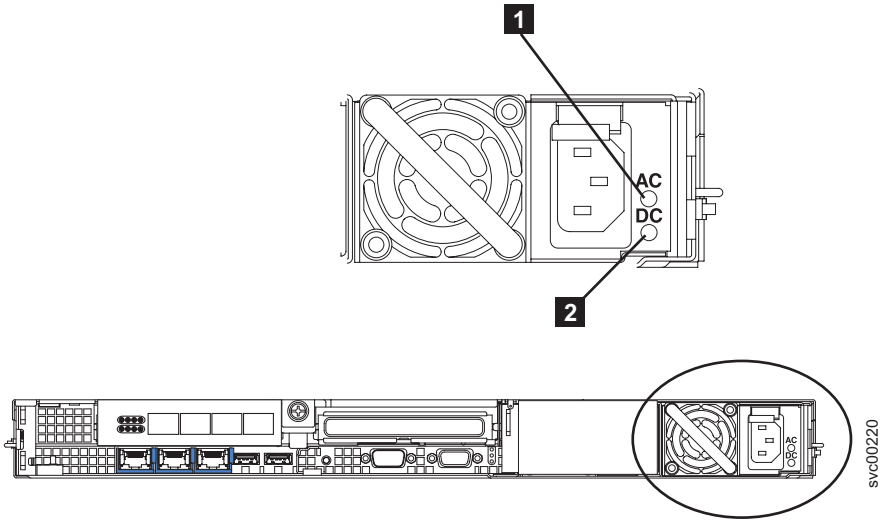
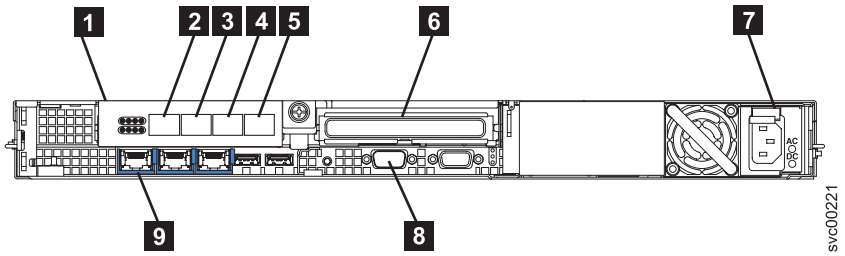


Figure 4. SAN Volume Controller 2145-8G4 ac and dc LEDs

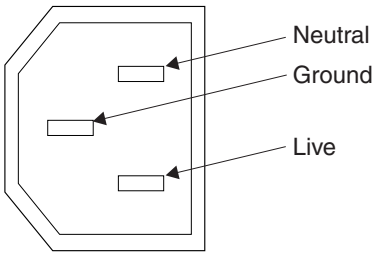
SAN Volume Controller 2145-8G4 connectors

The external connectors for the SAN Volume Controller 2145-8G4 can be easily located.



1. PCI slot 1
2. Fibre-channel port 1
3. Fibre-channel port 2
4. Fibre-channel port 4
5. Fibre-channel port 4
6. PCI slot 2
7. Power supply
8. Serial connection
9. Ethernet port 1

The following figure shows the type of connector that is located on the power supply assembly. The connector enables you to connect the SAN Volume Controller 2145-8G4 to the power source from the uninterruptible power supply.



SAN Volume Controller 2145-8G4 ports used during service procedures

The SAN Volume Controller 2145-8G4 contains a number of ports that are only used during service procedures. These ports are shown in Figure 5 on page 14.

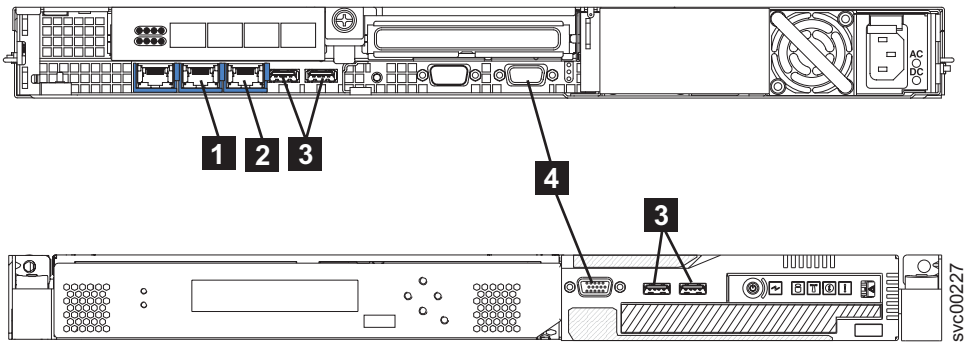


Figure 5. Service ports of the SAN Volume Controller 2145-8G4

1. Ethernet port 2
2. System management port
3. Four USB ports, two on the front and two on the rear
4. Two monitor ports, one on the front and one on the rear

During normal operation, none of these ports are used. You should only connect a device to any of these ports if directed to do so by a service procedure or by your IBM service representative.

SAN Volume Controller 2145-8G4 ports not used

The SAN Volume Controller 2145-8G4 has no unused ports.

Preparing your SAN Volume Controller 2145-8G4 environment

Before installing the SAN Volume Controller 2145-8G4, you must prepare the physical environment.

Input-voltage requirements

Ensure that the following requirements for each SAN Volume Controller 2145-8G4 node are met.

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

Power requirements for each node

Ensure that the following power is available for each SAN Volume Controller 2145-8G4 node. The power that is required depends on the node type, the uninterruptible power supply (UPS) type, and whether the redundant ac power feature is used.

Components	Power requirements
SAN Volume Controller 2145-8G4 + 2145 UPS-1U	470 W

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

Circuit breaker requirements

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

Environment requirements without redundant ac power

Environment	Temperature	Altitude	Relative humidity	Maximum wet bulb temperature
Operating in lower altitudes	10°C to 35°C (50°F to 95°F)	0 to 914 m (0 to 2998 ft)	8% to 80% noncondensing	23°C (74°F)
Operating in higher altitudes	10°C to 32°C (50°F to 88°F)	914 to 2133 m (2998 to 6988 ft)	8% to 80% noncondensing	23°C (74°F)
Powered off	10°C to 43°C (50°F to 110°F)	0 to 2133 m (2998 to 6988 ft)	8% to 80% noncondensing	27°C (81°F)
Storing	1°C to 60°C (34°F to 140°F)	0 to 2133 m (0 to 6988 ft)	5% to 80% noncondensing	29°C (84°F)
Shipping	-20°C to 60°C (-4°F to 140°F)	0 to 10668 m (0 to 34991 ft)	5% to 100% condensing, but no precipitation	29°C (84°F)

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 89°F)	0 to 914 m (0 to 2998 ft)	20% to 80% noncondensing	23°C (74°F)
Operating in higher altitudes	15°C to 32°C (50°F to 88°F)	914 to 2133 m (2998 to 6988 ft)	20% to 80% noncondensing	23°C (74°F)
Powered off	10°C to 43°C (50°F to 110°F)	0 to 2133m (0 to 6988 ft)	20% to 80% noncondensing	27°C (81°F)
Storing	1°C to 60°C (34°F to 140°F)	0 to 2133 m (0 to 6988 ft)	5% to 80% noncondensing	29°C (84°F)
Shipping	-20°C to 60°C (-4°F to 140°F)	0 to 10668 m (0 to 34991 ft)	5% to 100% condensing, but no precipitation	29°C (84°F)

Preparing your environment

The following three tables list the physical dimensions and weight of the node, the additional space requirements around a node, and the maximum heat dissipated by a node that you must consider before you install your SAN Volume Controller 2145-8G4:

Dimensions and weight

Height	Width	Depth	Maximum weight
43 mm (1.69 in.)	440 mm (17.32 in.)	686 mm (27 in.)	12.7 kg (28 lb)

Additional space requirements

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

Heat output of each SAN Volume Controller 2145-8G4 node

Model	Heat output per node
SAN Volume Controller 2145-8G4	400 W (1350 Btu per hour)

Fibre-channel port numbers and worldwide port names

Fibre-channel ports are identified by their physical port number and by a worldwide port name (WWPN).

The physical port numbers identify fibre-channel cards and cable connections when you perform service tasks. The WWPNs are used for tasks such as fibre-channel switch configuration and to uniquely identify the devices on the SAN.

The physical port numbers are 1 - 4, counting from left to right when you view the rear panel of the SAN Volume Controller. The WWPNs are derived from the worldwide node name (WWNN) of the SAN Volume Controller in which the card is installed.

The WWNN is in the form 50050768010*XXXXX*, where *XXXXX* is initially derived from the unit and is specific to a SAN Volume Controller. You can change the *XXXXX* value by using the front panel to facilitate service controller concurrent replacement and to enable some concurrent upgrade operations.

The WWPNs are in the form 5005076801*QXXXXX*, where *XXXXX* is as previously stated and *Q* is related to the port number as follows:

Port	Value of Q
1	4
2	3
3	1
4	2

SAN Volume Controller 2145-8G4 fibre-channel port numbers and worldwide port names

The SAN Volume Controller 2145-8G4 fibre-channel ports are identified by their physical port number and by a worldwide port name (WWPN).

Figure 6 provides a view of the rear of the SAN Volume Controller 2145-8G4.

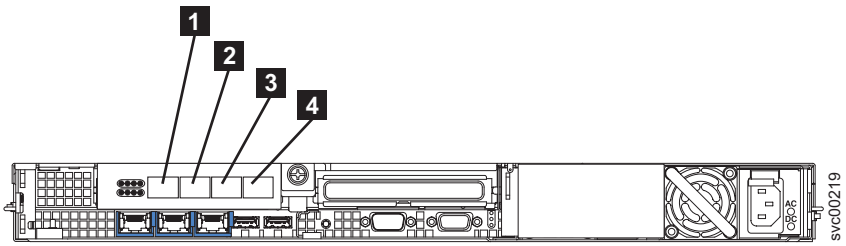


Figure 6. The physical port numbers for the SAN Volume Controller 2145-8G4

Chapter 3. Redundant ac power switch

The redundant ac power switch is an optional feature that makes the SAN Volume Controller nodes more resilient to power failure. The redundant ac power switch is not a replacement for an uninterruptible power supply (UPS), you must still use a 2145 UPS-1U 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 power off. Because the nodes are in two different I/O groups, the hosts do not lose access to the backend disk data.

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

The following graphic shows a redundant ac power switch.

Preparing your redundant ac power environment

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 uninterruptible power supply-1U (2145 UPS-1U) is rated at 10 A.

Redundant ac power switch specifications

Dimensions and weight

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

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 dissipated inside the redundant ac power switch is approximately 50 watts (170 Btu per hour).

Cabling of redundant ac power switches (example)

You must properly cable the redundant ac power switches in your environment.

Figure 7 on page 21 shows an example of the main wiring for a SAN Volume Controller cluster with the redundant ac power switch feature. The four-node cluster 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 7. A four-node SAN Volume Controller cluster 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 switches are used, and each powers one node in each I/O group. However, for maximum redundancy, use one redundant ac power switch to power each node in the cluster.

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

Chapter 4. Using the 2145 UPS-1U

The 2145 uninterruptible power supply-1U (2145 UPS-1U) provides a SAN Volume Controller node with a secondary power source if you lose power from your primary power source due to power failures, power sags, power surges, or line noise.

Unlike the traditional UPS that enables continued operation of the devices that they supply when power is lost, these UPS units are 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. Data is saved to the internal disk of the SAN Volume Controller node. The UPS units are required to power the SAN Volume Controller nodes even if the input power source is considered uninterruptible.

The SAN Volume Controller 2145-8G4, SAN Volume Controller 2145-8F4, and SAN Volume Controller 2145-8F2 nodes can operate only with the 2145 UPS-1U. The SAN Volume Controller 2145-4F2 node can operate with either the 2145 UPS or the 2145 UPS-1U.

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

2145 UPS-1U configuration

A 2145 UPS-1U powers one SAN Volume Controller node. All SAN Volume Controller model types are supported by the 2145 UPS-1U.

To make the SAN Volume Controller cluster more resilient to power failure, the 2145 UPS-1Us can be connected to the redundant ac power switch. If a redundant ac power switch is not used, connecting the two UPSs that are powering an I/O group to different, independent electrical power sources allows the SAN Volume Controller cluster to continue to operate with reduced capacity if a single power source fails.

Each UPS must be in the same rack as the node it powers.

Attention: Do not connect the UPSs to an input power source that does not conform to standards.

Each UPS includes power (line) cords that connect the UPS to either a redundant ac power switch, if one exists, a rack power distribution unit (PDU), if one exists, or to an external power source.

Each UPS 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 UPS units, these cables are wrapped together and supplied as a single field replaceable unit. The signal cable enables the SAN Volume Controller node to read status and identification information from the UPS.

2145 UPS-1U operation

Each SAN Volume Controller node monitors the operational state of the uninterruptible power supply (UPS) to which it is attached.

If the UPS reports a loss of input power, the SAN Volume Controller node stops all I/O operations and dumps the contents of its dynamic random access memory (DRAM) to the internal disk drive. When input power to the UPS is restored, the SAN Volume Controller node restarts and restores the original contents of the DRAM from the data saved on the disk drive.

A SAN Volume Controller node is not fully operational until the UPS battery charge state indicates that it has sufficient capacity to power the SAN Volume Controller node long enough to save all of its memory to the disk drive. In the event of a power loss, the UPS has sufficient power for the SAN Volume Controller to save all its memory to disk at least twice. For a fully-charged UPS, even after battery capacity has been used to power the SAN Volume Controller node while it saves DRAM data, sufficient battery capacity remains to allow the SAN Volume Controller node to become fully operational as soon as input power is restored.

Important: Do not shut down a UPS without first shutting down the SAN Volume Controller node that it supports. Data integrity can be compromised by pushing the 2145 UPS-1U on/off button when the node is still operating. However, in the case of an emergency, you can manually shut down the UPS by pushing the 2145 UPS-1U on/off button when the node is still operating. Service actions must then be performed before the node can resume normal operations. If multiple UPSs are shut down before the nodes they support, data can be corrupted.

Controls and indicators for the 2145 UPS-1U

All controls for the 2145 uninterruptible power supply-1U (2145 UPS-1U) are located on the front panel assembly.

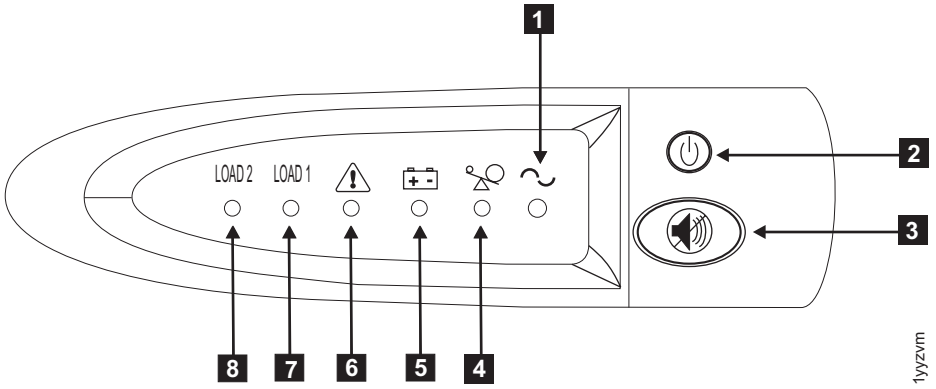


Figure 8. The 2145 UPS-1U front panel assembly

1. Power-on indicator
2. On/off button
3. Test and alarm reset button
4. Overload indicator

5 On-battery indicator

6 Service indicator

7 Load segment 1 indicator

8 Load segment 2 indicator

Power-on indicator

The power-on indicator is displayed when the 2145 uninterruptible power supply-1U (2145 UPS-1U) is functioning.

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

On/off button

The on/off button turns the power on or turns the power off to the 2145 uninterruptible power supply-1U (2145 UPS-1U).

Turning on the 2145 UPS-1U

After connecting the 2145 UPS-1U to the outlet, it will be in *standby* mode until you turn it on. Press and hold the on/off button until the power-on indicator is illuminated (approximately 5 seconds). 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/off button until the power-on light is extinguished (approximately 5 seconds). This places the 2145 UPS-1U in *standby* mode. You must then unplug the 2145 UPS-1U to power-off the unit.

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.

Note: This button is applicable to both the 2145 uninterruptible power supply (2145 UPS) and the 2145 uninterruptible power supply-1U (2145 UPS-1U).

Overload indicator

The overload indicator lights up when the capacity of the 2145 uninterruptible power supply-1U (2145 UPS-1U) is exceeded.

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

On-battery indicator

The on-battery indicator glows yellow when the 2145 uninterruptible power supply-1U (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.

Service indicator

If the service indicator on the 2145 uninterruptible power supply-1U (2145 UPS-1U) is flashing red, maintenance is required.

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

Load segment 1 indicator

The load segment 1 indicator on the 2145 uninterruptible power supply-1U (2145 UPS-1U) is not currently used.

Note: Load segment 1 is unused by the SAN Volume Controller. 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.

Load segment 2 indicator

The load segment 2 indicator on the 2145 uninterruptible power supply-1U (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.

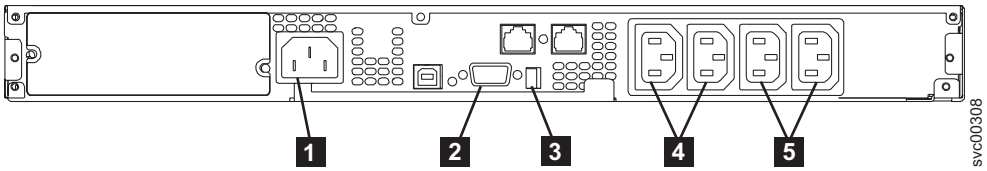
See the 2145 UPS-1U hardware documentation for the location of the power outlets for this segment.

Hardware for the 2145 UPS-1U

The 2145 uninterruptible power supply-1U (2145 UPS-1U) hardware is shown in the following graphics.

Locations for the 2145 UPS-1U connectors and switches

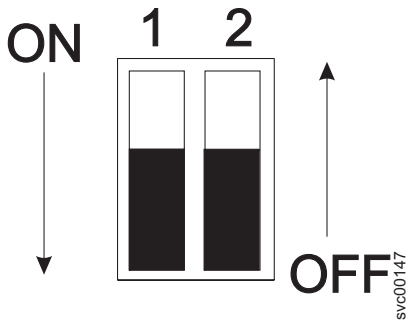
The following diagrams illustrate the hardware for the 2145 UPS-1U:



1. Main power connectors
2. Communication port
3. Dip switches
4. Load segment 1 receptacles
5. Load segment 2 receptacles

2145 UPS-1U dip switches

The dip switches are used to configure the input and output voltage ranges. Because this function is performed by the SAN Volume Controller software, both switches must be left in the Off position.



2145 UPS-1U ports not used

The 2145 UPS-1U is equipped with ports that are not used by the SAN Volume Controller and have not been tested. Use of these ports, in conjunction with the SAN Volume Controller or any other application that may be used with the SAN Volume Controller, is not supported. Figure 9 shows the 2145 UPS-1U ports that are not used.

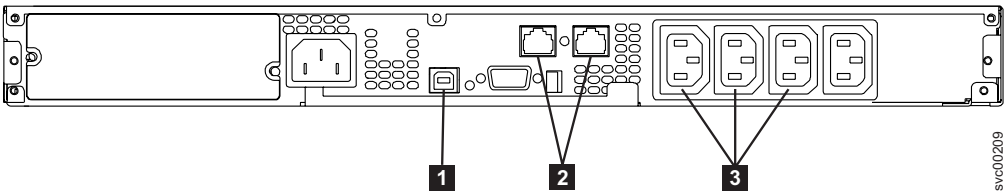
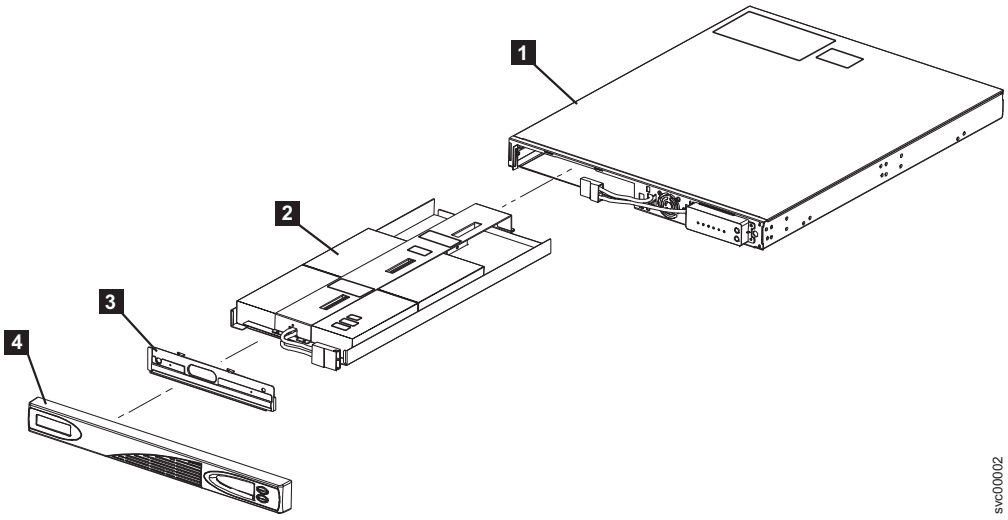


Figure 9. Ports not used by the 2145 UPS-1U

1. USB interface port
2. Network ports
3. Load segment receptacles

Hardware locations for the 2145 UPS-1U

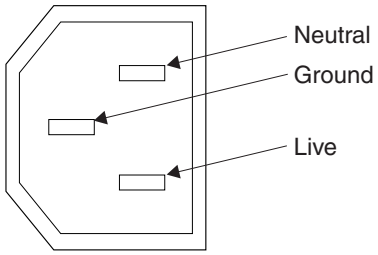


1. Frame assembly
2. Battery pack assembly

3 Battery plate

4 Front panel assembly

2145 UPS-1U power connector



Power cables for the 2145 UPS-1U

If you do not connect the 2145 uninterruptible power supply-1U (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 requirements 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
China (PRC)	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

Preparing your UPS environment

Ensure that your physical site meets the installation requirements for the uninterruptible power supply (UPS).

2145 UPS-1U environment

The SAN Volume Controller 2145-8G4, SAN Volume Controller 2145-8F4, SAN Volume Controller 2145-8F2, and SAN Volume Controller 2145-4F2 are supported with the 2145 uninterruptible power supply-1U (2145 UPS-1U).

UPS specifications

2145 UPS-1U dimensions and weight

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

Model	Heat output during normal operation	Heat output during battery operation
2145 UPS-1U	40 W (135 Btu per hour)	150 W (510 Btu per hour)

Chapter 5. Master console

The master console provides a single point from which to manage the SAN Volume Controller nodes. You can purchase the master console as a hardware product option (which includes the master console preinstalled software) or as a software-only option.

The two master console options are the same in function and software. However, the planning, installation, and configuration processes are slightly different:

Master console hardware option
The manufacturing plant installs the software on the hardware using the default settings. After the IBM service representative installs the hardware option, you must configure and customize the default factory settings.

Master console software-only option
You must provide your own hardware and perform both the installation and configuration processes.

The master console provides you with the following functions:

- A platform on which the subsystem configuration tools can be run
- A platform for remote service, which allows the desktop to be shared with remote IBM service personnel if assistance is required to resolve complex problems
- Access to the following components:
  - SAN Volume Controller Console, which is a graphical user interface application, through a Web browser
  - SAN Volume Controller command-line interface, through a Secure Shell (SSH) session

The master console can support up to four SAN Volume Controller clusters.

Master console hardware option components

Your master console software is preinstalled when you order the master console hardware option with your SAN Volume Controller.

The following components are included with the master console hardware option:

- 19-inch 1U rack-mounted IBM eServer™ xSeries® server
- 19-inch 1U flat panel monitor and keyboard

Attention: If more than one power distribution bus is available, the two power connectors, one supplying the master console server and the other supplying the master console monitor, must be connected to the same power distribution bus.

The following software is preinstalled on the system:

- Microsoft® Windows 2003 Standard Server Edition with the latest service pack
- PuTTY, a client for Telnet and Secure Shell (SSH) protocol communications
  - Putty.exe, the client software
  - Puttygen.exe, a utility for generating encryption keys
  - Plink.exe, the command-line interface to the PuTTY client software

- SAN Volume Controller Console
- Adobe Reader

The following Web site provides the current list of supported software versions:

http://www.ibm.com/storage/support/2145

After the master console hardware is installed, the customer must configure the software to meet their requirements.

Preparing your master console hardware option environment

If the master console hardware option is included with the SAN Volume Controller, ensure that your physical site meets the installation requirements for the master console hardware and the console monitor kit.

Server dimensions and weight

The following tables provide the physical characteristics and the environmental requirements for the master console hardware option:

Height	Width	Depth	Maximum Weight
44 mm (1.7 in.)	480 mm (18.9 in.)	426 mm (16.8 in.)	12.7 kg (28 lb)

Server AC and input-voltage requirements

Power Supply	Electrical Input
203 watt (110 or 220 V ac auto-sensing)	Sine-wave input (47–63 Hz) required Input voltage low range: Minimum: 100 V ac Maximum: 127 V ac Input voltage high range: Minimum: 200 V ac Maximum: 240 V ac Input kilovolt-amperes (kVA), approximately: Minimum: 0.0870 kVA Maximum: 0.150 kVA

Server environment

Environment	Temperature	Altitude	Relative Humidity
Server On	10° to 35°C (50°F to 95°F)	0 to 914 m (2998.0 ft)	8% to 80%
Server Off	-40°C to 60°C (-104°F to 140°F)	Maximum: 2133 m (6998.0 ft)	8% to 80%

Server heat output

Approximate heat output in British thermal units (Btu) per hour:

- Minimum configuration: 87 watts (297 Btu)

- Maximum configuration: 150 watts (512 Btu)

Monitor console kit dimensions and weight

Height	Width	Depth	Maximum Weight
40 mm (1.6 in.)	480 mm (18.9 in.)	530 mm (20.9 in.)	17.0 kg (37.0 lb)

Chapter 6. Installing the SAN Volume Controller 2145-8G4 hardware

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

The following topics describe the SAN Volume Controller hardware installation tasks in the order they should be performed.

Note: If you are adding a new I/O group to an existing SAN Volume Controller cluster, there is no need to power off the existing, operating cluster 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. Install and verify the redundant ac power switch, if it is to be used and is not already being used for a node.
3. Install the UPS.
4. Install the node.
5. Connect the fibre-channel and Ethernet cables to the node.
6. Connect the node to the UPS.
7. Verify the node.
8. Install and verify the master console. Optionally, you can perform this step first.

After you finish these steps, the hardware installation is complete.

Preparing for the SAN Volume Controller hardware installation

You must perform the steps to prepare for the installation of the optional redundant ac power switch, the uninterruptible power supply (UPS), the master console, and the SAN Volume Controller.

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 that are provided at http://www.ibm.com/storage/support/2145. The *IBM System Storage SAN Volume Controller: Planning Guide* 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. Check all the parts and quantities against the parts that are shown in Figure 10 on page 36 to make sure that everything has been delivered. If any piece is missing, contact the appropriate IBM representative.

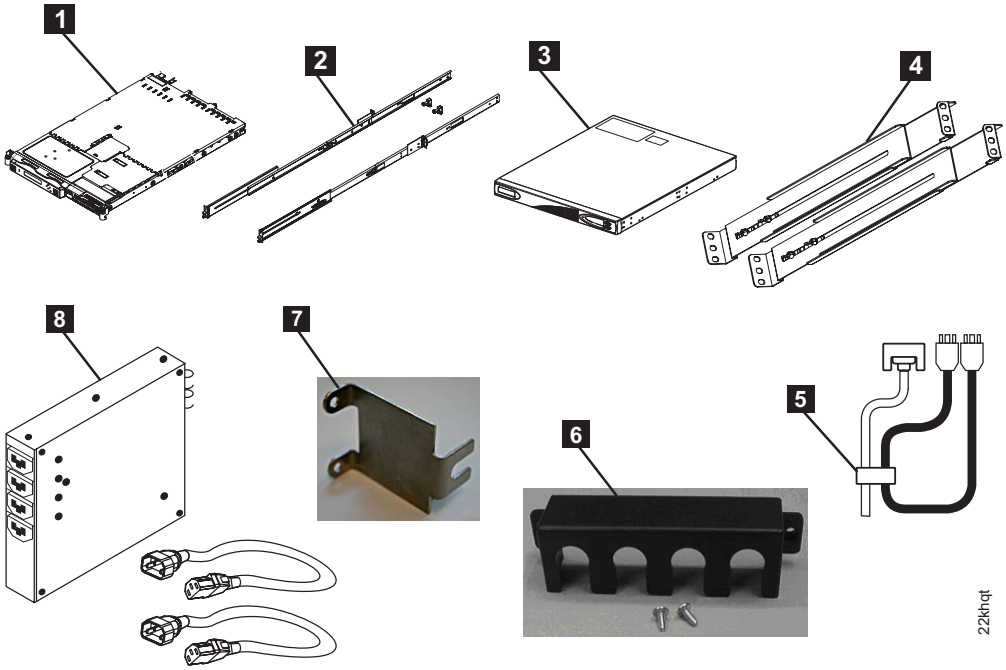


Figure 10. Parts provided for SAN Volume Controller hardware installation in a rack

You need the following items for each node:

1 SAN Volume Controller node

2 SAN Volume Controller support rails (2)

3 UPS

4 UPS support rails (2)

5 Power and signal cable

6 2145 UPS-1U cable retention bracket

7 SAN Volume Controller 2145-8G4 cable retention bracket (the actual design might differ)

8 Optionally, one or more redundant ac power switches, two side plates per switch, and power cables.

Note:

a. You must install at least two SAN Volume Controller nodes and each node requires a UPS.

b. You must ensure that you have the appropriate power cables to connect to the site power distribution point. See "Power cables for the 2145 UPS-1U" on page 28.

c. Optionally, install two redundant ac power switches to power the nodes in an I/O group through two 2145 UPS-1Us.

3. If you are installing UPSs, read through the safety and environmental notices.
4. If you are installing the master console, be sure to read all of the safety checks that are detailed in the *IBM System Storage Master Console for SAN File System and SAN Volume Controller: Installation and User's Guide*. Refer to the *IBM System Storage SAN Volume Controller: Planning Guide*, which provides the configuration data table, and to http://www.ibm.com/storage/support/2145 where you can

download the hardware location chart and the cable connection table for the customer to complete prior to installation.

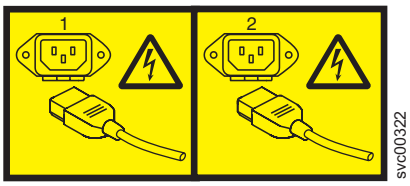
Installing the redundant ac power switch

Use the redundant ac power switch to make the SAN Volume Controller cluster more resilient to power failure.

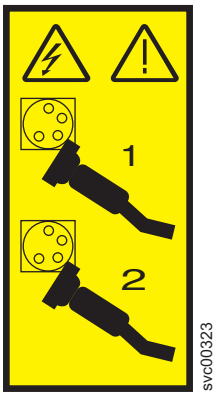
DANGER

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:

Attach each of the two mounting plates to the redundant ac power switch using three M3 Torx T8 head screws. Position the mounting face on the side of the redundant ac power switch containing the output power sockets. See Figure 11.

Figure 11. 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 power input 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 power input cables to the redundant ac power switch

You will find it easier to connect the power input 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 power input 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 cables using the clips of the redundant ac power switch. See Figure 12 on page 39.

Figure 12. 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. See Figure 13.

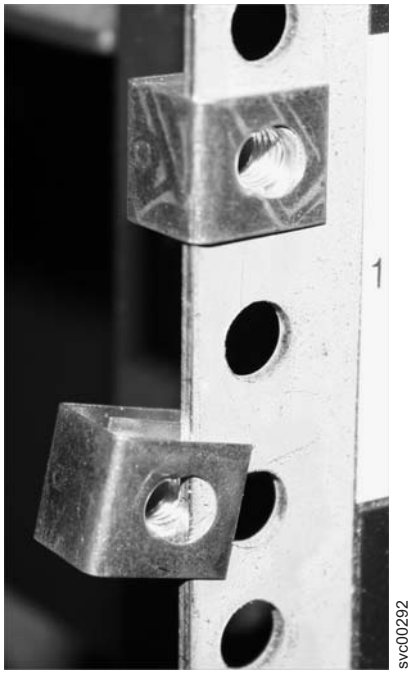


Figure 13. Positioning the clips

3. Position the redundant ac power switch in the rack first, pushing the cables through to the front of the rack. Mount in place using the four M6 screws. See Figure 14.

Figure 14. 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 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.

Note: 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 (UPS). In that case, power on the UPS (not the SAN Volume Controller node) and see if it changes to battery power. The test fails if the UPS switches to battery power for more than five seconds (any transient indications of battery power can be ignored).

When the instructions say “remove power”, you can either switch the power off if the site power distribution unit has outputs that are individually switched or remove the specified redundant ac power switch power cable from the outlet of the site power distribution unit.

Note: If at any time there is no power on the output socket, ensure that the power distribution sockets of the power source are powered. 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 (UPS).

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 into the rack.
3. Connect the 2145 UPS-1U battery.
4. Connect the power cables to the 2145 UPS-1U.
5. 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 uninterruptible power supply-1U (2145 UPS-1U).

Complete the following prerequisites before installing the support rails:

1. Use the user's hardware location chart to determine where in the rack that the 2145 UPS-1U is to be installed.
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 15 on page 42.

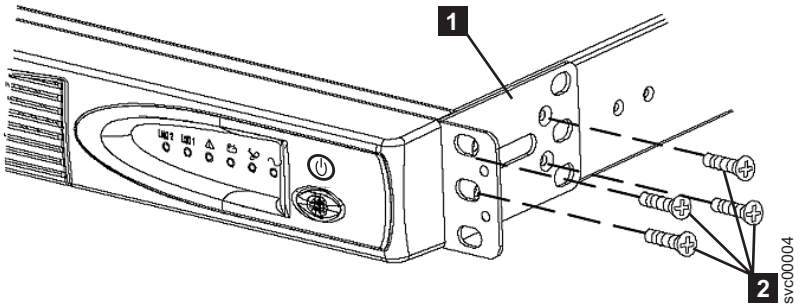


Figure 15. Installing the support rails for a 2145 UPS-1U into the rack

4. Loosen the assembly wing nuts (**1** in Figure 16) on both rail assemblies and adjust the rail size to the depth of your rack.

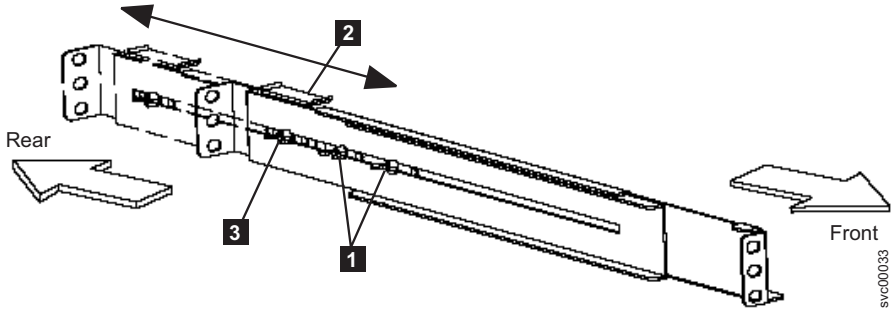


Figure 16. Adjusting the rail depth on the 2145 UPS-1U

1 Assembly wing nuts

2 Hold-down bracket

3 Wing nut

5. Position the rear, hold-down bracket (**2** in Figure 16) towards the end of the rail assemblies and tighten the wing nut (**3** in Figure 16).
6. Select the holes in the rail where you want to position the 2145 UPS-1U.

   Note: The bottom flange of the support rail must align with the EIA mark on the rack.

7. Using two M6 × 10 screws (**1** in Figure 17 on page 43) and two clip nuts **2**, attach the rail to the rear of the rack. The customer's rack might be different than the one shown here, and if so, might require different clip nuts or fasteners.

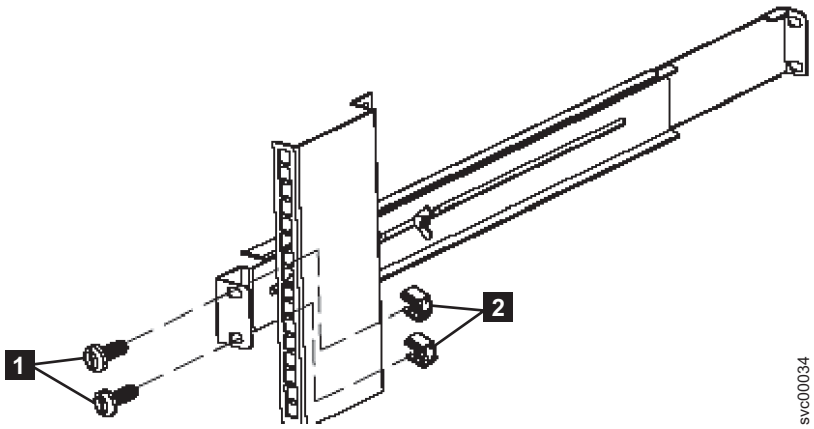


Figure 17. Securing the rear rail on the 2145 UPS-1U

8. Attach only the bottom hole of the rail to the front of the rack with one M6 × 10 screw and one clip nut (**1** in Figure 18).

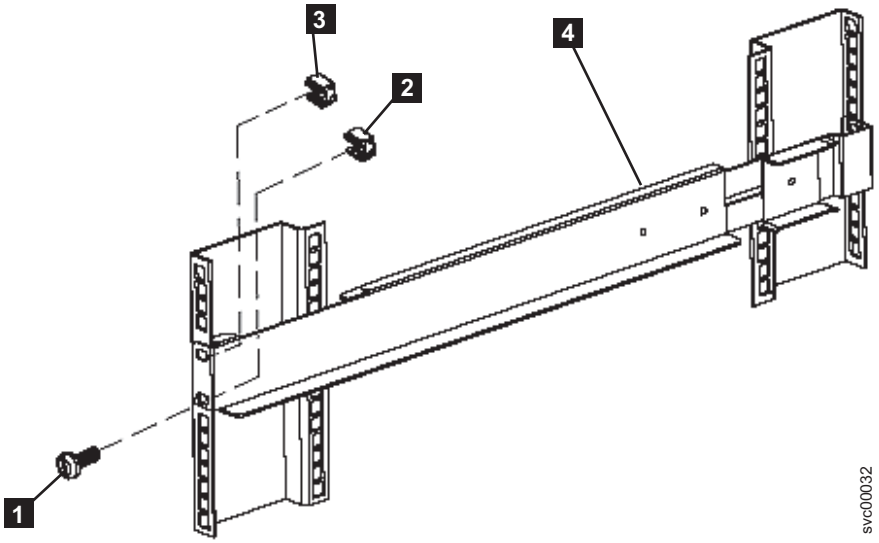


Figure 18. Securing the front rail on the 2145 UPS-1U

9. Install a clip nut in the top hole of the rail **3**.
10. Repeat step 7 on page 42 through step 9 for the other rail.
11. Tighten the assembly 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 uninterruptible power supply-1U (2145 UPS-1U) in the rack.

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

CAUTION:
The 2145 UPS-1U contains its own energy source (sealed, lead-acid batteries). The output receptacles might carry live voltage, even when the 2145 UPS-1U is not connected to an ac supply. (11)

CAUTION:
Do not remove or unplug the input cord when the 2145 UPS-1U is turned on. This removes the safety ground from the 2145 UPS-1U and the equipment connected to the 2145 UPS-1U. (12)

CAUTION:
To reduce the risk of fire or electric shock, install the 2145 UPS-1U 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.

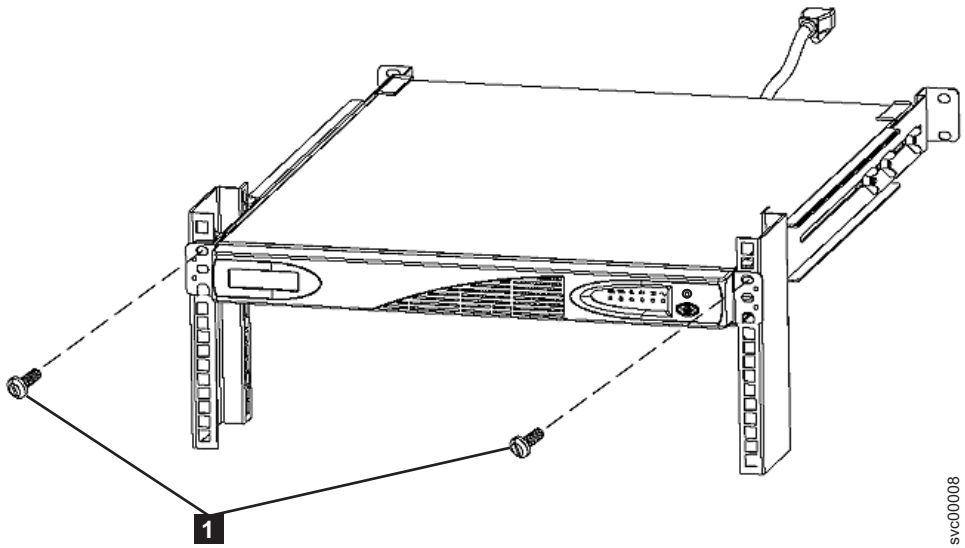
Perform the following steps to install the 2145 UPS-1U in the rack:

Note: You might have already completed steps 3 on page 45 through 6 on page 46 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.

   Note: The 2145 UPS-1U weighs 16 kg. If you feel unsure about lifting the UPS 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 **1** .



3. If you have not already connected the internal battery connector, remove the 2145 UPS-1U front panel.

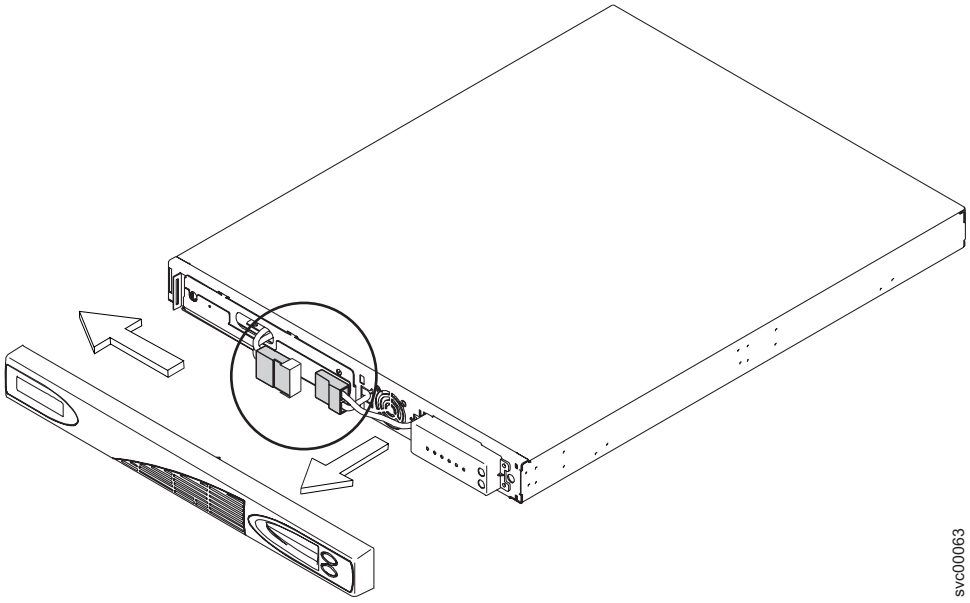


Figure 19. Removing the 2145 UPS-1U front panel

4. Remove the protective label from the internal battery connector.

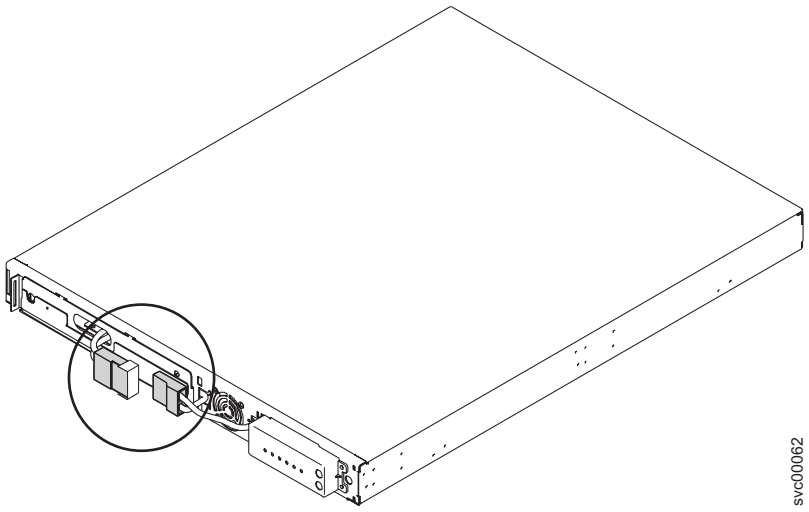


Figure 20. The 2145 UPS-1U internal battery connector with protective tape

5. Connect the internal battery connector. Each end of the keyed connector has two wires: one red (+) and one black (–). Join the black wires and the red wires 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.

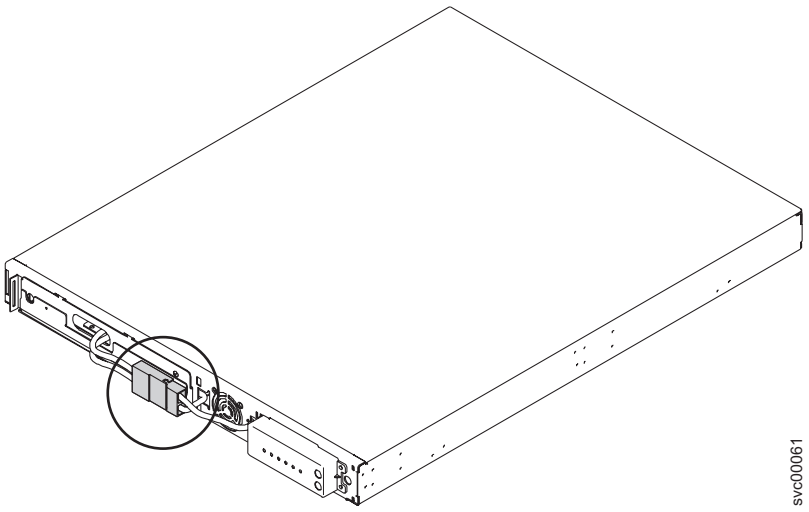


Figure 21. The 2145 UPS-1U internal battery connector

6. Reinstall the front panel. You might need to move the sliding section on the front of the 2145 UPS-1U to the closed position first.
7. At the back of the 2145 UPS-1U, plug the 2145 UPS-1U main power connector into the power socket (**1** in the following figure). The 2145 UPS-1U is in standby mode, so all indicators are off.

   It is recommended that each 2145 UPS-1U for an I/O group is connected to a different power source.

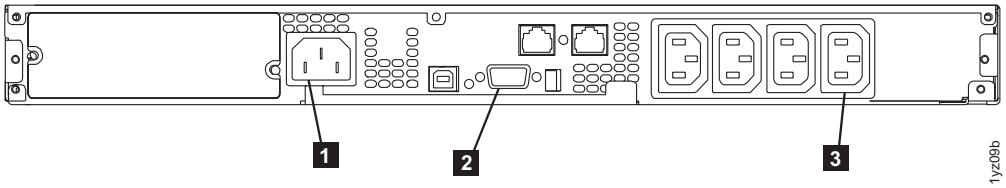


Figure 22. 2145 UPS-1U (rear view)

1 Mains power connector

2 Communication port

3 Load segment 2 receptacle

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 cluster malfunctions.

8. Press and hold the on/off button **2** for approximately five seconds. The front panel indicators cycle through a startup sequence while the 2145 UPS-1U conducts a self-test.

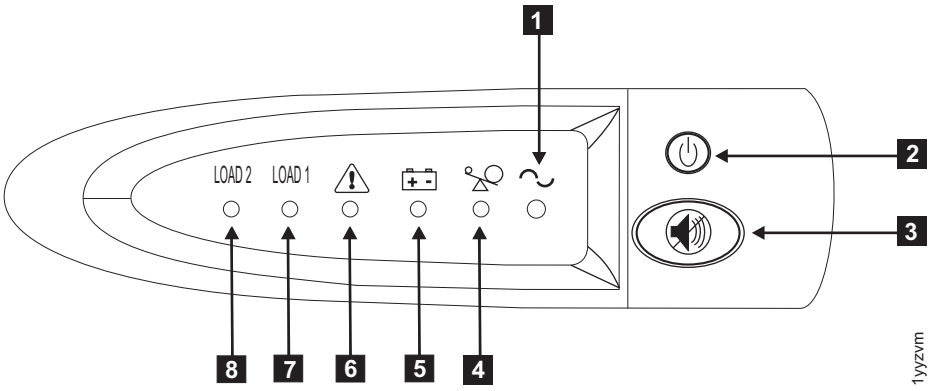


Figure 23. The 2145 UPS-1U front panel assembly

When the self-test is complete, the power-on indicator **1** and the load indicators (**7** and **8**) 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 power-on indicator **1** is flashing red 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 powered on.

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

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 2145-8G4 or the SAN Volume Controller 2145-8F4 is stable.

Install the bracket after you have installed the power cable between the 2145 UPS-1U and the SAN Volume Controller 2145-8G4 or the SAN Volume Controller 2145-8F4 node.

You can attach the bracket by performing the following steps:

1. Install the power cable into the rightmost power supply on the rear of the 2145 UPS-1U.
2. Remove the bracket and the two screws (shown in Figure 24 on page 48) from the packaging.

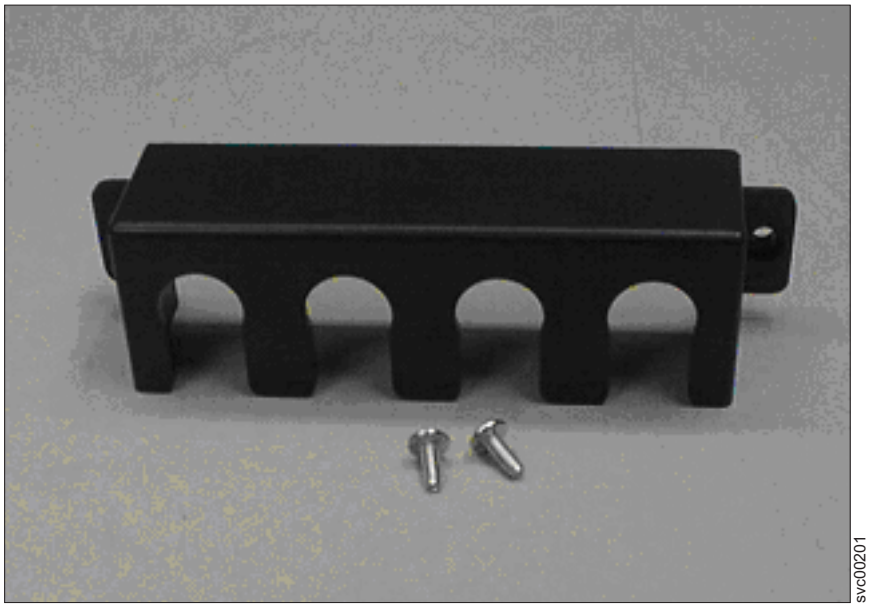


Figure 24. 2145 UPS-1U power cable retention bracket hardware

3. Place the bracket over the power supply inlets 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 25.

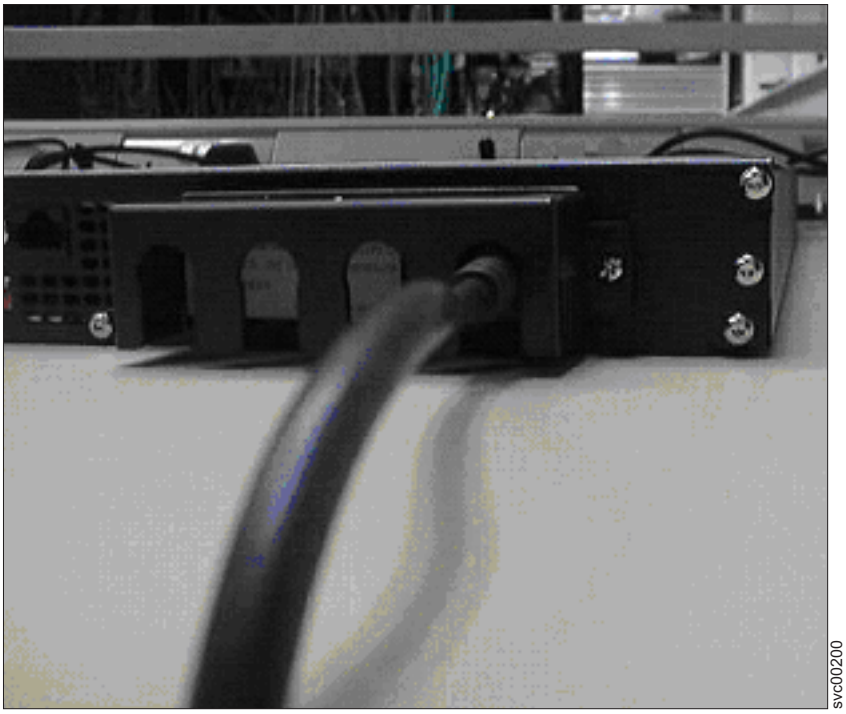


Figure 25. 2145 UPS-1U power cable retention bracket

Installing the SAN Volume Controller 2145-8G4

There are several steps that you must perform to install the SAN Volume Controller 2145-8G4 node.

Installing the SAN Volume Controller 2145-8G4 consists of the following tasks:

1. Installing the support rails in the rack cabinet.
2. Installing the SAN Volume Controller 2145-8G4.
3. Connecting the SAN Volume Controller 2145-8G4 to the UPS.
4. Installing the cable retention bracket on the SAN Volume Controller 2145-8G4.

Installation guidelines

Before you install the support rails, review the following guidelines:

- Do not install a unit in a rack where the internal rack ambient temperatures exceeds the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.
- 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 starting at the bottom of the rack cabinet.
- 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 master console. The front panel of the node protrudes beyond the front of the rack and overlaps part of the monitor, which prevents you from being able to open it.

Installing the support rails for the SAN Volume Controller 2145-8G4

You must install the support rails that hold the SAN Volume Controller 2145-8G4.

When you are ready to install the support rails, perform the following tasks:

- Refer to the Hardware Location Chart to determine where the SAN Volume Controller is to be installed in the rack.
- Refer to the Electronic Industries Alliance (EIA) markings on the rack and decide where you are going to install the support rails.

Perform the following steps to install the support rails (shown in Figure 26 on page 50) for the SAN Volume Controller 2145-8G4:

1. Make sure you have all the items that you need for installing the support rails.

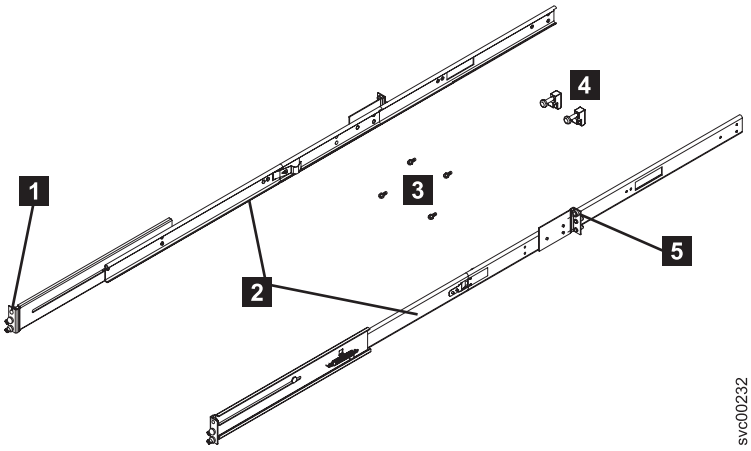


Figure 26. SAN Volume Controller 2145-8G4 support rails installation kit

1 Rear of rail

2 Rack mounting rails

3 M6 screws

4 Latches

5 Front of rail

Note: If possible, you might find that it helps to remove the rack doors and side panels to provide easier access during installation.

2. Check the labels on the support rails. Each rail has a label that indicates which is the front end of the rail and whether the rail is for the left or right side of the rack. Perform this procedure for both rails.
3. Insert the right slide rail 2 into the rear rack mounting flange, as shown in Figure 27, with the rail pins 1 protruding through the flange.

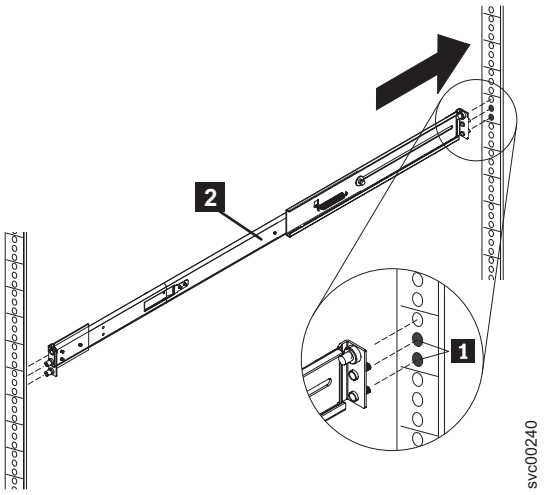


Figure 27. Inserting the right slide rail into the rear rack mounting flange

4. Extend the right slide rail 2 and insert it into the front rack mounting flange, as shown in Figure 28 on page 51, with the rail pins 1 protruding through

the flange. Insert the left slide rail in the same way.

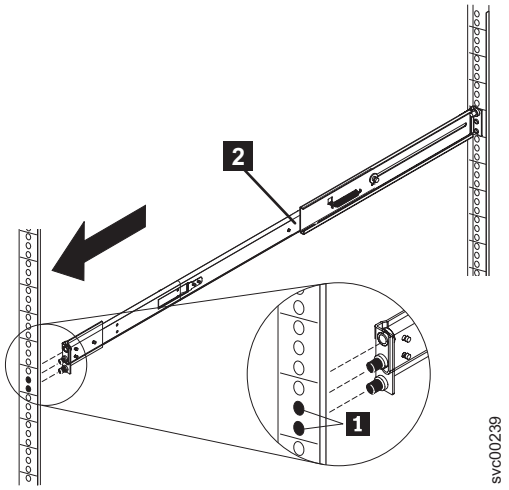


Figure 28. Extending the right slide rail

5. Attach one latch strike **1** to the front of the right rail **2**, as shown in Figure 29, using the captive screw **3**. The screw should be only finger tight. Attach the other latch strike to the front of the left rail in the same way.

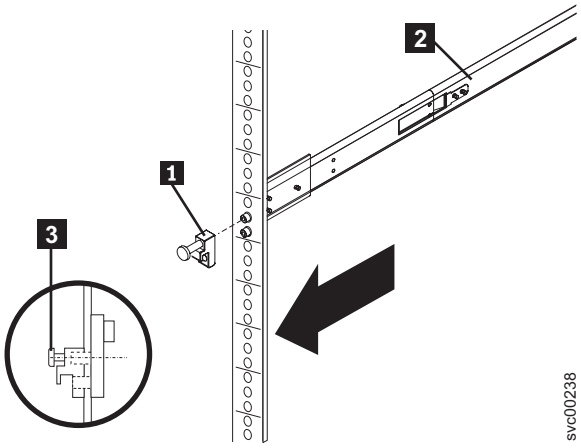


Figure 29. Attaching the latch strike to the front of the rail

6. Attach the slide rail to the left rear mounting flange **1** with a single screw **2**, as shown in Figure 30 on page 52. The screw should be only finger tight. Likewise, attach the other slide rail to the right rear mounting flange.

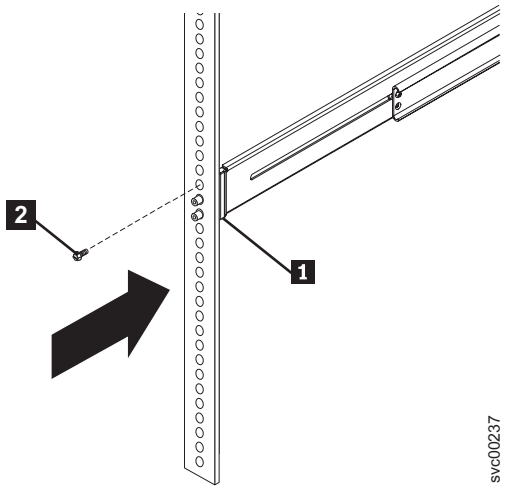


Figure 30. Attaching the slide rail to the rear mounting flange

The installation of the support rails for the SAN Volume Controller 2145-8G4 is complete.

Installing the SAN Volume Controller 2145-8G4 in a rack

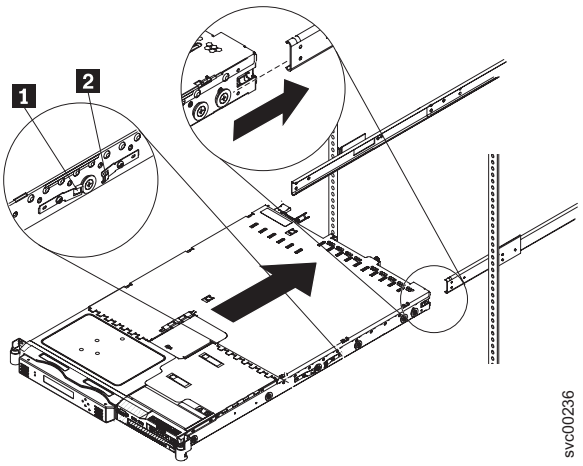
After installing the support rails, you can install the SAN Volume Controller 2145-8G4 in the rack.

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.

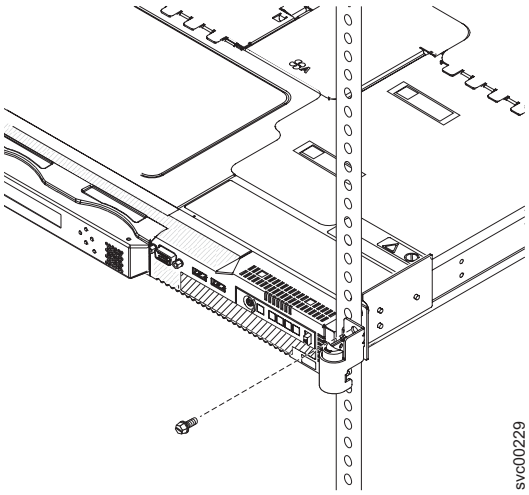
Perform the following steps to install the SAN Volume Controller 2145-8G4, which is also called a "node", in the rack:

1. Extend the slides approximately 150 mm (6 inches) from the front of the rack cabinet.
2. Remove the protective metal guard and the shipping bracket from the back of the node.
3. Align the two rear wheels on the node with the opening in the slides and then push the node into the slides until the rear slide release latches **2** click into place, locking the node in the slides.

   Note: If two people are available, one person can stand on either side of the node to lift it into the rack.



4. Pull the node out of the rack so the slides are fully extended.
5. Press the front slide release latches **1** on both sides of the node and move the node into the rack cabinet and back out to verify that the node moves freely.
6. Securely tighten the four mounting screws that you previously installed at the front and rear of both rails.



7. Press the front slide release latches **1** and push the node all the way into the rack cabinet.

   Attention: Use only the rear slide release latches **2** to remove the SAN Volume Controller 2145-8G4 from the rack.
8. Repeat this procedure for each SAN Volume Controller 2145-8G4 that needs to be installed.

   Tip: If you have available space, leave a 1U space between each node to improve the air circulation in the rack.

Connecting the SAN Volume Controller 2145-8G4 to the 2145 UPS-1U

Before you connect the SAN Volume Controller 2145-8G4 node to the 2145 uninterruptible power supply-1U (2145 UPS-1U), review the restrictions that exist between the two systems.

Note: To make the SAN Volume Controller cluster more resilient to power failure, the 2145 UPS-1Us can be connected to the redundant ac power switch. If a redundant ac power switch is not used, connecting the two UPS units that are powering an I/O group to different, independent electrical power sources allows the SAN Volume Controller cluster to continue to operate with reduced capacity if a single power source fails.

Before you begin this task, see the user's cable connection table, which is provided at http://www.ibm.com/storage/support/2145. Use this table to identify the 2145 UPS-1U to which this SAN Volume Controller 2145-8G4 is to be connected.

Perform the following steps to connect the SAN Volume Controller 2145-8G4 to the 2145 UPS-1U:

1. At the back of the SAN Volume Controller 2145-8G4, plug the power cable of the combined power and serial cable into the power connector **2**, as shown in Figure 31.

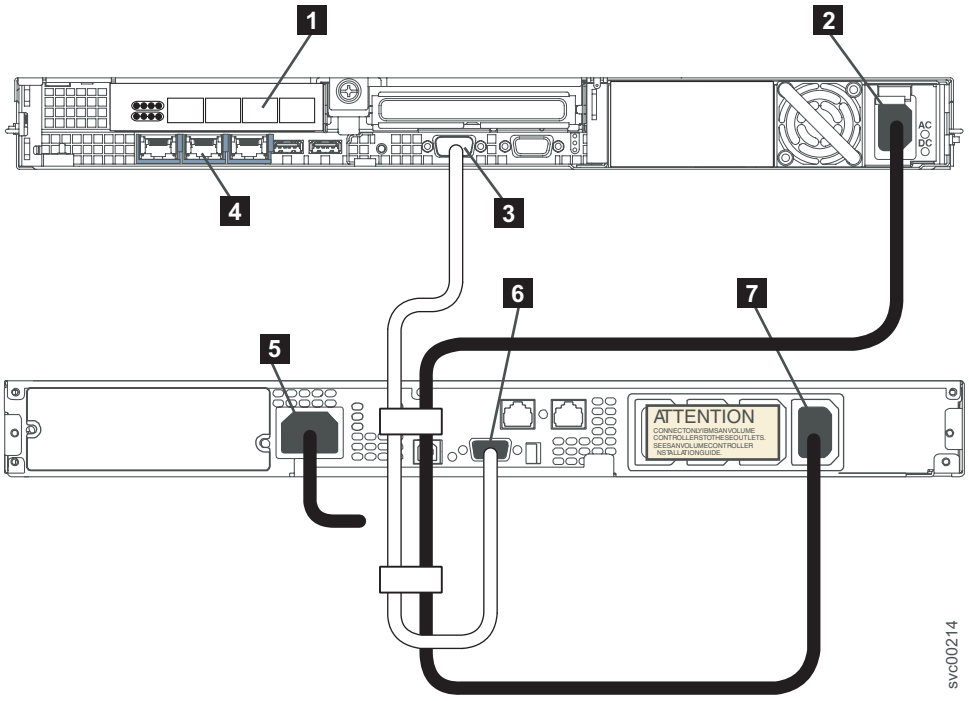


Figure 31. Connecting the SAN Volume Controller 2145-8G4 power cable to the 2145 UPS-1U

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 cable into the rightmost load segment 2 receptacle **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 2145-8G4.
4. Place the other end of the signal cable into the communication port **6** on the 2145 UPS-1U.

The SAN Volume Controller 2145-8G4 power is now connected to the 2145 UPS-1U.

Installing the SAN Volume Controller 2145-8G4 cable retention bracket

The cable retention bracket ensures that the SAN Volume Controller 2145-8G4 node does not mistakenly become unplugged from the uninterruptible power supply (UPS).

The SAN Volume Controller 2145-8G4 comes with one of two different cable retention brackets. Depending on which bracket you have, use the appropriate instructions to install the cable retention bracket.

- If your cable retention bracket looks like the following, go to "Installing the cable retention bracket - option A" on page 56.

- If your cable retention bracket looks like the following, go to "Installing the cable retention bracket - option B" on page 58.

Installing the cable retention bracket - option A

The cable retention bracket attaches to the back of the SAN Volume Controller 2145-8G4 node. It is connected with the screws that already hold the rear plate of the power supply in place.

Install the SAN Volume Controller 2145-8G4 cable retention bracket after you install the node in the rack.

To attach the bracket to the rack rail, perform the following steps:

1. With the node powered off and the power cable removed, unscrew and remove the two screws **1** on the right side of the rear plate that covers the power supply fan unit, as shown in Figure 32 on page 57.

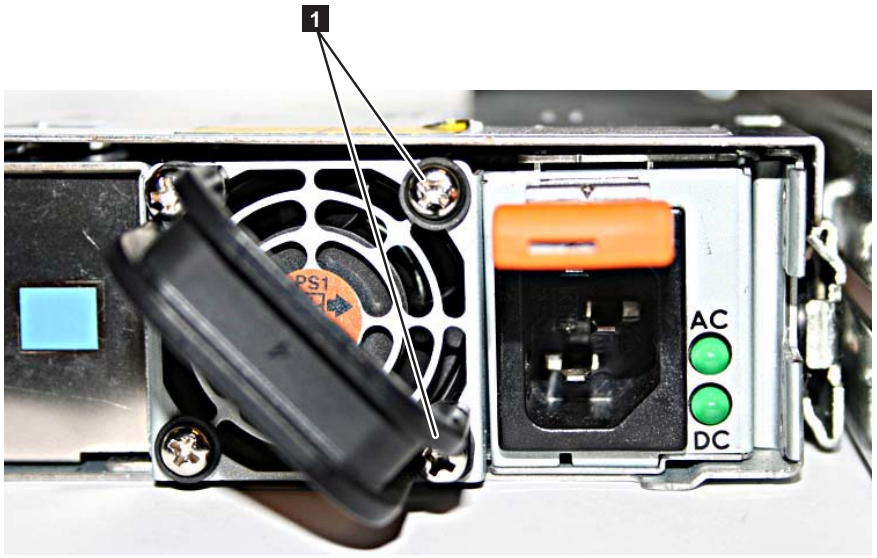


Figure 32. The SAN Volume Controller 2145-8G4 before you attach the cable retention bracket

2. Insert the power cable.
3. Position the cable retention bracket so that the power cable runs through the slot in the bracket, as shown in Figure 33. Align the screw holes in the bracket with the holes that are in the rear plate where you removed the two screws.
4. Replace the top screw.
5. Move the power supply handle back into place over the retention bracket, and replace the lower screw so that it holds the power supply handle, cable retention bracket, and power supply rear plate in place.

Figure 33. The SAN Volume Controller 2145-8G4 with cable retention bracket option A attached

Installing the cable retention bracket - option B

Install the SAN Volume Controller 2145-8G4 cable retention bracket after you install the node in the rack.

To attach the bracket to the rack rail, perform the following steps:

1. Install the power cable into the power supply.
2. At the back of the cabinet, remove the securing bolt from the node side rail next to the power supply, as shown in Figure 34.

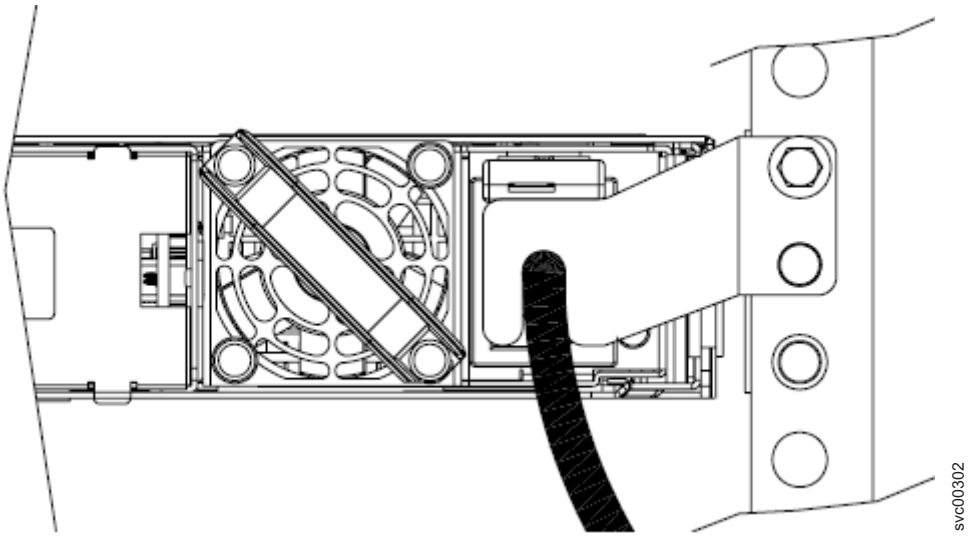


Figure 34. The SAN Volume Controller 2145-8G4 with cable retention bracket option B attached

3. Slide the cable retention bracket over the cable and position over the side rail. Secure it in place using the original bolt.

Note: Remove this cable retention bracket if you need to slide the node forward or out of the rack.

Connecting the SAN Volume Controller 2145-8G4 to the SAN and to the Ethernet network

Before you connect the SAN Volume Controller 2145-8G4 to the SAN, you must connect the Ethernet and fibre-channel cables.

Before you begin this task, refer to the user's cable connection table to find out where to connect the Ethernet and fibre-channel cables.

1. Connect the Ethernet cable to Ethernet port 1 **5** in Figure 35 on page 59.

   Attention: You must use only Ethernet port 1 on the SAN Volume Controller. The software is configured only for Ethernet port 1.
2. Connect the other end of the Ethernet cable to the proper connector on the Ethernet hub or switch.

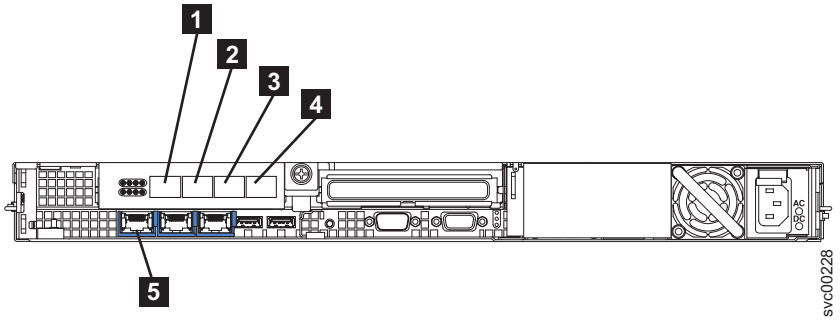


Figure 35. Connectors at the back of the SAN Volume Controller 2145-8G4

1. Fibre-channel port 1
2. Fibre-channel port 2
3. Fibre-channel port 3
4. Fibre-channel port 4
5. Ethernet port 1

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.).

3. Connect the fibre-channel cables to the fibre-channel ports as required by the user's configuration.
4. Connect the other ends of the fibre-channel cables to the proper connectors of the fibre-channel switches.

Complete steps 1 on page 58 through 4 for each node that you need to connect to the SAN and to the Ethernet network.

Verifying the SAN Volume Controller 2145-8G4 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: Start" in the *IBM System Storage SAN Volume Controller: Service Guide*, unless a different maintenance analysis procedure (MAP) is specified.

Perform the following steps to verify installation:

1. Press the SAN Volume Controller power switch. Verify that the green power light is on. If the light is not on, see "MAP 5000: Start" in the *IBM System Storage SAN Volume Controller: Service Guide* to repair the problem.

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

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

In most cases, the battery is delivered charged, so you do not see the `Charging` message. If the Charging message is displayed, you will also see a progress bar on the second line. Battery charging can take up to three hours to complete. In the meantime, if you press any navigation buttons, the battery charging menu is replaced, but battery charging continues. (You can re-enter the menu system to view the charging progress, as described in step 4.) When the battery is charged enough, `Cluster:` is displayed on the first line of the front-panel display. The second line is left blank.

2. Press and hold the select button for five seconds. The check light comes on and a display test is performed. 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 36 shows four examples of what the front panel should display when you press the buttons. When you have finished testing the buttons, press and hold the select button for five seconds in order to exit the test.

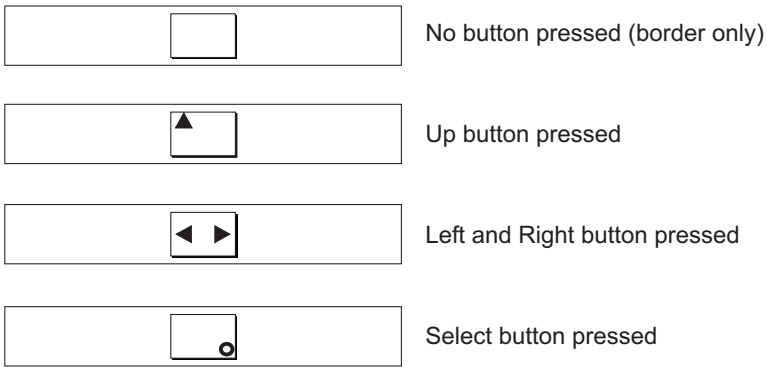


Figure 36. Front panel display when push buttons are pressed

4. If the `Charging` 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 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 37 shows how the node number appears on the front panel.

Figure 37. Node number

7. Press and release the up or down button until the `Ethernet` option is shown on the front panel display. The second line of the front-panel display in Figure 38 on page 61 shows the message `Inactive`. This message indicates

that, although an Ethernet connection is available, it cannot yet be used.

Figure 38. Ethernet mode

8. Press and release the up or down button until the `FC Port-1` option shows in the display.
9. 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: Service Guide* to repair the fault.
10. Press and hold the down button.
11. Press and release the select button.
12. Release the down button. 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 link is operating at the expected speed. If the operational speed does not match the expected speed, go to "MAP 5600: Fibre channel" in the *IBM System Storage SAN Volume Controller: Service Guide* to repair the fault.
13. Press the select button to return to the fibre-channel status display.
14. Press the right button to display each port in turn and repeat the above speed check.
15. If you want to select a language other than English, perform the following steps:
    a. Press the up or down button until `Select Language?` is displayed.
    b. Press the select button.
    c. Press the left or right button until the required language is displayed.
    d. Press the select button.

When the battery is fully charged–if it needed to be charged–the `Charging` message is replaced by `Cluster:` and 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, if necessary, create a new SAN Volume Controller cluster and to add the nodes into a SAN Volume Controller cluster.

Installing the hardware master console

If the master console hardware product option is included with the SAN Volume Controller, you must install it and perform initial hardware configuration for it.

Before you begin the installation, ensure that you have completed the following tasks:

- **Important:** Review and complete all of the safety checks that are detailed in the documentation for the master console IBM eServer xSeries hardware, the keyboard, and the display.
- Ensure that you have all the customer-completed information that you need, including the configuration data table, hardware location chart, and the cable

connection table, which are provided at http://www.ibm.com/storage/support/2145. The *IBM System Storage SAN Volume Controller: Planning Guide* provides guidelines for completing these tables and charts.

If you experience a problem with your master console, use the 2145 machine type and the serial number of the SAN Volume Controller node that was installed with the master console to open a hardware problem.

Perform the following steps to install the master console hardware option:

Note: Do not install the pull-out monitor and keyboard of the master console directly below a SAN Volume Controller node. The front panel of the node protrudes beyond the front of the rack and overlaps part of the monitor, which prevents you from being able to open it.

1. Install the master console hardware in the rack, following the hardware installation instructions that are provided by your xSeries Installation Guide and by the instructions that are provided with the mounting rails.

   If there are any devices directly above and below the master console server unit, it might be very difficult to reach in and connect the cables to the back of the server after it is placed in the rack. If that is the only slot available, connect the keyboard, mouse, monitor, and Ethernet cables at the back of the master console server before installing it in the rack. Leave the other end of the Ethernet cable disconnected from the network until you are directed to connect it.

   Important: Do not follow any *software* installation procedures in the xSeries Installation Guide.
2. Ensure that no cables are connected to the Ethernet ports.
3. Turn on the master console.
   a. Type `administrator` in the User ID field.
   b. Type `passw0rd` in the password field; this password applies to all required password fields. The master console continues to start.

      Note: This process can take several minutes before all services are started and operations are completely responsive.
   c. Click **OK** if you receive any messages that a network interface card port is offline.
4. Check that the reference identification tag is securely fastened to the front panel of the master console. The tag indicates the machine type `2145` and the serial number of the SAN Volume Controller node that is being installed with the master console.
5. **IMPORTANT**: This step must be the last step that you perform on the master console before you hand over the machine to the user. It sets up the master console so that it presents a Windows license agreement screen at the next power on and then shuts down the master console.
   a. Select **Start → Run**
   b. Type `c:\sysprep\sysprep.exe`
   c. Click **OK**. The System Preparation Tool panel is displayed.
   d. Select **Don't re-generate security ID**.
   e. Select **Reboot** from the **Shutdown Mode** list.
   f. Click **Reseal**.

Note: It is important that you do this step; otherwise, the user is not presented later with the choice to accept or decline Windows registration conditions.

6. Connect the master console to the Ethernet port that is designated in the Cable connection table.

Appendix A. SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2

The SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 nodes have some unique features, controls and indicators, rear panel indicators, hardware components, and connectors.

Features of a SAN Volume Controller 2145-8F4 node

The SAN Volume Controller 2145-8F4 node has the following features:

- 19-inch rack-mounted enclosure
- One 4-port 4 Gbps fibre-channel adapter (four fibre-channel ports)
- 8 GB cache memory

Features of a SAN Volume Controller 2145-8F2 node

The SAN Volume Controller 2145-8F2 node has the following features:

- 19-inch rack-mounted enclosure
- Two 2 Gbps 2-port fibre-channel adapters (four fibre-channel ports)
- 8 GB cache memory

Preparing your SAN Volume Controller 2145-8F4 or SAN Volume Controller 2145-8F2 environment

Before installing the SAN Volume Controller 2145-8F4 or SAN Volume Controller 2145-8F2, you must prepare the physical environment.

Input-voltage requirements

Ensure that the following requirements for each SAN Volume Controller 2145-8F4 or SAN Volume Controller 2145-8F2 node are met:

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

Power requirements for each node

Ensure that the following power is available for each SAN Volume Controller 2145-8F4 or SAN Volume Controller 2145-8F2 node. The power that is required depends on the node type, the uninterruptible power supply (UPS) type, and whether the redundant ac power feature is used.

Components	Power requirements
SAN Volume Controller 2145-8F4 + 2145 UPS-1U	520 W
SAN Volume Controller 2145-8F2 + 2145 UPS-1U	520 W
SAN Volume Controller 2145-4F2 + 2145 UPS-1U	420 W

Components	Power requirements
One SAN Volume Controller 2145-4F2 + one 2145 UPS	760 W
Two SAN Volume Controller 2145-4F2 nodes + one 2145 UPS	1120 W

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

Circuit breaker requirements

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

Environment requirements without redundant ac power

Environment	Temperature	Altitude	Relative humidity	Maximum wet bulb temperature
Operating in lower altitudes	10°C to 35°C (50°F to 95°F)	0 to 914 m (0 to 2998 ft)	8% to 80% noncondensing	23°C (74°F)
Operating in higher altitudes	10°C to 32°C (50°F to 88°F)	914 to 2133 m (2998 to 6988 ft)	8% to 80% noncondensing	23°C (74°F)
Powered off	10°C to 43°C (50°F to 110°F)	0 to 2133 m (2998 to 6988 ft)	8% to 80% noncondensing	27°C (81°F)
Storing	1°C to 60°C (34°F to 140°F)	0 to 2133 m (0 to 6988 ft)	5% to 80% noncondensing	29°C (84°F)
Shipping	-20°C to 60°C (-4°F to 140°F)	0 to 10668 m (0 to 34991 ft)	5% to 100% condensing, but no precipitation	29°C (84°F)

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 89°F)	0 to 914 m (0 to 2998 ft)	20% to 80% noncondensing	23°C (74°F)
Operating in higher altitudes	15°C to 32°C (50°F to 88°F)	914 to 2133 m (2998 to 6988 ft)	20% to 80% noncondensing	23°C (74°F)
Powered off	10°C to 43°C (50°F to 110°F)	0 to 2133m (0 to 6988 ft)	20% to 80% noncondensing	27°C (81°F)
Storing	1°C to 60°C (34°F to 140°F)	0 to 2133 m (0 to 6988 ft)	5% to 80% noncondensing	29°C (84°F)
Shipping	-20°C to 60°C (-4°F to 140°F)	0 to 10668 m (0 to 34991 ft)	5% to 100% condensing, but no precipitation	29°C (84°F)

Preparing your environment

The following three tables list the physical dimensions and weight of the node, the additional space requirements around a node, and the maximum heat dissipated

by a node that you must consider before you install your SAN Volume Controller 2145-8F2 or SAN Volume Controller 2145-8F4:

Dimensions and weight

Height	Width	Depth	Maximum weight
43 mm (1.69 in.)	440 mm (17.32 in.)	686 mm (27 in.)	12.7 kg (28 lb)

Additional space requirements

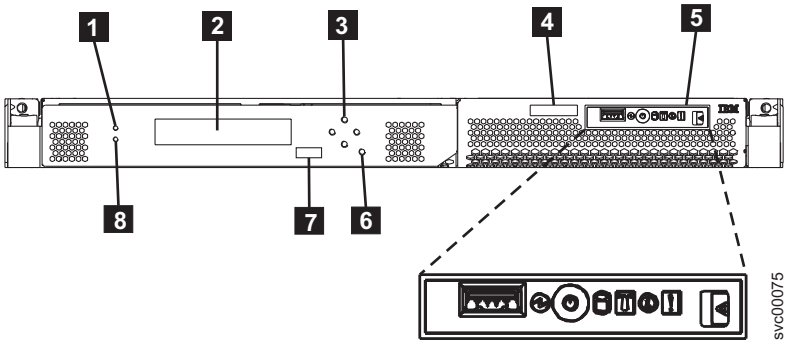
Location	Additional space requirements	Reason
Left and right sides	50 mm (2 in.)	Cooling air flow
Back	Minimum: 100 mm (4 in.)	Cable exit

Heat output of each SAN Volume Controller 2145-8F4 or SAN Volume Controller 2145-8F2 node

Model	Heat output per node
SAN Volume Controller 2145-8F4	450 W (1540 Btu per hour)
SAN Volume Controller 2145-8F2	450 W (1540 Btu per hour)

SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 controls and indicators

The following figure shows the controls and indicators on the front panel of the SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2.



1. Cache LED
2. Front panel display
3. Navigation buttons
4. Serial number label
5. Operator information panel (see the operator information panel topic)

6 Select button

7 Node identification label

8 Error LED

Cache LED

System activity is indicated through the green, cache LED.

Table 2 describes the system activity indicators.

Table 2. Cache LED settings

Cache LED status	Result
Off	The system has not yet started processing.
On	The system is functionally active, has joined a working cluster, and is processing data.
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). Do not remove the power cable or force a power-off action while this LED is flashing.

Front panel display

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

Information on the front panel display is available in several languages. The display can show both alphanumeric information and graphical information (progress bars).

The front panel displays configuration and service information about the SAN Volume Controller and the SAN Volume Controller cluster, 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

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.

Product serial number

The node contains a SAN Volume Controller product serial number that is imbedded on the system board hardware.

This number is used for warranty and service entitlement checking and is included in the data sent with error reports. It is essential that this number is *not* changed during the life of the product. If the system board is replaced, you must follow the system board replacement instructions carefully and rewrite the serial number on the system board.

SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 operator information panel

The operator information panel contains indicators and buttons for the SAN Volume Controller 2145-8F4 or SAN Volume Controller 2145-8F2.

Figure 39 shows the operator panel used by the SAN Volume Controller 2145-8F4 and the SAN Volume Controller 2145-8F2 models.

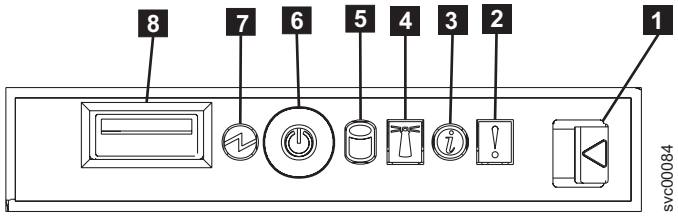


Figure 39. SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 operator information panel

1. Release latch for light path diagnostics panel
2. System-error LED (amber)
3. Information LED (amber)
4. Location LED (blue)
5. Hard disk drive activity LED (green)
6. Power control button
7. Power LED (green)
8. USB connector

Release latch

The release latch gives you access to the light path diagnostics panel, which provides a preliminary method of determining the location of a problem.

After pressing the release latch on the 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" in the *IBM System Storage SAN Volume Controller: Service Guide* for more detail.

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

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" in the *IBM System Storage SAN Volume Controller: Service Guide* to help you to isolate the faulty FRU.

A system-led error LED is also on the rear of the SAN Volume Controller.

Information-Error LED

When the information-error LED is lit, a non-critical event has occurred.

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

Location LED

The SAN Volume Controller does not use the location LED.

Hard disk drive activity LED

When it is lit, the green hard disk drive activity LED indicates that the hard disk drive is in use.

Hard disk drive activity is shown on the hard disk drive activity LED. For the SAN Volume Controller 2145-8F2, hard disk drive activity is also shown on the hard disk drive itself.

Power control button

The power control button switches on or switches off the main power to the SAN Volume Controller.

To turn on the power, press and release the power control button.

To turn off the power, press and release the power control button. For more information about how to power off the SAN Volume Controller node, see "MAP 5350: Powering off a SAN Volume Controller node" in the *IBM System Storage SAN Volume Controller: Service Guide*.

Note: When the node is operational and the power control button is pressed, the SAN Volume Controller indicates on its front panel that it is powering off and writes its control data to its internal disk. This can take up to five minutes. If the power control button is pressed and not released, an immediate power off is performed without writing the SAN Volume Controller control data to disk. Service actions are then required to make the SAN Volume Controller operational again. Therefore, when powering off, you should not press and hold the power control button for more than two seconds.

Note: The 2145 uninterruptible power supply-1U (2145 UPS-1U) does not power off when the SAN Volume Controller is shut down from the power control button.

Power LED

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

The properties of the green power LED are as follows:

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 powered on.

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

Note: A power LED is also on the rear of the server.

Select button

You can 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.

Node identification label

The node identification label on the front panel displays a six-digit node identification number.

The node identification label is the same as the six-digit number that is used in the **svctask addnode** command. It is readable by system software and is used by configuration and service software as a node identifier. The node identifier can also be displayed on the front panel display when `node` is selected from the menu.

If the service controller assembly front panel is replaced, the configuration and service software displays the number that is printed on the front of the replacement panel. Future error reports contain the new number. No cluster reconfiguration is necessary when the front panel is replaced.

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.

SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 rear panel indicators

The rear panel indicators for the SAN Volume Controller 2145-8F4 and the SAN Volume Controller 2145-8F2 are contained on the back panel assembly.

SAN Volume Controller 2145-8F4 rear panel indicators

The following figure shows the rear panel indicators on the SAN Volume Controller 2145-8F4 back panel assembly.

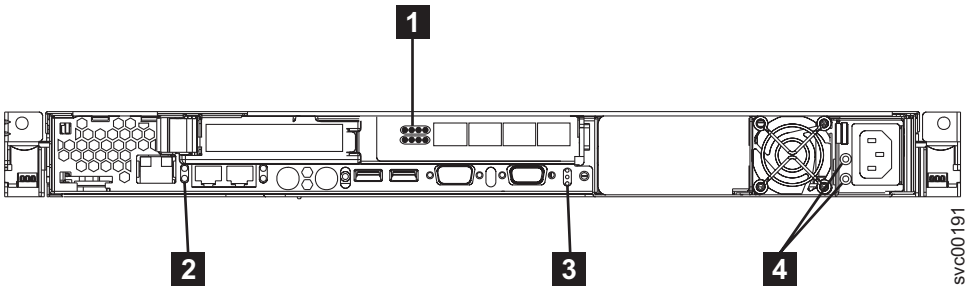


Figure 40. SAN Volume Controller 2145-8F4 rear panel

1. Fibre-channel LEDs
2. Ethernet link LED
3. Power, location, and system error LEDs
4. Ac and dc LEDs

SAN Volume Controller 2145-8F2 rear panel indicators

The following figure shows the rear panel indicators on the SAN Volume Controller 2145-8F2 back panel assembly.

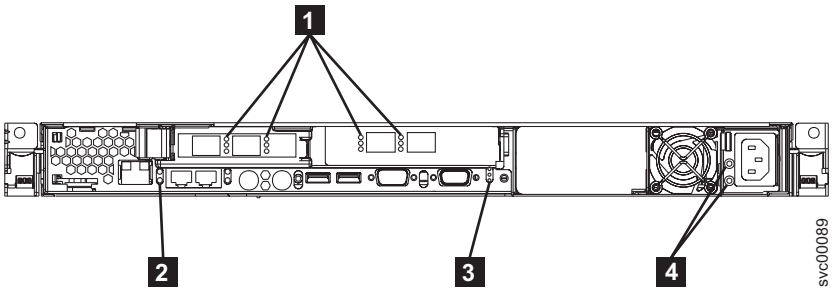


Figure 41. SAN Volume Controller 2145-8F2 rear panel

1. Fibre-channel LEDs
2. Ethernet link LED
3. Power, location, and system error LEDs
4. Ac and dc LEDs

Fibre-channel LEDs

The fibre-channel LEDs indicate the status of the fibre-channel ports.

The SAN Volume Controller 2145-8G4 and SAN Volume Controller 2145-8F4 use two fibre-channel LEDs per fibre-channel port, arranged one above the other. The LEDs are arranged in the same order as the ports.

Table 3 describes the status of the link LEDs.

Table 3. Settings for the SAN Volume Controller 2145-8G4 and SAN Volume Controller 2145-8F4 fibre-channel LEDs

Top LED (link speed)	Bottom LED (link activity)	Link Status
Off	Off	Inactive
Off	On/blinking	Active 1 Gbps
Blinking	On/blinking	Active 2 Gbps
On	On/blinking	Active 4 Gbps

Fibre-channel LEDs on the SAN Volume Controller 2145-8F4

The fibre-channel LEDs on the SAN Volume Controller 2145-8F4 indicate the status of the fibre-channel ports.

Figure 42 shows the fibre-channel LEDs on the SAN Volume Controller 2145-8F4.

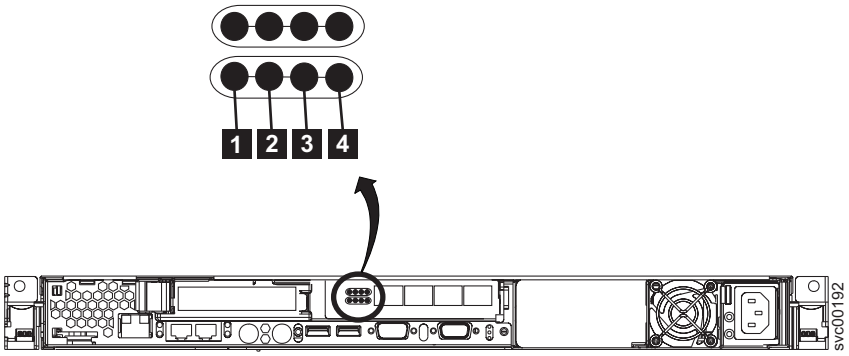


Figure 42. SAN Volume Controller 2145-8F4 fibre-channel LEDs

The fibre-channel LEDs are not used by the SAN Volume Controller 2145-8F2.

Ethernet link LED

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

The Ethernet link LED is located on each Ethernet port; however, only Ethernet port 1 is used during normal operation.

Power, location, and system error LEDs

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

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

Power LED

This is the top of the three LEDs and indicates the following:

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 powered on.

Flashing

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

Location LED

This is the middle of the three LEDs and is not used by the SAN Volume Controller.

System-error LED

This is the bottom of the three LEDs that indicates that a system board error has occurred. The light path diagnostics provide more information.

Ac and dc LEDs

The ac and dc LEDs indicate whether the node is receiving electrical current.

Ac LED

The upper LED **1** next to the power supply, indicates that ac current is present on the node.

Dc LED

The lower LED **2** next to the power supply, indicates that dc current is present on the node.

Ac and dc LEDs on the SAN Volume Controller 2145-8F4 and the SAN Volume Controller 2145-8F2:

The ac LED and dc LED are located on the rear of the SAN Volume Controller 2145-8F4 and the SAN Volume Controller 2145-8F2.

Figure 43 on page 75 shows the location of the ac and dc LEDs.

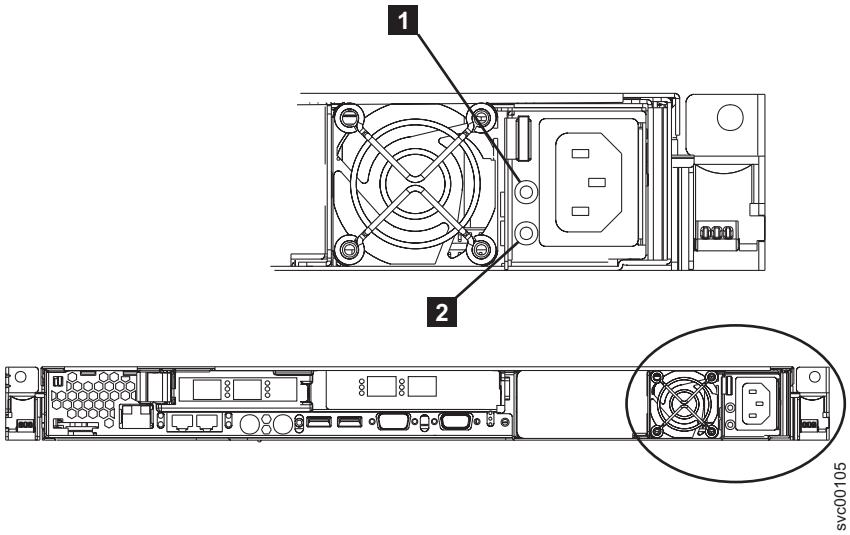


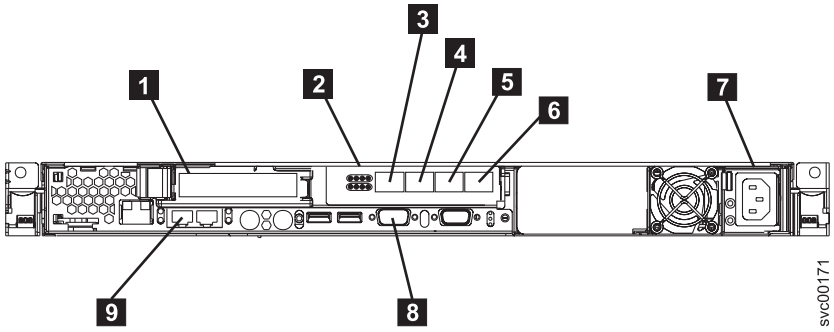
Figure 43. SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 ac and dc LEDs

Physical characteristics of the SAN Volume Controller 2145-8F4 and the SAN Volume Controller 2145-8F2

The following topics provide detailed information about the physical characteristics of the SAN Volume Controller 2145-8G4 .

SAN Volume Controller 2145-8F4 connectors

The external connectors for the SAN Volume Controller 2145-8F4 can be easily located.



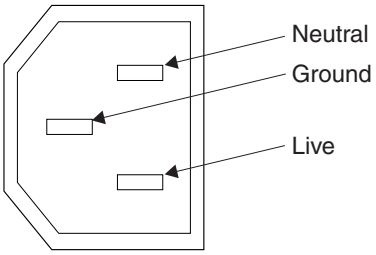
1. PCI slot 1
2. PCI slot 2
3. Fibre-channel port 1
4. Fibre-channel port 2
5. Fibre-channel port 3
6. Fibre-channel port 4

7 Power supply

8 Serial connection

9 Ethernet port 1

The following figure shows the type of connector that is located on the power supply assembly. The connector enables you to connect the SAN Volume Controller 2145-8F4 to the power source from the uninterruptible power supply.



SAN Volume Controller 2145-8F4 ports used during service procedures

The SAN Volume Controller 2145-8F4 contains three service ports: Ethernet port 2, the keyboard port, and the monitor port. These ports are currently not in use. Figure 44 provides the locations of the service ports.

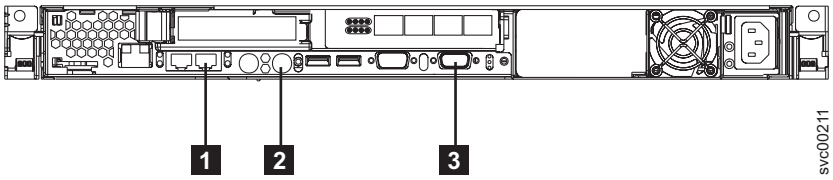


Figure 44. Service ports of the SAN Volume Controller 2145-8F4

1 Ethernet port 2

2 Keyboard port

3 Monitor port

SAN Volume Controller 2145-8F4 ports not used during normal operation

The SAN Volume Controller 2145-8F4 is equipped with several ports that are not used by the SAN Volume Controller during normal operation and that have not been tested. Use of these ports in conjunction with the SAN Volume Controller 2145-8F4, or any other application that might be run on this hardware, is not supported. See Figure 45 on page 77 and Figure 45 on page 77 for those ports that are not used.

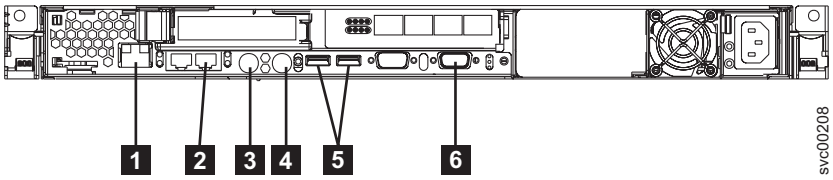


Figure 45. Ports not used by the SAN Volume Controller 2145-8F4

1. System management port
2. Ethernet port 2
3. Mouse port
4. Keyboard port
5. USB ports
6. Monitor port

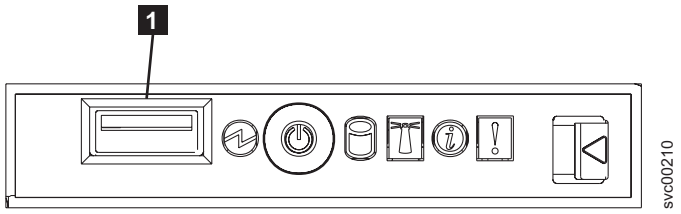
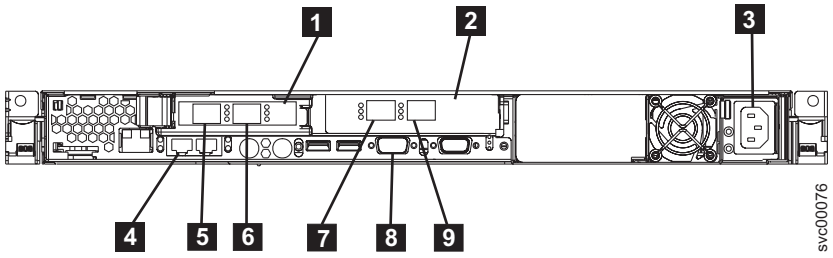


Figure 46. Ports not used on the front panel of the SAN Volume Controller 2145-8F4

1. USB port

SAN Volume Controller 2145-8F2 connectors

The external connectors for the SAN Volume Controller 2145-8F2 can be easily located.

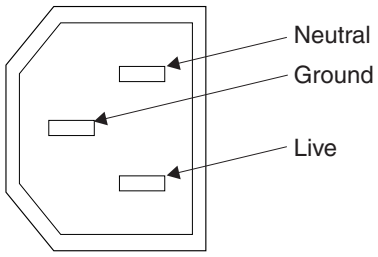


1. PCI slot 1
2. PCI slot 2
3. Power supply
4. Ethernet port 1
5. Fibre-channel port 1
6. Fibre-channel port 2
7. Fibre-channel port 3

8 Serial connection

9 Fibre-channel port 4

The following figure shows the type of connector located on the power supply assembly. The connector enables you to connect the SAN Volume Controller 2145-8F2 to the power source from the uninterruptible power supply.



Fibre-channel port numbers and worldwide port names

Fibre-channel ports are identified by their physical port number and by a worldwide port name (WWPN).

The physical port numbers identify fibre-channel cards and cable connections when you perform service tasks. The WWPNs are used for tasks such as fibre-channel switch configuration and to uniquely identify the devices on the SAN.

The physical port numbers are 1 - 4, counting from left to right when you view the rear panel of the SAN Volume Controller. The WWPNs are derived from the worldwide node name (WWNN) of the SAN Volume Controller in which the card is installed.

The WWNN is in the form 50050768010*XXXXX*, where *XXXXX* is initially derived from the unit and is specific to a SAN Volume Controller. You can change the *XXXXX* value by using the front panel to facilitate service controller concurrent replacement and to enable some concurrent upgrade operations.

The WWPNs are in the form 5005076801*QXXXXX*, where *XXXXX* is as previously stated and *Q* is related to the port number as follows:

Port	Value of Q
1	4
2	3
3	1
4	2

SAN Volume Controller 2145-8F4 fibre-channel port numbers and worldwide port names

The SAN Volume Controller 2145-8F4 fibre-channel ports are identified by their physical port number and by a worldwide port name (WWPN).

Figure 47 provides a view of the rear of the SAN Volume Controller 2145-8F4.

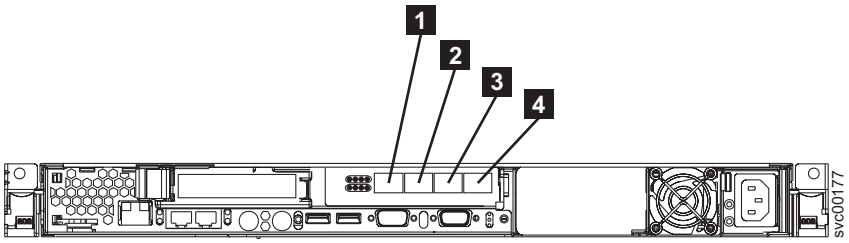


Figure 47. The physical port numbers for the SAN Volume Controller 2145-8F4

SAN Volume Controller 2145-8F2 fibre-channel port numbers and worldwide port names

The SAN Volume Controller 2145-8F2 fibre-channel ports are identified by their physical port number and by a worldwide port name (WWPN).

Figure 48 provides a view of the rear of the SAN Volume Controller 2145-8F2.

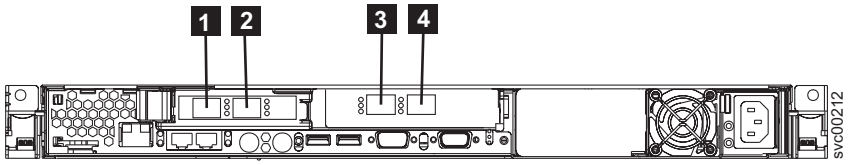


Figure 48. The physical port numbers for the SAN Volume Controller 2145-8F2

Installing the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 hardware

There are several steps that you must perform to prepare and then install the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 hardware.

The following topics describe the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 hardware installation tasks in the order they should be performed.

Note: If you are adding a new I/O group to an existing SAN Volume Controller 2145-8F4 or SAN Volume Controller 2145-8F2 cluster, there is no need to power off the existing, operating cluster 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. Install and verify the redundant ac power switch, if it is to be used and is not already being used for a node.
3. Install the UPS.
4. Install the node.
5. Connect the fibre-channel and Ethernet cables to the node.
6. Connect the node to the UPS.
7. Verify the node.

8. Install and verify the master console, unless it is already installed. Optionally, you can perform this step first.

After you finish these steps, the hardware installation is complete.

Installing the 2145 UPS-1U

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

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 into the rack.
3. Connect the 2145 UPS-1U battery.
4. Connect the power cables to the 2145 UPS-1U.
5. 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 uninterruptible power supply-1U (2145 UPS-1U).

Complete the following prerequisites before installing the support rails:

1. Use the user's hardware location chart to determine where in the rack that the 2145 UPS-1U is to be installed.
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 49.

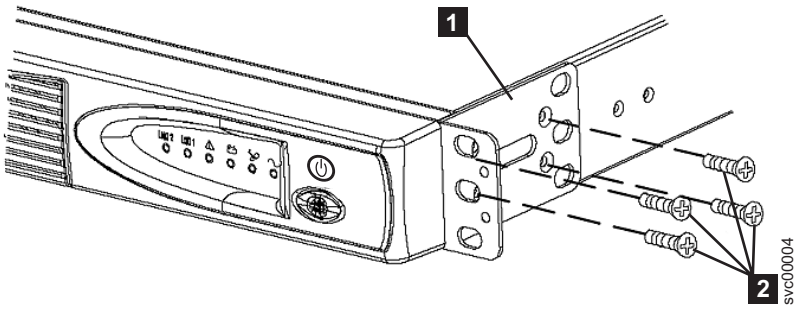


Figure 49. Installing the support rails for a 2145 UPS-1U into the rack

4. Loosen the assembly wing nuts (**1** in Figure 50 on page 81) on both rail assemblies and adjust the rail size to the depth of your rack.

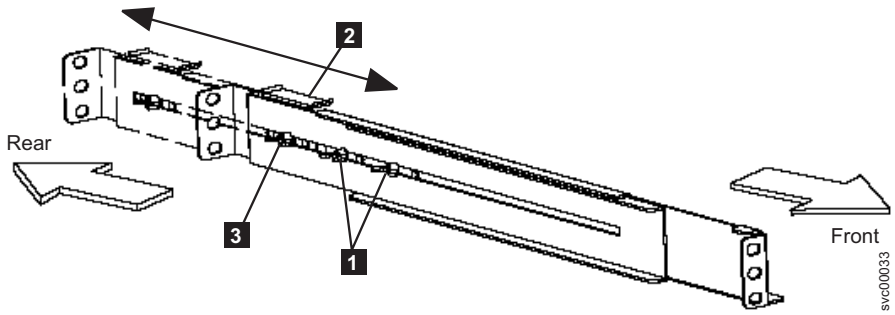


Figure 50. Adjusting the rail depth on the 2145 UPS-1U

1 Assembly wing nuts

2 Hold-down bracket

3 Wing nut

5. Position the rear, hold-down bracket (**2** in Figure 50) towards the end of the rail assemblies and tighten the wing nut (**3** in Figure 50).
6. Select the holes in the rail where you want to position the 2145 UPS-1U.

   Note: The bottom flange of the support rail must align with the EIA mark on the rack.

7. Using two M6 × 10 screws (**1** in Figure 51) and two clip nuts **2**, attach the rail to the rear of the rack. The customer's rack might be different than the one shown here, and if so, might require different clip nuts or fasteners.

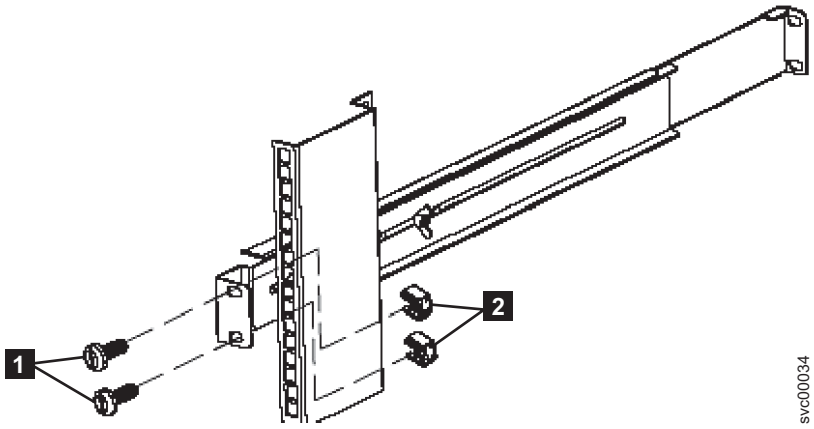


Figure 51. Securing the rear rail on the 2145 UPS-1U

8. Attach only the bottom hole of the rail to the front of the rack with one M6 × 10 screw and one clip nut (**1** in Figure 52 on page 82).

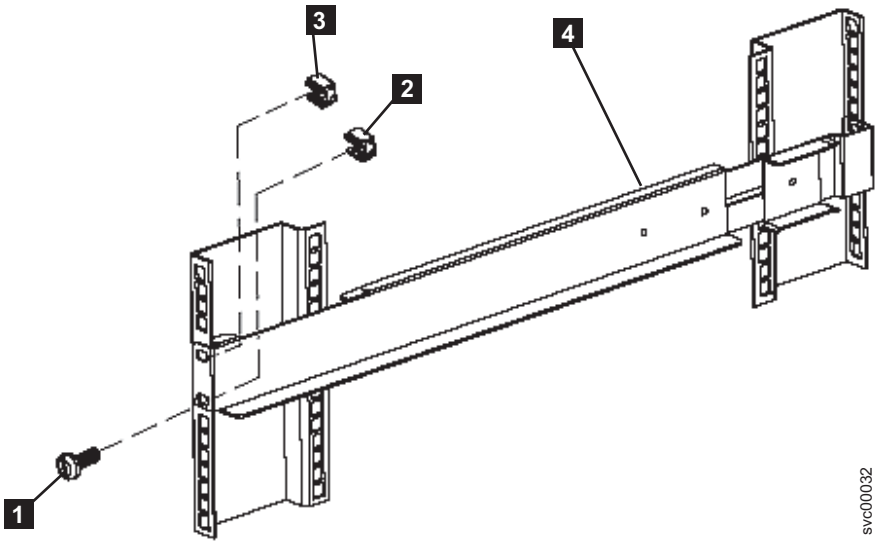


Figure 52. Securing the front rail on the 2145 UPS-1U

9. Install a clip nut in the top hole of the rail **3** .
10. Repeat step 7 on page 81 through step 9 for the other rail.
11. Tighten the assembly 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 uninterruptible power supply-1U (2145 UPS-1U) in the rack.

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

CAUTION:
The 2145 UPS-1U contains its own energy source (sealed, lead-acid batteries). The output receptacles might carry live voltage, even when the 2145 UPS-1U is not connected to an ac supply. (11)

CAUTION:
Do not remove or unplug the input cord when the 2145 UPS-1U is turned on. This removes the safety ground from the 2145 UPS-1U and the equipment connected to the 2145 UPS-1U. (12)

CAUTION:
To reduce the risk of fire or electric shock, install the 2145 UPS-1U 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.

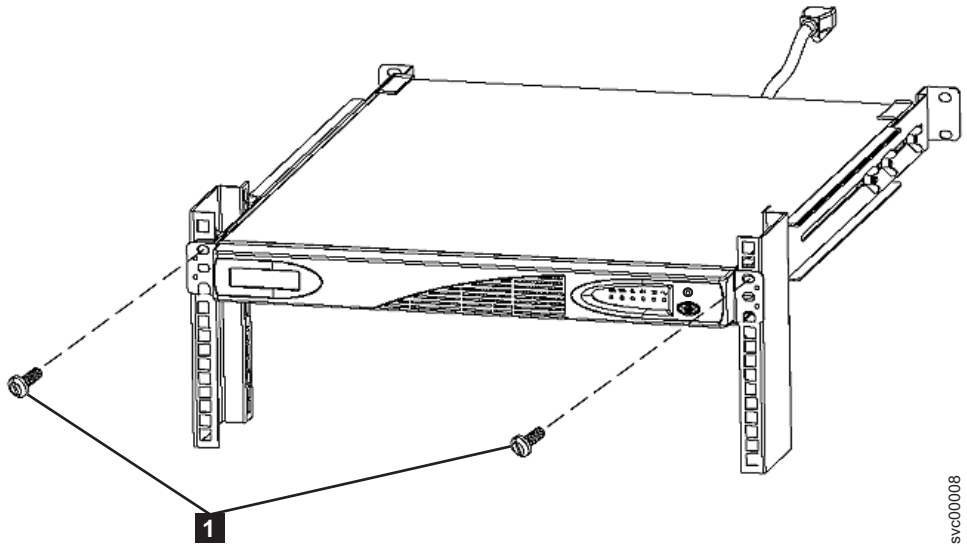
Perform the following steps to install the 2145 UPS-1U in the rack:

Note: You might have already completed steps 3 through 6 on page 84 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.

   Note: The 2145 UPS-1U weighs 16 kg. If you feel unsure about lifting the UPS 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 **1**.



3. If you have not already connected the internal battery connector, remove the 2145 UPS-1U front panel.

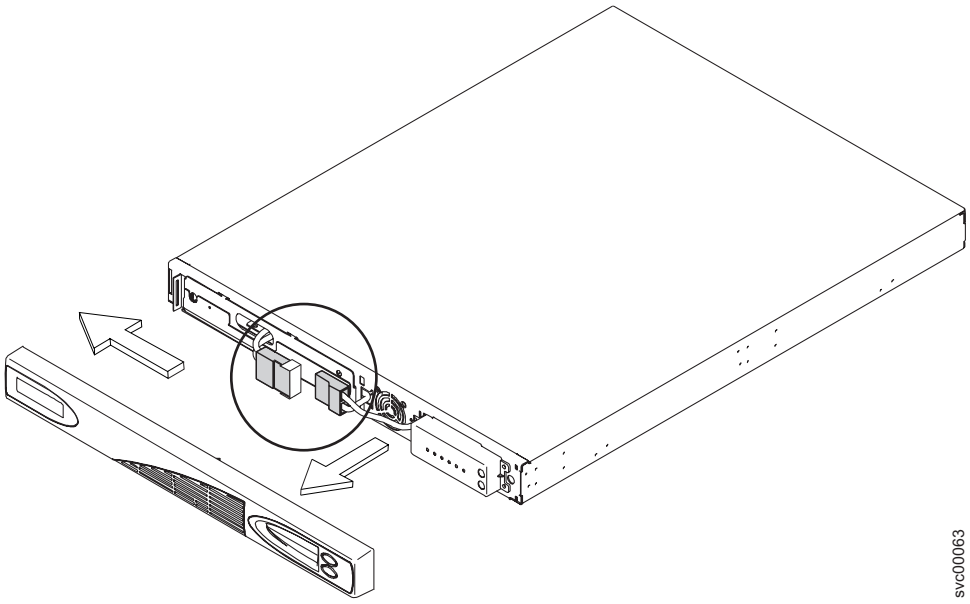


Figure 53. Removing the 2145 UPS-1U front panel

4. Remove the protective label from the internal battery connector.

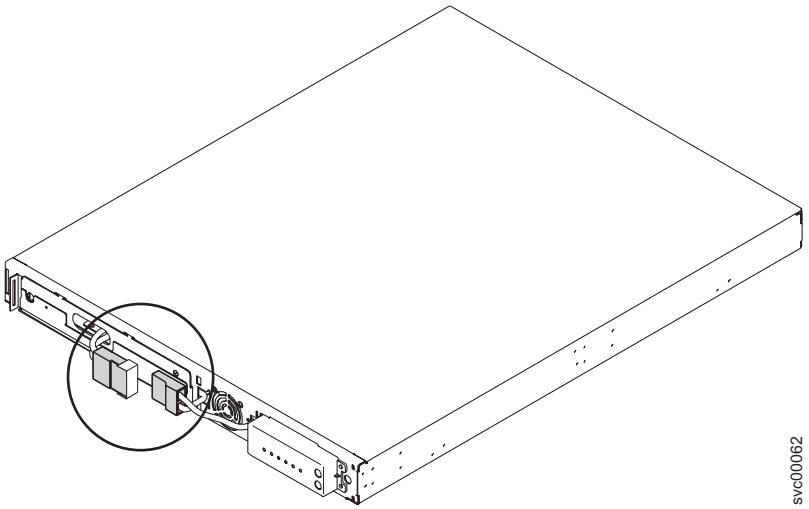


Figure 54. The 2145 UPS-1U internal battery connector with protective tape

5. Connect the internal battery connector. Each end of the keyed connector has two wires: one red (+) and one black (–). Join the black wires and the red wires 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.

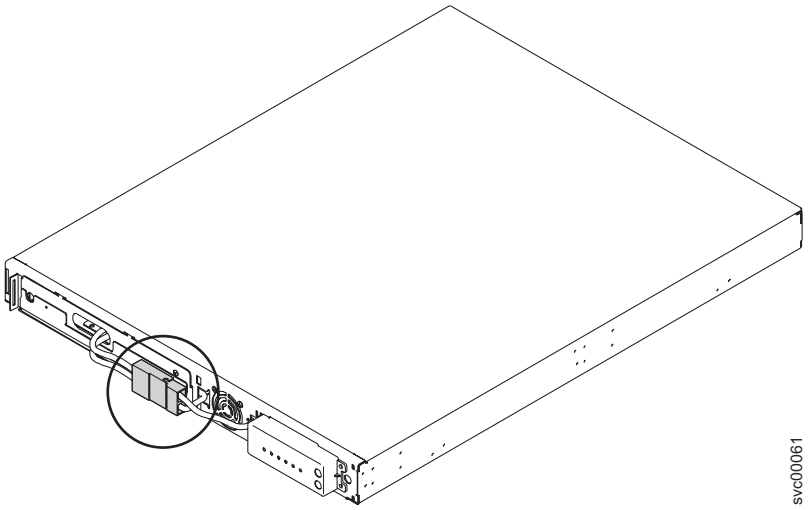


Figure 55. The 2145 UPS-1U internal battery connector

6. Reinstall the front panel. You might need to move the sliding section on the front of the 2145 UPS-1U to the closed position first.
7. At the back of the 2145 UPS-1U, plug the 2145 UPS-1U main power connector into the power socket (**1** in the following figure). The 2145 UPS-1U is in standby mode, so all indicators are off.

   It is recommended that each 2145 UPS-1U for an I/O group is connected to a different power source.

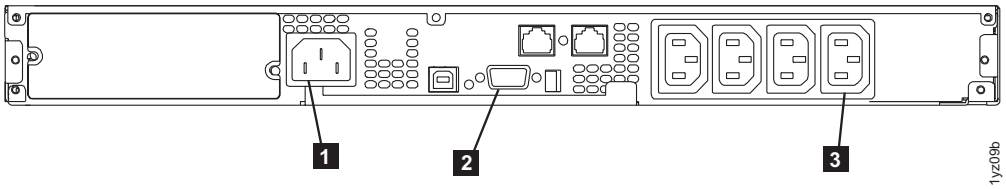


Figure 56. 2145 UPS-1U (rear view)

1 Mains power connector

2 Communication port

3 Load segment 2 receptacle

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 cluster malfunctions.

8. Press and hold the on/off button **2** for approximately five seconds. The front panel indicators cycle through a startup sequence while the 2145 UPS-1U conducts a self-test.

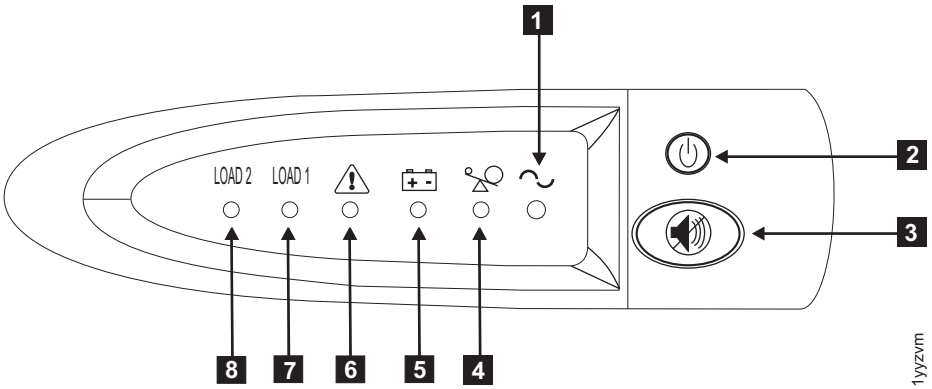


Figure 57. The 2145 UPS-1U front panel assembly

When the self-test is complete, the power-on indicator **1** and the load indicators (**7** and **8**) 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 power-on indicator **1** is flashing red 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 powered on.

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

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 2145-8G4 or the SAN Volume Controller 2145-8F4 is stable.

Install the bracket after you have installed the power cable between the 2145 UPS-1U and the SAN Volume Controller 2145-8G4 or the SAN Volume Controller 2145-8F4 node.

You can attach the bracket by performing the following steps:

1. Install the power cable into the rightmost power supply on the rear of the 2145 UPS-1U.
2. Remove the bracket and the two screws (shown in Figure 58) from the packaging.

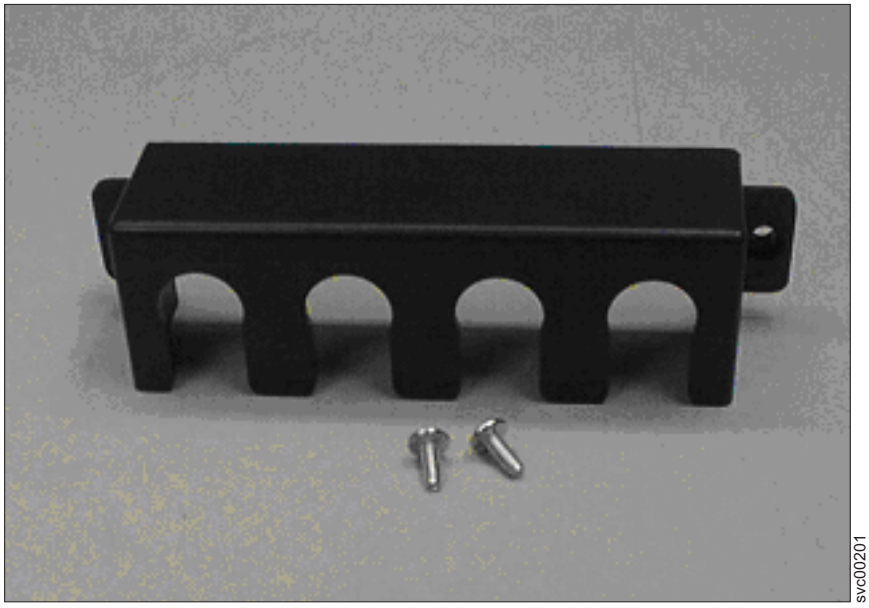


Figure 58. 2145 UPS-1U power cable retention bracket hardware

3. Place the bracket over the power supply inlets 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 59 on page 87.

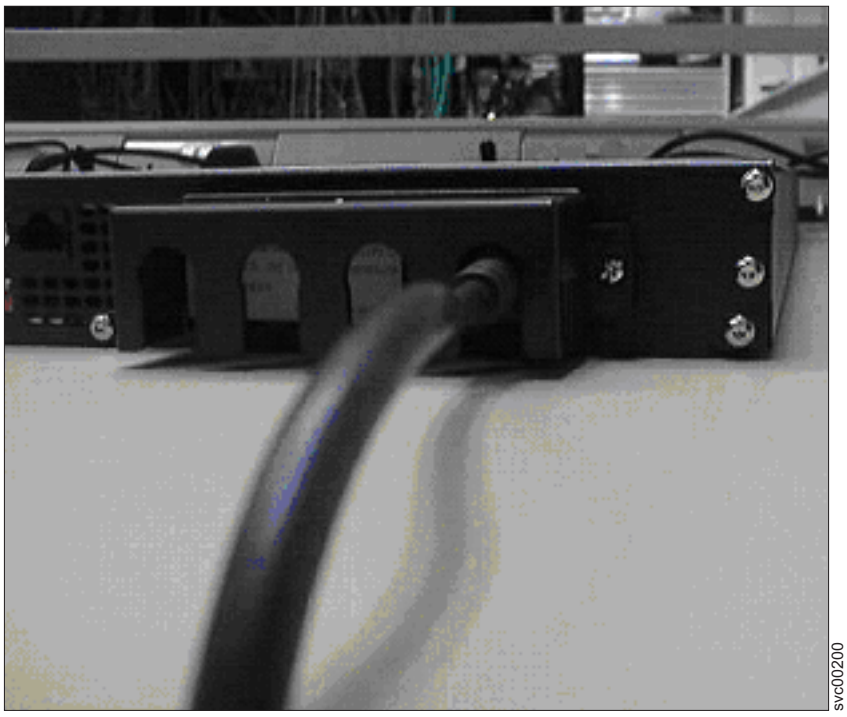


Figure 59. 2145 UPS-1U power cable retention bracket

Installing the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2

There are several steps that you must perform to install the SAN Volume Controller 2145-8G4 node.

Installing the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 consists of the following tasks:

1. Installing the support rails in the rack cabinet.
2. Installing the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2.
3. Connecting the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 to the UPS.
4. Installing the cable retention bracket on the SAN Volume Controller 2145-8F4.

Installing the support rails for the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2

You must install the support rails that hold the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2.

When you are ready to install the support rails, perform the following tasks:

- Refer to the Hardware Location Chart to determine where the SAN Volume Controller is to be installed in the rack.
- Refer to the Electronic Industries Alliance (EIA) markings on the rack and decide where you are going to install the support rails.

Perform the following steps to install the support rails:

1. Check the labels on the support rails. Each rail has a label that indicates which is the front end of the rail and whether the rail is for the left or right side of the rack. Perform this procedure for both rails.
2. Put your index finger against the side of the latch-lever, 1 in Figure 60, and put your thumb against the front of the latch-lock 2.

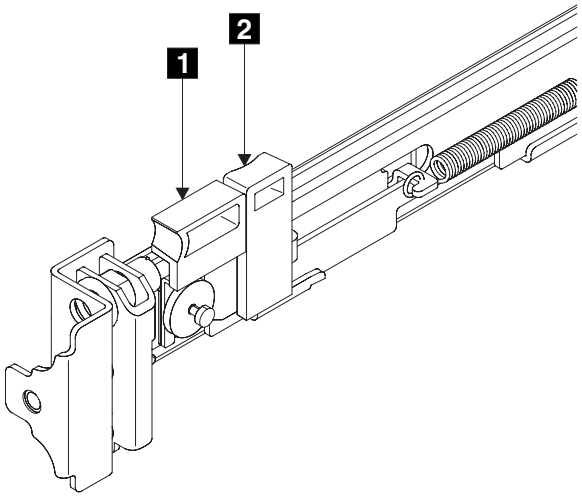


Figure 60. Retracting the latch lock carrier

1 Latch-lever

2 Latch-lock

3. Gently push the latch lock 2 away from the rail as you move the latch lever 1 toward the far end of the rail (Figure 61). The latch-lock carrier assembly slides against the spring tension.

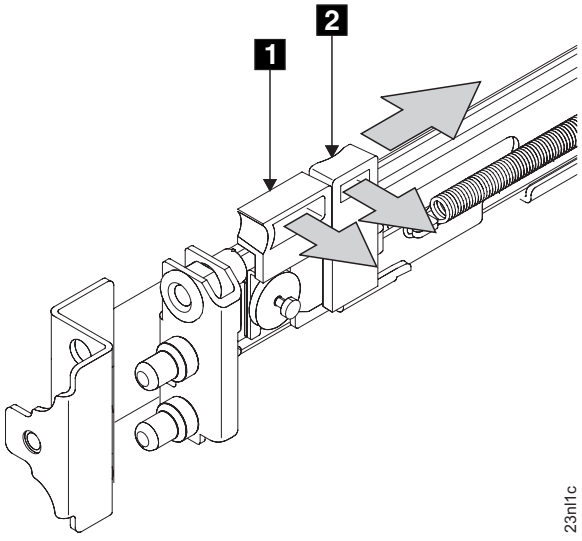


Figure 61. Opening the front latch-lock carrier assembly

1 Latch-lever

2 Latch-lock

4. Continue to slide the latch-lock carrier for approximately 13 mm (0.5 in). The latch-lever engages a hole in the back bracket assembly and holds the latch-lock carrier in the retracted position.
5. Push the back rail bracket **1** (Figure 62) toward the front of the rail until it stops. The rail is now at its shortest adjustment.

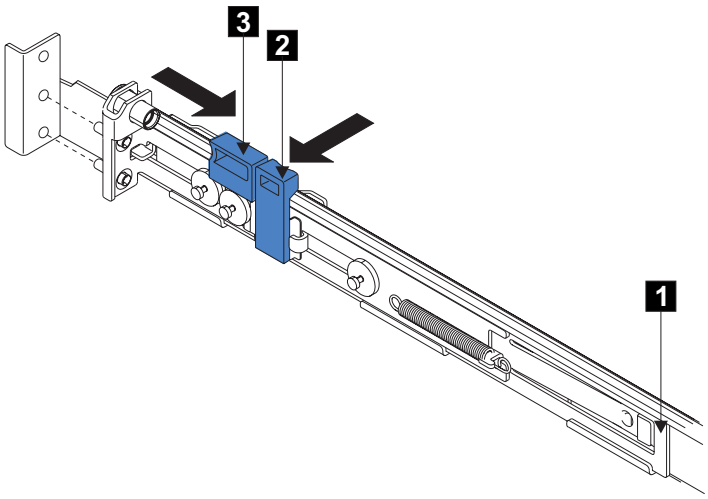


Figure 62. Opening the back latch-lock carrier assembly

1 Back rail bracket

2 Latch-lock

3 Latch-lever

6. Place the front end of the left rail in the rack cabinet. Align the top of the front bracket **1** (Figure 63 on page 90) with the required EIA marking that is on the rack.

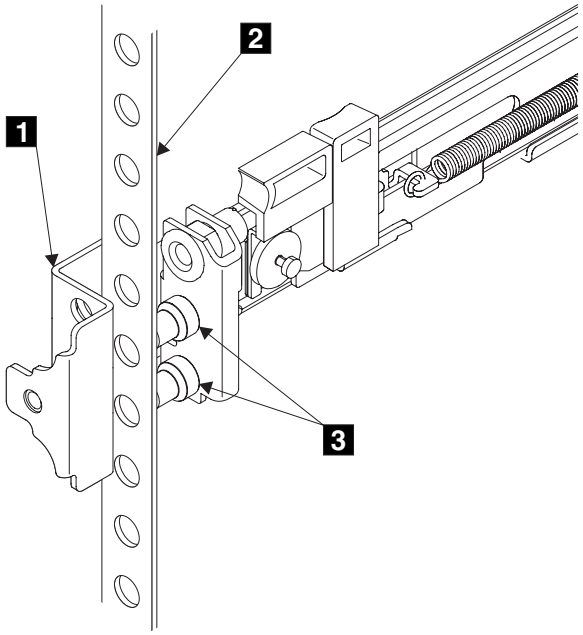


Figure 63. Installing the front end of the rail

1 Front bracket

2 Rack-mounting flange

3 Locating pins

7. Align the locating pins 3 with the holes that are in the rack-mounting flange.
8. Push the latch lock 2 (Figure 64 on page 91) away from the rail to release the carrier. The latch-lock carrier slides toward the front of the rack and the locating pins project through the holes that are in the front flange and in the front rail bracket.

   Important: Ensure that the locating pins are fully extended through the front rail bracket.

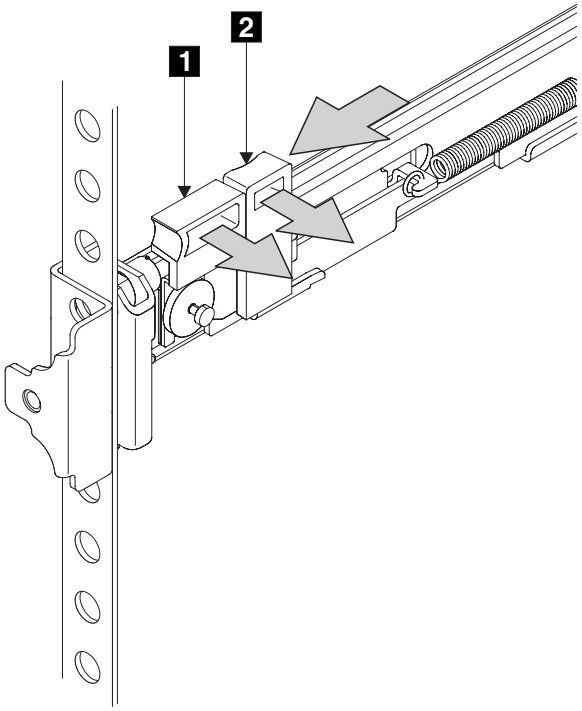


Figure 64. Closing the latch-lock carrier assembly

1 Latch-lever

2 Latch-lock

9. Push the back rail bracket toward the rear of the rack and align the locating pins with the rack-mounting flange.
10. Push the latch lock **2** away from the rail to release the carrier. The latch-lock carrier slides toward the rear of the rack, and the locating pins project through the holes that are in the rear flange and in the rear rail bracket.

    Important: Ensure that the locating pins are fully extended through the rear rail bracket.
11. On the rear of each rail, press the blue release tab and slide the shipping bracket off the slide rail. Store the shipping bracket for further use.

You must perform this procedure for both rails.

Installing the SAN Volume Controller in a rack

After installing the support rails, you can install the SAN Volume Controller in a rack.

Installing the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 in a rack:

After installing the support rails, you can install the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 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.

Perform the following steps to install the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 node in the rack:

1. Stand at the front of the rack and place the back of the node onto the support rails, as low in the rack as possible.
2. Slide the node fully into the rack.

   The node snaps into place.
3. Repeat this procedure for each SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 node that needs to be installed.

   Tip: If you have available space, leave a 1U space between each node to improve the air circulation in the rack.

Connecting the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 to the 2145 UPS-1U

Before you connect the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 node to the 2145 uninterruptible power supply-1U (2145 UPS-1U), review the restrictions that exist between the two systems.

Note: To make the SAN Volume Controller cluster more resilient to power failure, the 2145 UPS-1Us can be connected to the redundant ac power switch. If a redundant ac power switch is not used, connecting the two UPSs that are powering an I/O group to different, independent electrical power sources allows the SAN Volume Controller cluster to continue to operate with reduced capacity if a single power source fails.

Before you begin this task, see the user's cable connection table, which is provided in the *IBM System Storage SAN Volume Controller: Planning Guide* and is also available at http://www.ibm.com/storage/support/2145. Use this table to identify the 2145 UPS-1U to which this SAN Volume Controller 2145-8F4 or SAN Volume Controller 2145-8F2 is to be connected.

Perform the following steps to connect the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 to the 2145 UPS-1U:

1. At the back of the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2, plug the combined power and serial cable into the power connector **2**. See Figure 65 on page 93.

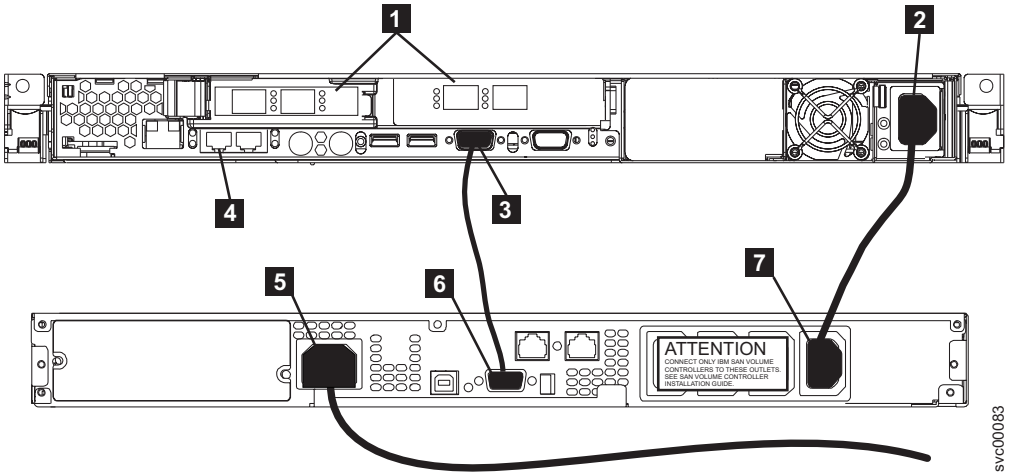


Figure 65. Connecting the SAN Volume Controller 2145-8F2 power cable to the 2145 UPS-1U

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 cable into the rightmost load segment 2 receptacle **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 2145-8F4 or the SAN Volume Controller 2145-8F2.
4. Place the other end of the signal cable into the communication port **6** on the 2145 UPS-1U.

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

Installing the SAN Volume Controller 2145-8F4 cable retention bracket

The cable retention bracket ensures that the SAN Volume Controller 2145-8F4 node does not mistakenly become unplugged from the uninterruptible power supply (UPS).

Install the SAN Volume Controller 2145-8F4 cable retention bracket after you install the node in the rack.

To attach the bracket to the support rail, perform the following steps:

1. Install the power cable into the power supply.

2. Insert the bracket onto the power cable so that the power cable is held by the slot on the end of the bracket. Figure 66 provides a view of how to align the cable retention bracket with the cable.

Figure 66. Attaching the cable retention bracket to the SAN Volume Controller 2145-8F4 power cable

3. Position the cable retention bracket against the support rail and attach the bracket onto the slot in the rear of the rail. Figure 67 provides a view of the cable retention bracket that is attached to the SAN Volume Controller 2145-8F4.

Figure 67. The SAN Volume Controller 2145-8F4 with cable retention bracket attached

Connecting the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 to the SAN and to the Ethernet network

Before you connect the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 to the SAN, you must connect the Ethernet and fibre-channel cables.

Before you begin this task, refer to the user's cable connection table to find out where to connect the Ethernet and fibre-channel cables.

1. Connect the Ethernet cable to Ethernet port 1 **5** in Figure 68 on page 95 or Figure 69 on page 95.

   Attention: You must use only Ethernet port 1 on the SAN Volume Controller. The software is configured only for Ethernet port 1.

2. Connect the other end of the Ethernet cable to the proper connector on the Ethernet hub or switch.

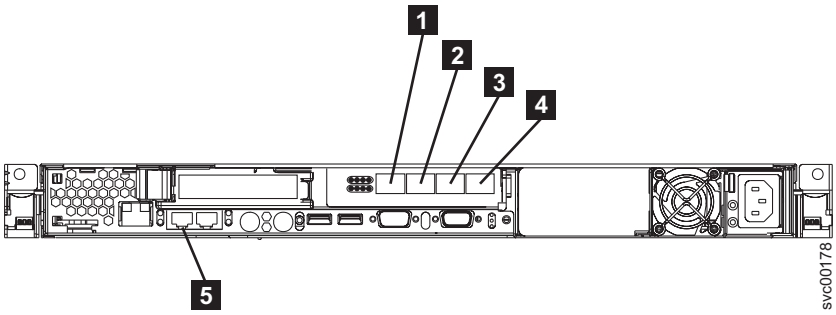


Figure 68. Connectors at the back of the SAN Volume Controller 2145-8F4

1 Fibre-channel port 1

2 Fibre-channel port 2

3 Fibre-channel port 3

4 Fibre-channel port 4

5 Ethernet port 1

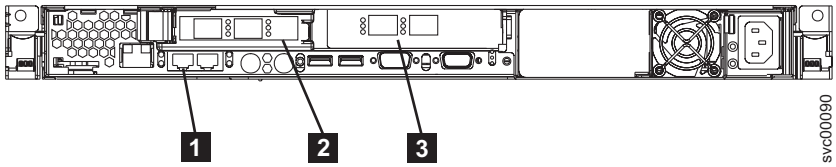


Figure 69. Connectors at the back of the SAN Volume Controller 2145-8F2

1 Ethernet port 1

2 Low profile duel port fibre-channel host bus adapter (HBA) with ports 1 and 2 (left to right)

3 Full height duel port fibre-channel HBA with ports 3 and 4 (left to right)

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.).

3. Connect the fibre-channel cables to the fibre-channel ports as required by the user's configuration.
4. Connect the other ends of the fibre-channel cables to the proper connectors of the fibre-channel switches.

Complete steps 1 on page 94 through 4 for each node that you need to connect to the SAN and to the Ethernet network.

Verifying the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 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 2145-8F4 or the SAN Volume Controller 2145-8F2 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: Start" in the *IBM System Storage SAN Volume Controller: Service Guide*, unless a different maintenance analysis procedure (MAP) is specified.

Perform the following steps to verify installation:

1. Press the SAN Volume Controller power switch. Verify that the green power light is on. If the light is not on, see "MAP 5000: Start" in the *IBM System Storage SAN Volume Controller: Service Guide* to repair the problem.

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

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

   In most cases, the battery is delivered charged, so you do not see the `Charging` message. If the Charging message is displayed, you will also see a progress bar on the second line. Battery charging can take up to three hours to complete. In the meantime, if you press any navigation buttons, the battery charging menu is replaced, but battery charging continues. (You can re-enter the menu system to view the charging progress, as described in step 4.) When the battery is charged enough, `Cluster:` is displayed on the first line of the front-panel display. The second line is left blank.
2. Press and hold the select button for five seconds. The check light comes on and a display test is performed. 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 70 shows four examples of what the front panel should display when you press the buttons. When you have finished testing the buttons, press and hold the select button for five seconds in order to exit the test.

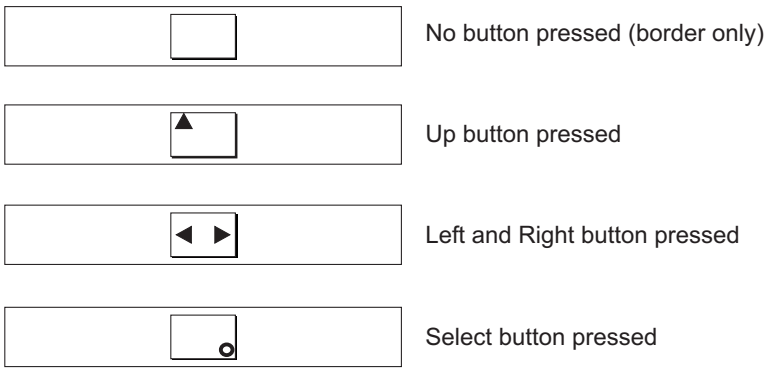


Figure 70. Front panel display when push buttons are pressed

4. If the `Charging` 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 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 71 shows how the node number appears on the front panel.

Figure 71. Node number

7. Press and release the up or down button until the `Ethernet` option is shown on the front panel display. The second line of the front-panel display in Figure 72 shows the message `Inactive`. This message indicates that, although an Ethernet connection is available, it cannot yet be used.

Figure 72. Ethernet mode

8. Press and release the up or down button until the `FC Port-1` option shows in the display.
9. 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: Service Guide* to repair the fault.
10. If you are installing a SAN Volume Controller 2145-8F2, go to step 16. If you are installing a SAN Volume Controller 2145-8F4, go to step 11.
11. Press and hold the down button.
12. Press and release the select button.
13. Release the down button. 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 link is operating at the expected speed. If the operational speed does not match the expected speed, go to "MAP 5600: Fibre channel" in the *IBM System Storage SAN Volume Controller: Service Guide* to repair the fault.
14. Press the select button to return to the fibre-channel status display.
15. Press the right button to display each port in turn and repeat the above speed check. Go to step 18 on page 98
16. Press and release the left or right button to display the other port options. Check whether for each port, the second line of the front-panel display shows the message `Active`. If `Active` is not shown for any port, go to "MAP 5600: Fibre channel" in the *IBM System Storage SAN Volume Controller: Service Guide* to repair the fault.

17. If the configuration data table provided by the user indicates that the SAN Volume Controller nodes are to be operated at 1 Gbps, follow these steps:
    a. Press and hold the down button.
    b. Press and release the select button.
    c. Release the down button.

    The second line of the front-panel display shows the current fibre-channel speed setting of the node. Press the up or down button until `1 Gbps` is displayed and then press the select button. This changes the fibre-channel speed for all ports on this node to 1 Gbps.
18. If you want to select a language other than English, perform the following steps:
    a. Press the up or down button until `Select Language?` is displayed.
    b. Press the select button.
    c. Press the left or right button until the required language is displayed.
    d. Press the select button.

When the battery is fully charged–if it needed to be charged–the `Charging` message is replaced by `Cluster:` and 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, if necessary, create a new SAN Volume Controller cluster and to add the nodes into a SAN Volume Controller cluster.

Installing the hardware master console

If the master console hardware product option is included with the SAN Volume Controller, you must install it and perform initial hardware configuration for it.

Before you begin the installation, ensure that you have completed the following tasks:

- **Important:** Review and complete all of the safety checks that are detailed in the documentation for the master console IBM eServer xSeries hardware, the keyboard, and the display.
- Ensure that you have all the customer-completed information that you need, including the configuration data table, hardware location chart, and the cable connection table, which are provided at http://www.ibm.com/storage/support/2145. The *IBM System Storage SAN Volume Controller: Planning Guide* provides guidelines for completing these tables and charts.

If you experience a problem with your master console, use the 2145 machine type and the serial number of the SAN Volume Controller node that was installed with the master console to open a hardware problem.

Perform the following steps to install the master console hardware option:

Note: Do not install the pull-out monitor and keyboard of the master console directly below a SAN Volume Controller node. The front panel of the node protrudes beyond the front of the rack and overlaps part of the monitor, which prevents you from being able to open it.

1. Install the master console hardware in the rack, following the hardware installation instructions that are provided by your xSeries Installation Guide and by the instructions that are provided with the mounting rails.

If there are any devices directly above and below the master console server unit, it might be very difficult to reach in and connect the cables to the back of the server after it is placed in the rack. If that is the only slot available, connect the keyboard, mouse, monitor, and Ethernet cables at the back of the master console server before installing it in the rack. Leave the other end of the Ethernet cable disconnected from the network until you are directed to connect it.

Important: Do not follow any *software* installation procedures in the xSeries Installation Guide.

2. Ensure that no cables are connected to the Ethernet ports.
3. Turn on the master console.
   a. Type `administrator` in the User ID field.
   b. Type `passw0rd` in the password field; this password applies to all required password fields. The master console continues to start.

      Note: This process can take several minutes before all services are started and operations are completely responsive.

   c. Click **OK** if you receive any messages that a network interface card port is offline.
4. Check that the reference identification tag is securely fastened to the front panel of the master console. The tag indicates the machine type 2145 and the serial number of the SAN Volume Controller node that is being installed with the master console.
5. **IMPORTANT**: This step must be the last step that you perform on the master console before you hand over the machine to the user. It sets up the master console so that it presents a Windows license agreement screen at the next power on and then shuts down the master console.
   a. Select **Start → Run**
   b. Type `c:\sysprep\sysprep.exe`
   c. Click **OK**. The System Preparation Tool panel is displayed.
   d. Select **Don't re-generate security ID**.
   e. Select **Reboot** from the **Shutdown Mode** list.
   f. Click **Reseal**.

   Note: It is important that you do this step; otherwise, the user is not presented later with the choice to accept or decline Windows registration conditions.
6. Connect the master console to the Ethernet port that is designated in the Cable connection table.

Appendix B. SAN Volume Controller 2145-4F2

The SAN Volume Controller 2145-4F2 node has some unique controls and indicators, rear panel indicators, hardware components, and connectors.

Preparing your SAN Volume Controller 2145-4F2 environment

Before installing the SAN Volume Controller 2145-4F2, you must prepare the physical environment.

Input-voltage requirements

Ensure that the following requirements for each SAN Volume Controller 2145-4F2 node are met:

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

Power requirements for each node

Ensure that the following power is available for each SAN Volume Controller 2145-4F2 node. The power that is required depends on the node type, the uninterruptible power supply (UPS) type, and whether the redundant ac power feature is used.

Components	Power requirements
SAN Volume Controller 2145-4F2 + 2145 UPS-1U	420 W
One SAN Volume Controller 2145-4F2 + one 2145 UPS	760 W
Two SAN Volume Controller 2145-4F2 nodes + one 2145 UPS	1120 W

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

Circuit breaker requirements

Ensure that the following circuit breaker requirements are met:

- The 2145 UPS-1U has an integrated circuit breaker and does not require additional protection.
- Each 2145 UPS is connected to a separate branch circuit, which includes a UL-listed 15 A circuit breaker.

Environment requirements without redundant ac power

Environment	Temperature	Altitude	Relative humidity	Maximum wet bulb temperature
Operating in lower altitudes	10°C to 35°C (50°F to 95°F)	0 to 914 m (0 to 2998 ft)	8% to 80% noncondensing	23°C (74°F)

Environment	Temperature	Altitude	Relative humidity	Maximum wet bulb temperature
Operating in higher altitudes	10°C to 32°C (50°F to 88°F)	914 to 2133 m (2998 to 6988 ft)	8% to 80% noncondensing	23°C (74°F)
Powered off	10°C to 43°C (50°F to 110°F)	0 to 2133 m (2998 to 6988 ft)	8% to 80% noncondensing	27°C (81°F)
Storing	1°C to 60°C (34°F to 140°F)	0 to 2133 m (0 to 6988 ft)	5% to 80% noncondensing	29°C (84°F)
Shipping	-20°C to 60°C (-4°F to 140°F)	0 to 10668 m (0 to 34991 ft)	5% to 100% condensing, but no precipitation	29°C (84°F)

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 89°F)	0 to 914 m (0 to 2998 ft)	20% to 80% noncondensing	23°C (74°F)
Operating in higher altitudes	15°C to 32°C (50°F to 88°F)	914 to 2133 m (2998 to 6988 ft)	20% to 80% noncondensing	23°C (74°F)
Powered off	10°C to 43°C (50°F to 110°F)	0 to 2133m (0 to 6988 ft)	20% to 80% noncondensing	27°C (81°F)
Storing	1°C to 60°C (34°F to 140°F)	0 to 2133 m (0 to 6988 ft)	5% to 80% noncondensing	29°C (84°F)
Shipping	-20°C to 60°C (-4°F to 140°F)	0 to 10668 m (0 to 34991 ft)	5% to 100% condensing, but no precipitation	29°C (84°F)

Preparing your environment

The following three tables list the physical dimensions and weight of the node, the additional space requirements around a node, and the maximum heat dissipated by a node that you must consider before you install your SAN Volume Controller 2145-4F2:

Dimensions and weight

Height	Width	Depth	Maximum weight
43 mm (1.69 in.)	440 mm (17.32 in.)	686 mm (27 in.)	12.7 kg (28 lb)

Additional space requirements

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

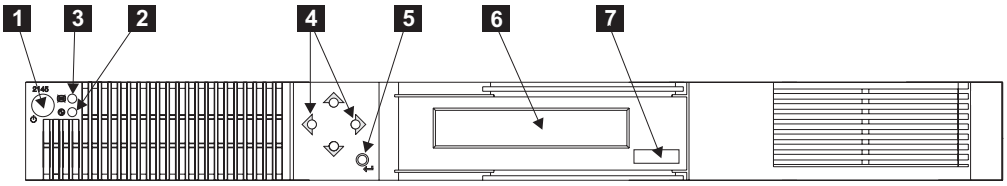
Heat output of each SAN Volume Controller 2145-4F2 node

Model	Heat output per node
SAN Volume Controller 2145-4F2	350 W (1200 Btu per hour)

SAN Volume Controller 2145-4F2 controls and indicators

All controls and indicators are located on the front panel of the SAN Volume Controller 2145-4F2.

SAN Volume Controller 2145-4F2 controls and indicators



1. Power button
2. Power LED
3. Check LED
4. Navigation buttons
5. Select button
6. Front panel display
7. Node identification label

Power button

The power button switches on or off, the main power to the SAN Volume Controller 2145-4F2.

To turn on the power, press and release the power button.

To turn off the power, press and release the power button. For a preferred method of powering off, see the "Powering off a SAN Volume Controller node" topic in the *IBM System Storage SAN Volume Controller: Service Guide*.

Note: When the SAN Volume Controller is operational and the power control button is pressed, the SAN Volume Controller indicates on its front panel that it is powering off and writes its control data to its internal disk. This can take up to five minutes. If the power control button is pressed and not released, an immediate power off is performed without writing the SAN Volume Controller control data to disk. Service actions are then required to make the SAN Volume Controller operational again. Therefore, when powering off, you should not press and hold the power button for more than two seconds.

Attention: If a SAN Volume Controller is powered off for more than five minutes and it is the only SAN Volume Controller that is connected to an 2145 uninterruptible power supply (2145 UPS), the 2145 UPS also powers off. To power on the SAN Volume Controller, you must first power on the 2145 UPS to which it is connected.

Note: The 2145 uninterruptible power supply-1U (2145 UPS-1U) does not power 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 properties of the green power LED are as follows:

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 powered on.

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

Note: A power LED is also on the rear of the server.

Check LED

The amber check LED is used to indicate critical failures on the service controller.

If the check LED is off and the power LED is on, the service controller is working correctly.

If the check LED is on, a critical service controller failure was detected.

The check LED is also on while the service controller code is being reprogrammed. For example, when the SAN Volume Controller cluster code is being upgraded, the **check LED** is on. It is normal for the power LED to be on at this time.

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.

Select button

You can 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.

Front panel display

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

Information on the front panel display is available in several languages. The display can show both alphanumeric information and graphical information (progress bars).

The front panel displays configuration and service information about the SAN Volume Controller and the SAN Volume Controller cluster, 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

Node identification label

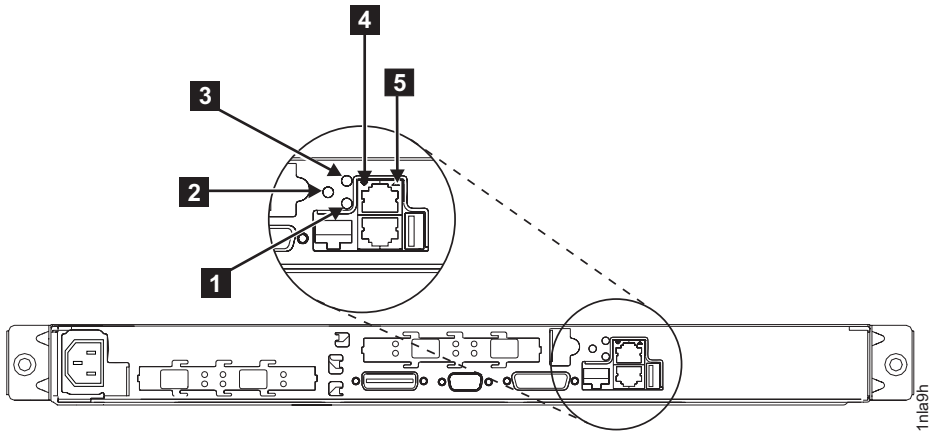
The node identification label on the front panel displays a six-digit node identification number.

The node identification label is the same as the six-digit number that is used in the **svctask addnode** command. It is readable by system software and is used by configuration and service software as a node identifier. The node identifier can also be displayed on the front panel display when `node` is selected from the menu.

If the service controller assembly front panel is replaced, the configuration and service software displays the number that is printed on the front of the replacement panel. Future error reports contain the new number. No cluster reconfiguration is necessary when the front panel is replaced.

SAN Volume Controller 2145-4F2 rear panel indicators

The following figure shows the rear panel indicators on the SAN Volume Controller 2145-4F2 back panel assembly.



1 System board power LED

2 System board fault LED

3 Monitor LED (not used)

4 Lower Ethernet link LED

5 Upper Ethernet link LED

System board power LED

The system board power LED indicates the power supply status that is detected by the system board.

System board fault LED

The amber system board fault LED indicates that the system board has detected a critical failure.

You can view the system board fault LED in the documentation on the rear panel indicators.

Monitor LED

The green monitor LED is not used on the SAN Volume Controller.

You can view the monitor LED in the documentation concerning the rear panel indicators.

Lower Ethernet link LED

The lower Ethernet link LED indicates the operational status of Ethernet port 1. This LED is illuminated when a good Ethernet connection exists between the SAN Volume Controller 2145-4F2 and the Ethernet network.

Upper Ethernet link LED

The upper Ethernet link LED indicates the operational status of Ethernet port 2. This LED is illuminated when a good Ethernet connection exists between the SAN Volume Controller 2145-4F2 and the Ethernet network.

Ethernet port 2 is not used on the SAN Volume Controller.

SAN Volume Controller 2145-4F2 connectors

The external connectors for the SAN Volume Controller can be located easily.

Context

Figure 73 provides the locations of the external connectors.

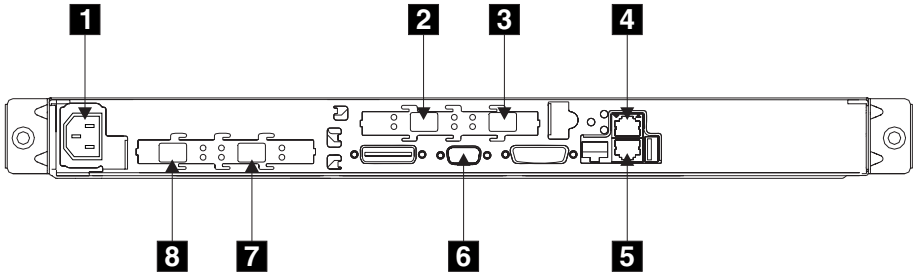
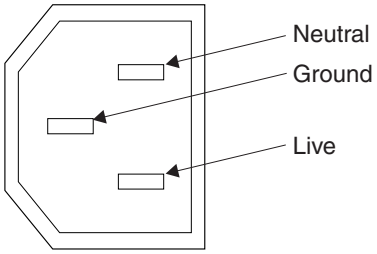


Figure 73. SAN Volume Controller 2145-4F2 connector locations

1. Power connector
2. fibre-channel port 3
3. fibre-channel port 4
4. Ethernet port 2 ***(not used on the SAN Volume Controller 2145-4F2)***
5. Ethernet port 1
6. Serial connector
7. fibre-channel port 2
8. fibre-channel port 1

The following figure shows an illustration of the type of connector located on the power supply assembly. The connector allows you to connect the SAN Volume Controller 2145-4F2 to the power source from the uninterruptible power supply.



Using the 2145 UPS

The 2145 uninterruptible power supply (2145 UPS) provides a SAN Volume Controller 2145-4F2 node with a secondary power source if you lose power from your primary power source due to power failures, power sags, power surges, or line noise.

The SAN Volume Controller 2145-4F2 node can operate with either the 2145 UPS or the 2145 UPS-1U. For information about the 2145 UPS-1U, see Chapter 4, “Using the 2145 UPS-1U,” on page 23.

2145 UPS configuration

To provide full redundancy and concurrent maintenance, SAN Volume Controller 2145-4F2 nodes must be installed in pairs.

A 2145 UPS powers one or two SAN Volume Controller 2145-4F2 nodes. If it is powering two SAN Volume Controller 2145-4F2 nodes, they must be in different I/O groups of the same SAN Volume Controller cluster.

The following table provides the UPS guidelines for the SAN Volume Controller 2145-4F2:

Number of SAN Volume Controller 2145-4F2 models	Number of 2145 UPS units	Number of 2145 UPS-1U units
2	2	2
4	2	4
6	4	6
8	4	8

2145 UPS operation

If input power is disconnected from a 2145 UPS, a fully-operational SAN Volume Controller 2145-4F2 node that is connected to that 2145 UPS performs a power-down sequence.

This operation, which saves the configuration and cache data to an internal disk in the SAN Volume Controller 2145-4F2 node, typically takes about three minutes, at which time power is removed from the output of the 2145 UPS. In the event of a delay in the completion of the power-down sequence, the 2145 UPS output power is removed five minutes after the power is disconnected from the 2145 UPS. Because this operation is controlled by the SAN Volume Controller 2145-4F2 node, a 2145 UPS that is not connected to an active SAN Volume Controller 2145-4F2 node does not shut off within the five-minute required period.

Important: Do not shut down a UPS without first shutting down the SAN Volume Controller 2145-4F2 node that it supports. Data integrity can be compromised by pushing the 2145 UPS power-off button when the node is still operating. However, in the case of an emergency, you can manually shut down the UPS by pushing the 2145 UPS power-off button when the node is still operating. Service actions must then be performed before the node can resume normal operations. If multiple UPSs are shut down before the nodes they support, data can be corrupted.

If you have two SAN Volume Controller 2145-4F2 nodes that use 2145 UPSs in the same I/O group, you must connect these nodes to different 2145 UPSs. This configuration ensures that cache and cluster state information is protected in the event of a failure of either the UPS or the mainline power source.

2145 UPS environment

Ensure that your physical site meets the installation requirements of the 2145 uninterruptible power supply (2145 UPS).

UPS specifications

Attention: Ensure that you comply with the following requirements for the 2145 UPS units:

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

2145 UPS dimensions and weight

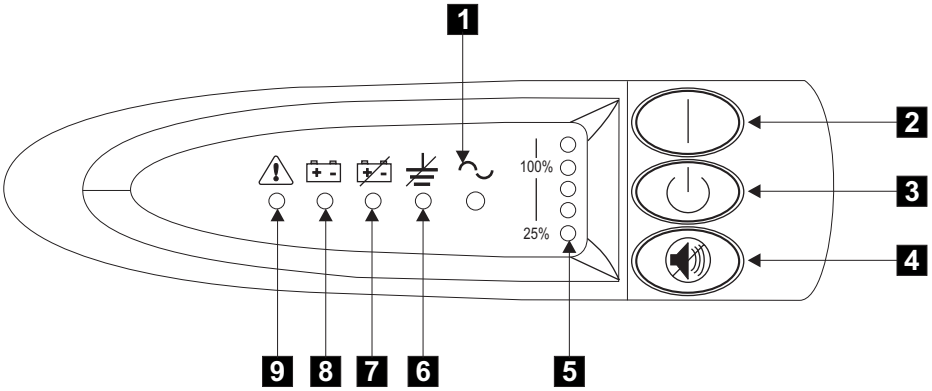
Height	Width	Depth	Maximum weight
89 mm (3.5 in.)	483 mm (19 in.)	622 mm (24.5 in.)	37 kg (84 lb)

Heat output

Model	Heat output during normal operation	Heat output during battery operation
2145 UPS powering two SAN Volume Controller 2145-4F2 nodes	140 W (480 Btu per hour)	250 W (850 Btu per hour)

Controls and indicators for the 2145 UPS

All controls for the 2145 uninterruptible power supply (2145 UPS) are located on the front panel assembly.



1. Mode indicator
2. On button
3. Off button
4. Test and alarm reset button
5. Load-level indicators

6 Site wiring fault indicators

7 Battery service indicator

8 Battery mode indicator

9 General alarm indicator

Mode indicator

The mode indicator provides status information on the 2145 uninterruptible power supply (2145 UPS) and is located on the front panel.

When the mode indicator is a steady green, the 2145 UPS is in normal mode. The 2145 UPS checks and charges its battery as necessary.

When the mode indicator is flashing green, the 2145 UPS is in standby mode. Standby mode means that the 2145 UPS is turned off but is still connected to the main power source. No power is available from the 2145 UPS output sockets but the 2145 UPS monitors and charges its battery as necessary.

When the mode indicator is steady red, the 2145 UPS is in bypass mode because of one of the following conditions:

- The 2145 UPS has overheated
- The 2145 UPS has an overload condition of 103% through 110% for 30 seconds
- The 2145 UPS detects a fault in the battery or in the 2145 UPS electronics assembly

When the mode indicator is flashing red and the alarm is sounding, the voltage range setting might not be correct. When a SAN Volume Controller 2145-4F2 is connected to the 2145 UPS, the SAN Volume Controller 2145-4F2 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 2145-4F2 has been connected to a 2145 UPS and powered on.

On button

The on button turns on the main power to the 2145 uninterruptible power supply (2145 UPS).

To turn on the power, press and hold the on button until you hear a beep (approximately one second). The mode indicator stops flashing and the load-level indicators display the percentage of load that is being applied to the 2145 UPS.

Off button

The off button turns off the main power to the 2145 uninterruptible power supply (2145 UPS).

Attention: Never use the off button unless you are specifically directed to in the instructions that are provided with the SAN Volume Controller 2145-4F2. If you press it at any other time, you might lose data in the cluster if the other 2145 UPS fails.

To turn off the power, press and hold the off button until the long beep stops (approximately five seconds). The mode indicator starts to flash and the 2145 UPS remains in standby mode until you disconnect the 2145 UPS from the main power outlet.

Load-level indicators

The load-level indicators show the percentage of the 2145 uninterruptible power supply (2145 UPS) capacity that the SAN Volume Controller 2145-4F2 is using.

When all the indicators are lit, the power requirements of the SAN Volume Controller 2145-4F2 have exceeded the capacity of the 2145 UPS.

Site wiring fault indicator

The site wiring fault indicator on the 2145 uninterruptible power supply (2145 UPS) shows that either a ground wire connection does not exist or the live and neutral wires are reversed in the input power connection.

The site wiring fault indicator is located on the front panel of the 2145 UPS.

Battery service indicator

The battery service indicator is located on the front panel of the 2145 uninterruptible power supply (2145 UPS) and shows that the charge in the battery has become low while the 2145 UPS is in battery mode.

The alarm continues to beep once every five seconds. The application programs immediately complete and save the work to prevent loss of data. If the 2145 UPS shuts down, it automatically restarts when the main power returns.

Battery mode indicator

The battery mode indicator shows that the 2145 uninterruptible power supply (2145 UPS) is operating on batteries.

The battery mode indicator lights up when the main power source fails and the 2145 UPS is running on battery power. The alarm beeps once every five seconds. When main power returns, the 2145 UPS returns to normal mode and the battery recharges. The battery mode indicator then shuts off and the alarm ceases.

General alarm indicator

The general alarm indicator on the 2145 uninterruptible power supply (2145 UPS) turns on when a power or temperature problem occurs.

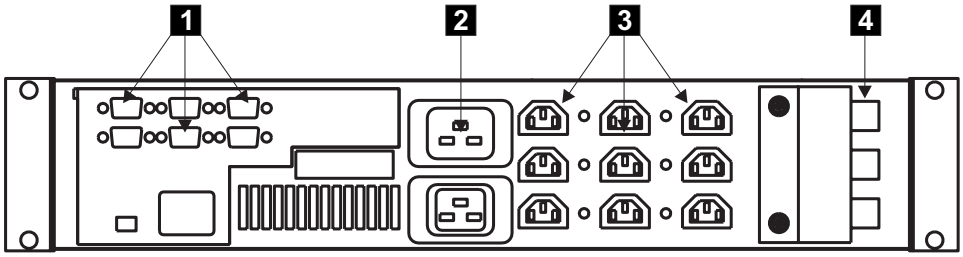
When the general alarm indicator is accompanied by the audio alarm beeping every five seconds, the battery is low. If the audio alarm is continuous, the internal temperature of the 2145 UPS is too high or there has been a momentary output overload.

Hardware for the 2145 UPS

The 2145 uninterruptible power supply (2145 UPS) hardware is displayed in the following graphics.

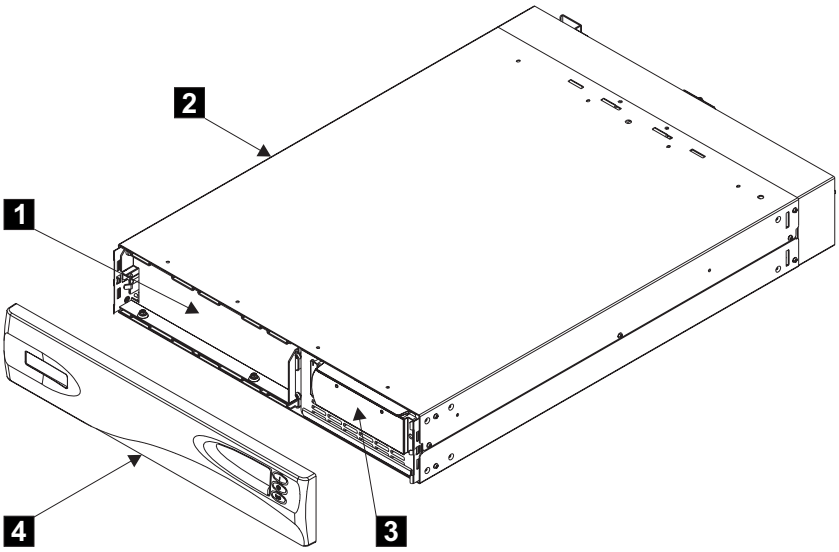
Locations for the 2145 UPS connectors and circuit breakers

The following diagrams illustrate the hardware for the 2145 UPS:



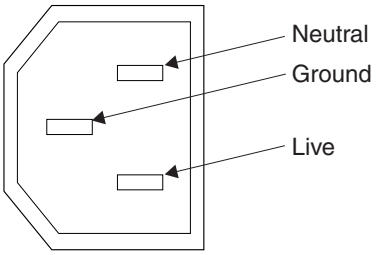
1. Signal cable connectors
2. Main power connector
3. Output connectors
4. Circuit breakers

Hardware locations for the 2145 UPS



1. Battery assembly
2. Frame assembly
3. Electronics assembly
4. Front panel assembly

2145 UPS connector



Power cables for the 2145 UPS

You must follow the power requirements of your country or region to choose the appropriate power cable for the 2145 uninterruptible power supply (2145 UPS).

The following table lists the power cable requirements for your country or region:

Country or region	Length	Connection type (attached plug designed for 200 - 240 V ac input)	Part number
Afghanistan, Albania, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, China (Macau S.A.R.), Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, 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	2.5 m (8 ft)	CEE7	55H6643
Antigua, Bahrain, Brunei, Channel Islands, Cyprus, Denmark, Dubai, Fiji, Ghana, Hong Kong S.A.R. of the PRC, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia	2.5 m (8 ft)	IEC 309	36L8822
Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	2.5 m (8 ft)	L6-20P	12J5118
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	2.5 m (8 ft)	NEMA L6-15P	12J5119
Bangladesh, Burma, Pakistan, South Africa, Sri Lanka	2.5 m (8 ft)	SABS 164	12J5124
Thailand	2.5 m (8 ft)	NEMA 6-15P	12J5120

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	14F1549

Installing the SAN Volume Controller 2145-4F2 hardware

There are several steps that you must perform to prepare and then install the SAN Volume Controller 2145-4F2 hardware.

The following topics describe the SAN Volume Controller 2145-4F2 hardware installation tasks in the order they should be performed.

Note: If you are adding a new I/O group to an existing SAN Volume Controller 2145-4F2 cluster, there is no need to power off the existing, operating cluster nodes.

1. Install and verify the redundant ac power switch, if it is to be used and is not already being used for a node.
2. Install the UPS.
3. Install the node.
4. Connect the fibre-channel and Ethernet cables to the node.
5. Connect the node to the UPS.
6. Verify the node.
7. Install and verify the master console, unless it is already installed. Optionally, you can perform this step first.

After you finish these steps, the hardware installation is complete.

Installing the 2145 UPS-1U

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

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 into the rack.
3. Connect the 2145 UPS-1U battery.
4. Connect the power cables to the 2145 UPS-1U.
5. 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 uninterruptible power supply-1U (2145 UPS-1U).

Complete the following prerequisites before installing the support rails:

1. Use the user's hardware location chart to determine where in the rack that the 2145 UPS-1U is to be installed.

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 49 on page 80.

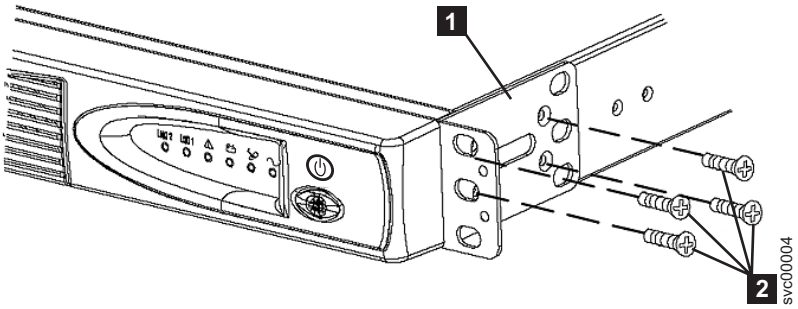


Figure 74. Installing the support rails for a 2145 UPS-1U into the rack

4. Loosen the assembly wing nuts (**1** in Figure 50 on page 81) on both rail assemblies and adjust the rail size to the depth of your rack.

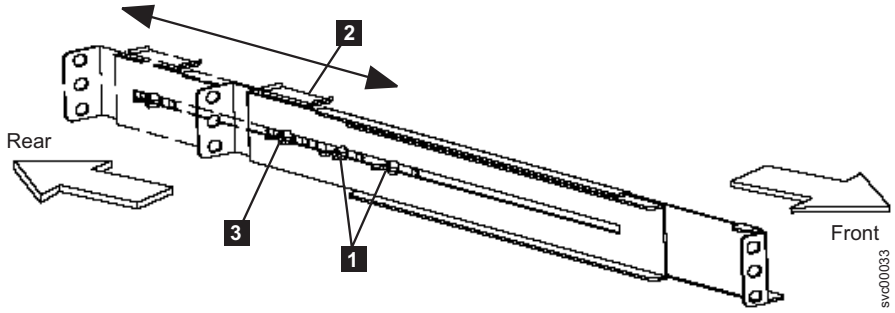


Figure 75. Adjusting the rail depth on the 2145 UPS-1U

1 Assembly wing nuts

2 Hold-down bracket

3 Wing nut

5. Position the rear, hold-down bracket (**2** in Figure 50 on page 81) towards the end of the rail assemblies and tighten the wing nut (**3** in Figure 50 on page 81).

6. Select the holes in the rail where you want to position the 2145 UPS-1U.

   Note: The bottom flange of the support rail must align with the EIA mark on the rack.

7. Using two M6 × 10 screws (**1** in Figure 51 on page 81) and two clip nuts **2**, attach the rail to the rear of the rack. The customer's rack might be different than the one shown here, and if so, might require different clip nuts or fasteners.

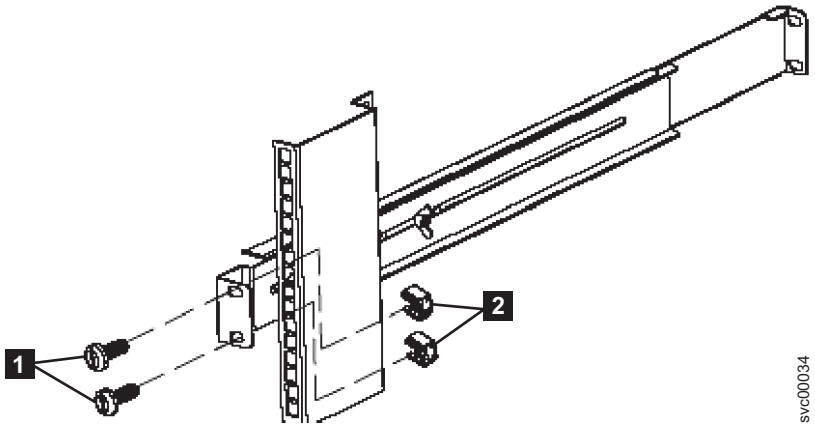


Figure 76. Securing the rear rail on the 2145 UPS-1U

8. Attach only the bottom hole of the rail to the front of the rack with one M6 × 10 screw and one clip nut (**1** in Figure 52 on page 82).

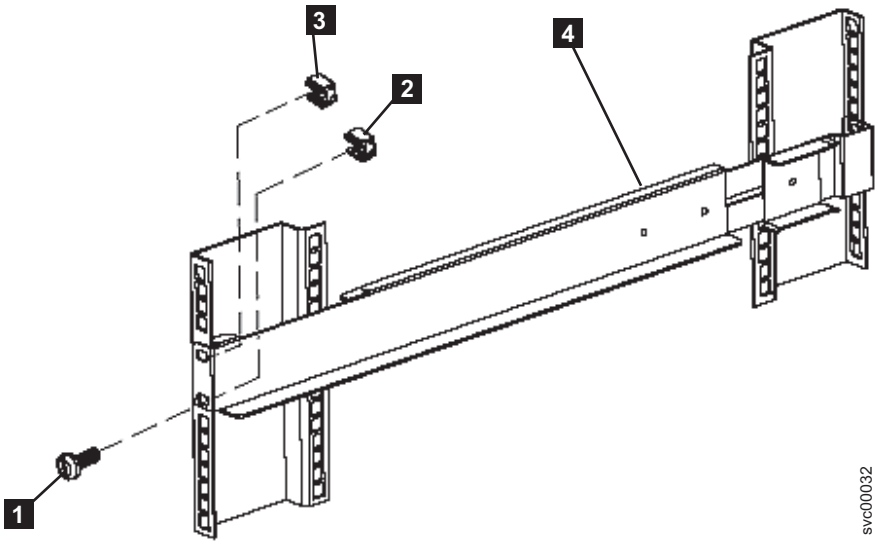


Figure 77. Securing the front rail on the 2145 UPS-1U

9. Install a clip nut in the top hole of the rail **3**.
10. Repeat step 7 on page 81 through step 9 on page 82 for the other rail.
11. Tighten the assembly 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 uninterruptible power supply-1U (2145 UPS-1U) in the rack.

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

CAUTION:
The 2145 UPS-1U contains its own energy source (sealed, lead-acid batteries). The output receptacles might carry live voltage, even when the 2145 UPS-1U is not connected to an ac supply. (11)

CAUTION:
Do not remove or unplug the input cord when the 2145 UPS-1U is turned on. This removes the safety ground from the 2145 UPS-1U and the equipment connected to the 2145 UPS-1U. (12)

CAUTION:
To reduce the risk of fire or electric shock, install the 2145 UPS-1U 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.

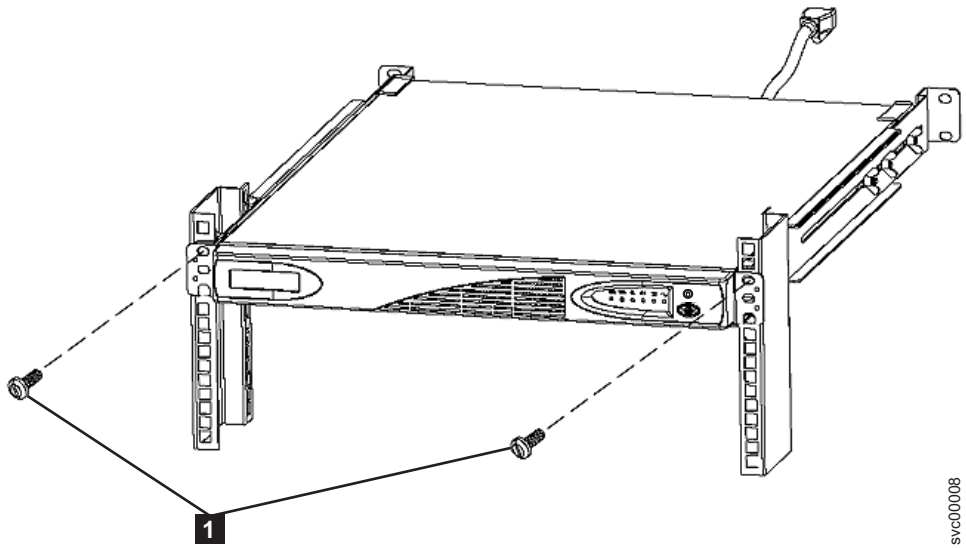
Perform the following steps to install the 2145 UPS-1U in the rack:

Note: You might have already completed steps 3 on page 83 through 6 on page 84 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.

   Note: The 2145 UPS-1U weighs 16 kg. If you feel unsure about lifting the UPS 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 **1**.



3. If you have not already connected the internal battery connector, remove the 2145 UPS-1U front panel.

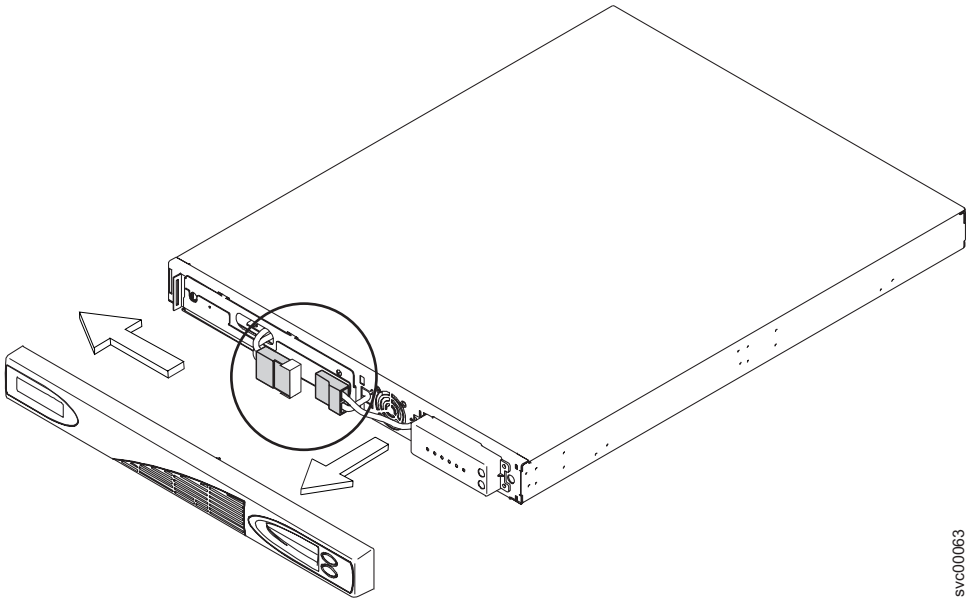


Figure 78. Removing the 2145 UPS-1U front panel

4. Remove the protective label from the internal battery connector.

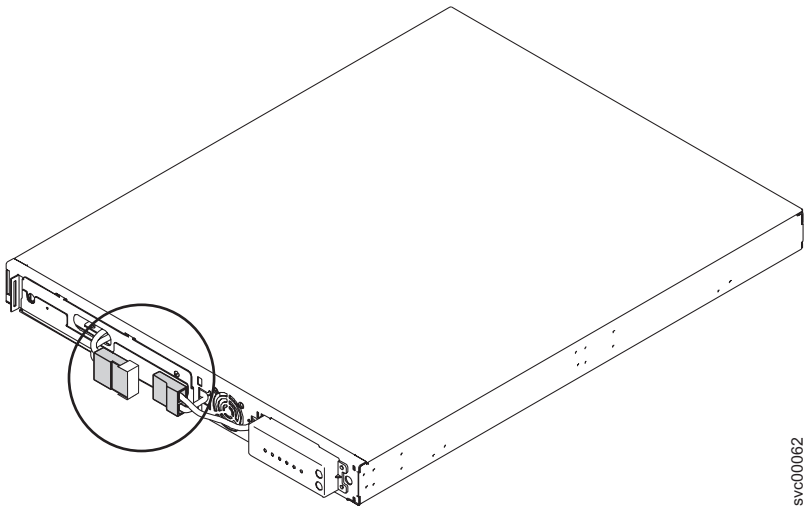


Figure 79. The 2145 UPS-1U internal battery connector with protective tape

5. Connect the internal battery connector. Each end of the keyed connector has two wires: one red (+) and one black (–). Join the black wires and the red wires 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.

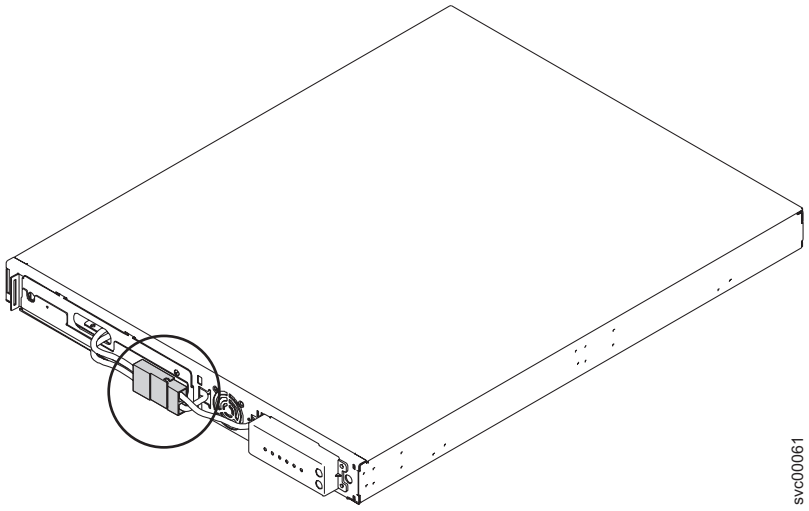


Figure 80. The 2145 UPS-1U internal battery connector

6. Reinstall the front panel. You might need to move the sliding section on the front of the 2145 UPS-1U to the closed position first.
7. At the back of the 2145 UPS-1U, plug the 2145 UPS-1U main power connector into the power socket (**1** in the following figure). The 2145 UPS-1U is in standby mode, so all indicators are off.

   It is recommended that each 2145 UPS-1U for an I/O group is connected to a different power source.

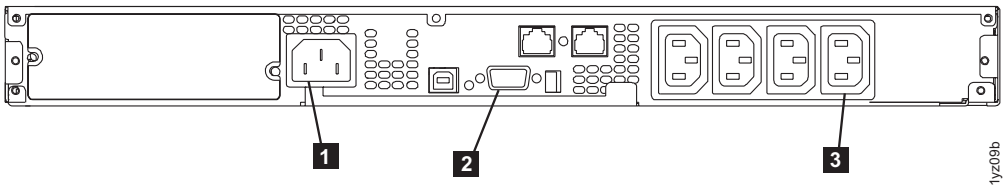


Figure 81. 2145 UPS-1U (rear view)

1 Mains power connector

2 Communication port

3 Load segment 2 receptacle

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 cluster malfunctions.

8. Press and hold the on/off button **2** for approximately five seconds. The front panel indicators cycle through a startup sequence while the 2145 UPS-1U conducts a self-test.

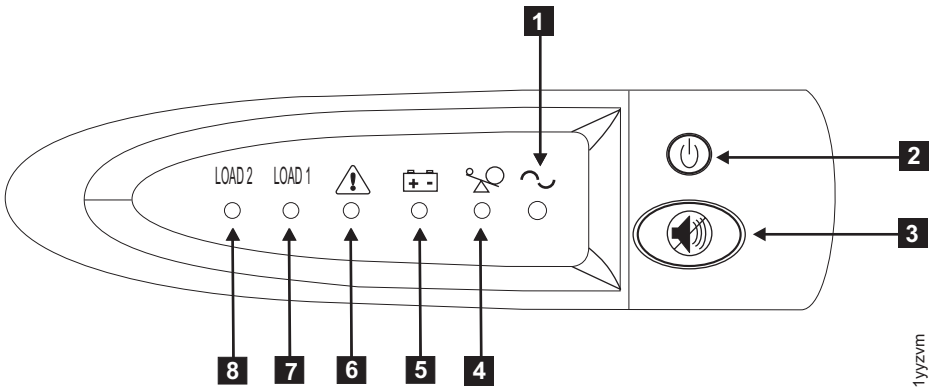


Figure 82. The 2145 UPS-1U front panel assembly

When the self-test is complete, the power-on indicator **1** and the load indicators (**7** and **8**) 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 power-on indicator **1** is flashing red 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 powered on.

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

Installing the 2145 UPS

Before you can use the SAN Volume Controller 2145-4F2, you need to install the uninterruptible power supply (UPS).

The SAN Volume Controller 2145-4F2 node can operate with either the 2145 UPS or the 2145 UPS-1U. For more information about installing the 2145 UPS-1U, see "Installing the 2145 UPS-1U" on page 80 and then "Connecting the SAN Volume Controller 2145-4F2 to the 2145 UPS-1U" on page 133.

Complete the following steps to install the 2145 UPS:

1. Install the support rails for the 2145 UPS.
2. Install the 2145 UPS into the rack.
3. Connect the 2145 UPS battery.
4. Connect the power cables to the 2145 UPS.

Installing the support rails for a 2145 UPS

You must install the support rails in the rack before installing the 2145 uninterruptible power supply (2145 UPS).

Before you install the support rails, determine where the 2145 UPSs are to be installed in the rack. Complete the following prerequisites before you install the support rails:

- Use the user's hardware location chart, which you downloaded from http://www.ibm.com/storage/support/2145, to determine where in the rack that you want to install the 2145 UPS.
- Discard the two handles and their associated nuts that are shipped with the support rails.
- At the back of the rack, observe the Electronic Industries Alliance (EIA) positions and determine where you are going to install the 2145 UPS. Always install the 2145 UPS into the lowest available position in the rack. The only device that can be beneath a 2145 UPS is another UPS. The bottom of the flange of the support rail must align with the EIA mark on the rack.

Note: The user can already have installed in the rack a 2145 UPS with available spare capacity. Therefore, the SAN Volume Controller 2145-4F2 might be delivered without a 2145 UPS.

Perform the following steps for each rail:

1. Attach nut clips **4** to the rack (see Figure 83 on page 122). These nut clips must align with the second and fourth holes of the support rail flange.

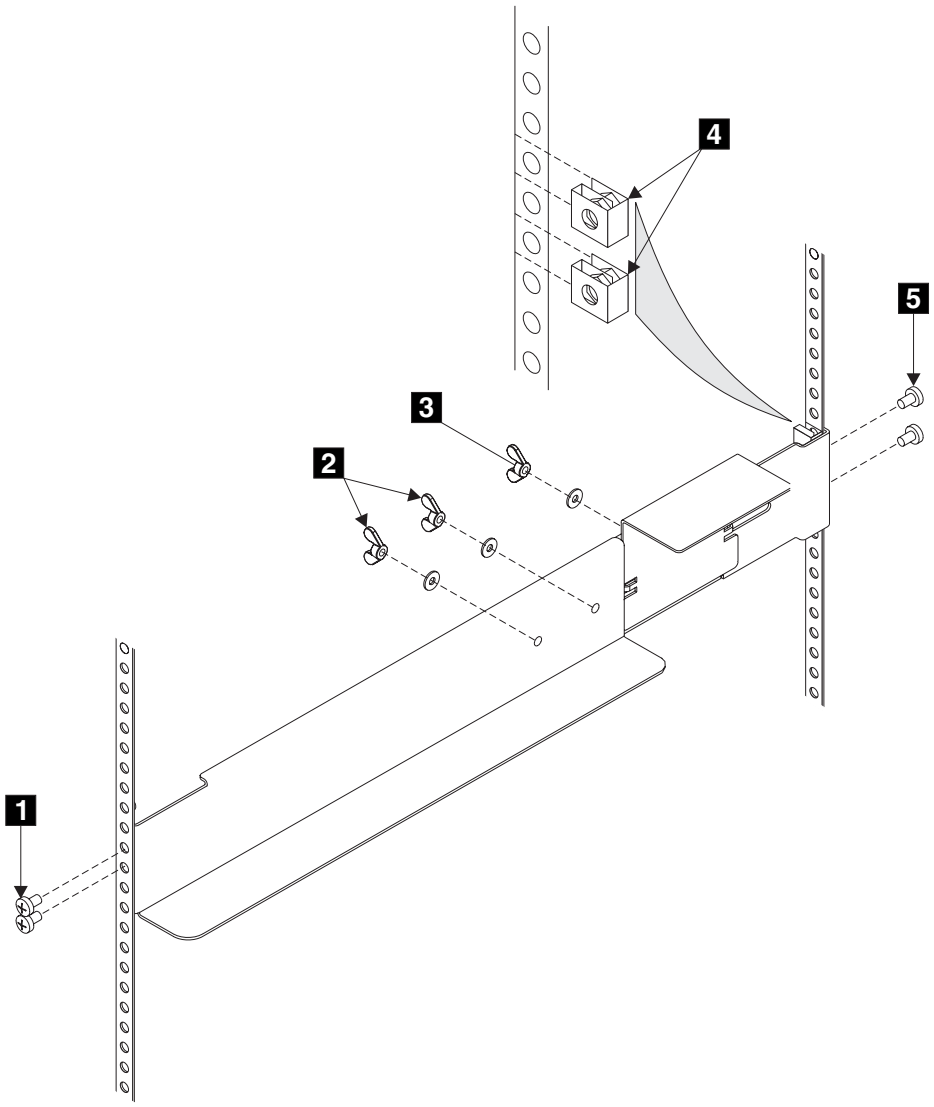


Figure 83. Installing support rails for a 2145 UPS into the rack

2. Loosen the two wing nuts **2**.
3. Loosen the wing nut **3** and slide the bracket toward the back of the rail.
4. Remain at the back of the rack holding the support rail in position in the rack, and then install and fully tighten the two mounting screws **5**.
5. Go to the front of the rack.
6. Extend the support rail toward the front of the rack.

   Note: Hold the support rail in position until you have completed step 8.
7. Ensure that the support rail is horizontal (a level might be useful here).
8. Install the two mounting screws **1** into the third and fourth holes of the support rail flange. Fully tighten the screws.
9. Fully tighten the two wing nuts **2**.
10. Loosen the wing nut **3** and slide the bracket toward the front of the rail as far as it will go, with the front edge of the bracket against the back-end of the front support rail.

11. Fully tighten the wing nut 3 .

    Note: You must perform all of the previous steps for each rail.

Installing the 2145 UPS in the rack

After you have completed the preparation procedures, you can install the 2145 uninterruptible power supply (2145 UPS) in the rack.

You must complete the following prerequisites before you install the 2145 UPS in the rack:

1. Complete the preinstallation procedures.
2. Install the support rails for the 2145 UPS.
3. Prepare your 2145 UPS environment.

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

CAUTION:
The 2145 UPS-1U contains its own energy source (sealed, lead-acid batteries). The output receptacles might carry live voltage, even when the 2145 UPS-1U is not connected to an ac supply. (11)

CAUTION:
Do not remove or unplug the input cord when the 2145 UPS-1U is turned on. This removes the safety ground from the 2145 UPS-1U and the equipment connected to the 2145 UPS-1U. (12)

CAUTION:
To reduce the risk of fire or electric shock, install the 2145 UPS-1U 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.

The 2145 UPS weighs 39 kg (86 lb) with the electronics assembly and the battery assembly installed:

- **Do not attempt to lift the 2145 UPS by yourself. Ask another service representative for assistance.**
- **Remove the battery assembly from the 2145 UPS before removing the 2145 UPS from the shipping carton.**
- **Do not attempt to install the 2145 UPS into the rack unless the electronics assembly and the battery assembly have been removed.**

Perform the following steps to install the 2145 UPS in the rack:

1. Before you remove the 2145 UPS from the shipping carton, you must reduce its weight by removing the battery assembly. Perform the following steps to remove the 2145 UPS battery assembly:

a. Open the top of the 2145 UPS shipping carton. With the assistance of another service representative, grip the flaps on either side of the 2145 UPS, as shown in Figure 84.

Figure 84. Opening the top of the 2145 UPS shipping carton

b. Slide the 2145 UPS to the end of the carton and rest its front edge on the edge of the carton, as shown in Figure 85.

Figure 85. Sliding the 2145 UPS to the end of the carton.

c. Remove the two bolts **1** and additional nut **2** on the left side of the bracket, as shown in Figure 86 on page 125. Next, remove the battery retaining bracket **3**.

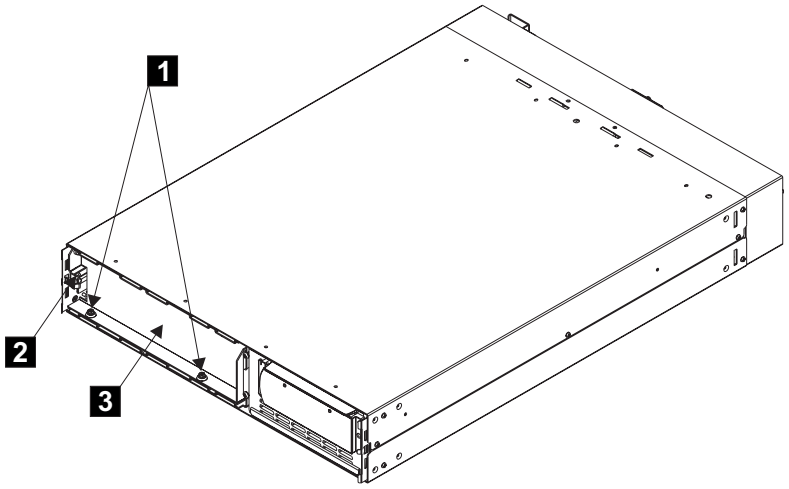


Figure 86. Fastening the battery retaining bracket

1 Bolts

2 Nut

3 Battery retaining bracket

d. Grip the tab on the front of the battery and pull the battery forward until it can be accessed by two service representatives.

e. With the assistance of another service representative, lift the battery assembly clear of the 2145 UPS and place to one side.

Note: The front cover for the 2145 UPS is not installed, however, it is included inside of the shipping carton. The front cover is installed later in the installation process.

2. With the assistance of another service representative, lift the 2145 UPS clear of the shipping carton and place it on a flat, stable surface.
3. Remove the two screws **1** (shown in Figure 87 on page 126).
4. Pull the electronics assembly **2** out of the 2145 UPS, and put it to one side.

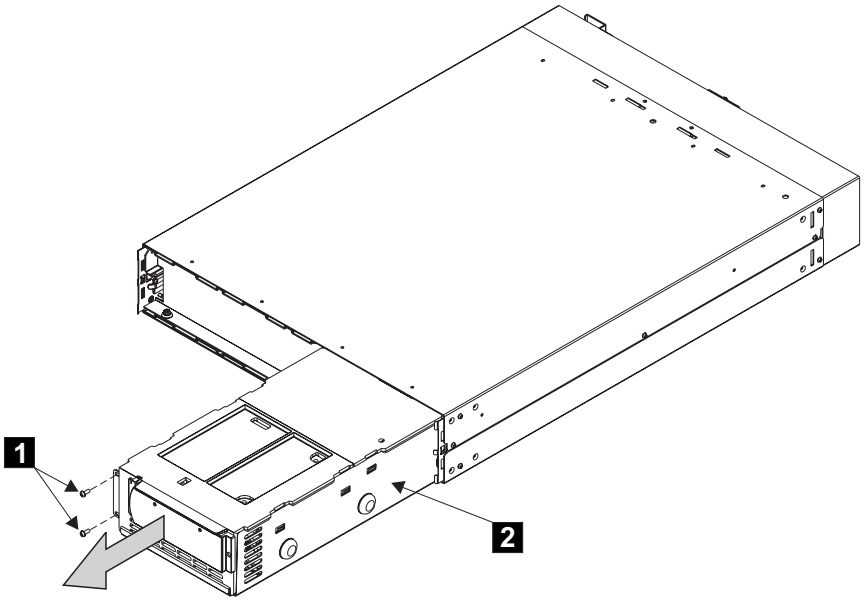


Figure 87. Removing the 2145 UPS electronics assembly

1 Screws

2 Electronics assembly

5. Stand at the front of the rack. With the help of another service representative, place the back of the 2145 UPS onto the support rails and then slide it into the rack.
6. Install the front flathead screws (**1** in Figure 88 on page 127).

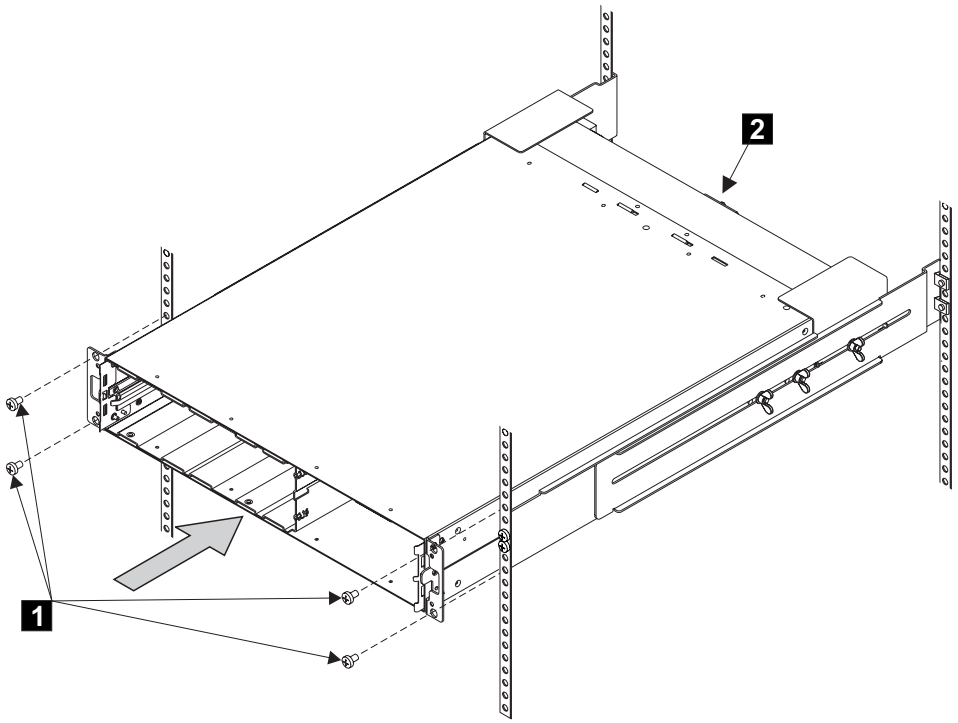


Figure 88. Installing the 2145 UPS into a rack

1 Front flathead screws

7. With the assistance of another service representative, reinstall the following parts:
   a. Battery assembly
   b. Battery retaining bracket
   c. Electronics assembly

   Attention: A grounding screw feature is provided on the back of the 2145 UPS so that you can attach a ground bonding wire, if it is required by local wiring codes. Because safety grounding of the 2145 UPS chassis is maintained through the input line power cord, you are usually not required to use this additional grounding screw feature.
8. Install the front panel.
9. At the back of the 2145 UPS, plug the 2145 UPS main power cable (**1** in Figure 89 on page 128) into the power socket.

   Note: The 2145 UPS is intended to maintain power on SAN Volume Controller 2145-4F2 nodes until data can be saved to the local hard disk drive. Only SAN Volume Controller 2145-4F2 nodes can be plugged in to the 2145 UPS, or the SAN Volume Controller 2145-4F2 cluster malfunctions.

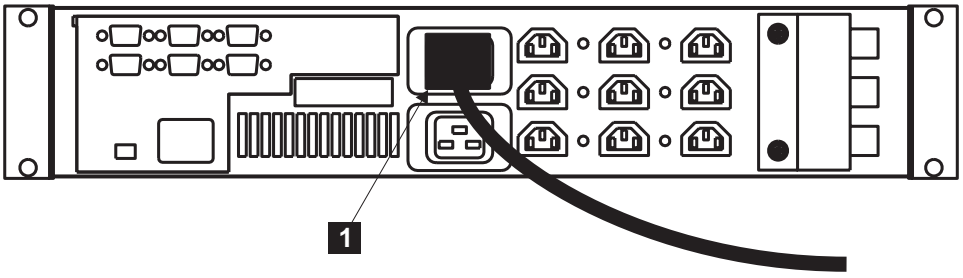


Figure 89. Installing the 2145 UPS power cable

1 Main power cable

If possible, ensure that the two UPSs are not both connected to the same power source. Ensure that you comply with the following requirements for the 2145 UPS:

- Each 2145 UPS should be connected to a separate branch circuit.
- A UL-listed 15 A circuit breaker must be installed in each branch circuit that supplies power to the 2145 UPS.
- The voltage that is supplied to the 2145 UPS must be 200 – 240 V single phase.
- The frequency that is supplied must be 50 or 60 Hz.

Note: If the 2145 UPS is cascaded from another UPS, the source UPS must have at least 3 times the capacity per phase and the total harmonic distortion must be less than 5%. The UPS should also have input voltage capture that has a slew rate of no more than 3 Hz per second.

10. All front panel indicators of the 2145 UPS flash for a short time while the 2145 UPS runs a self-test. When the test is complete, the mode indicator **1** flashes to show that the 2145 UPS is in standby mode; see Figure 90.

    Press and hold the 2145 UPS On button, **2** in Figure 90, until you hear the 2145 UPS beep (approximately one second). The mode indicator stops flashing and the load-level indicators display the percentage of load that is being supplied by the 2145 UPS. The 2145 UPS is now in normal mode and is charging its battery.

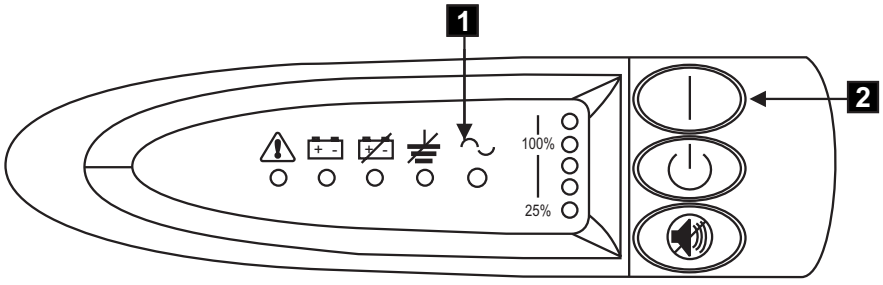


Figure 90. Power switch and indicators on the 2145 UPS

1 Mode indicator

2 On button

If the mode indicator **1** is flashing red and the alarm is sounding, the voltage range setting might not be correct. When a SAN Volume Controller 2145-4F2 is connected to the 2145 UPS, the SAN Volume Controller 2145-4F2

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 2145-4F2 has been connected to this 2145 UPS and powered on.

11. Repeat all of these steps to install additional 2145 UPSs.

Installing the SAN Volume Controller 2145-4F2

There are several steps that you must perform to install the SAN Volume Controller 2145-4F2 node.

Installing the SAN Volume Controller 2145-4F2 consists of the following tasks:

1. Installing the support rails in the rack cabinet.
2. Installing the SAN Volume Controller 2145-4F2.
3. Connecting the SAN Volume Controller 2145-4F2 to the 2145 UPS-1U or the 2145 UPS.

Installing the support rails for the SAN Volume Controller 2145-4F2

You must install the support rails that hold the SAN Volume Controller 2145-4F2.

When you are ready to install the support rails, perform the following tasks:

- Refer to the Hardware Location Chart to determine where the SAN Volume Controller 2145-4F2 is to be installed in the rack.
- Refer to the Electronic Industries Alliance (EIA) markings on the rack and decide where you are going to install the support rails.

Perform the following steps to install the support rails:

1. Check the labels on the support rails. Each rail has a label that indicates which is the front end of the rail and whether the rail is for the left or right side of the rack. Perform this procedure for both rails.
2. Put your index finger against the side of the latch-lever, **1** in Figure 91, and put your thumb against the front of the latch-lock **2**.

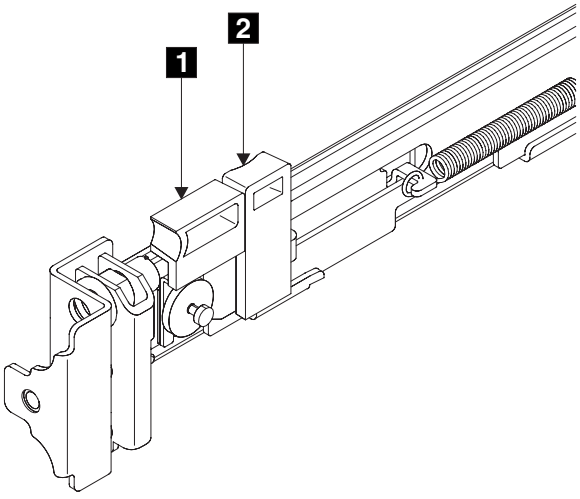


Figure 91. Retracting the latch lock carrier

1 Latch-lever

2 Latch-lock

3. Gently push the latch lock 2 away from the rail as you move the latch lever 1 toward the far end of the rail (Figure 92). The latch-lock carrier assembly slides against the spring tension.

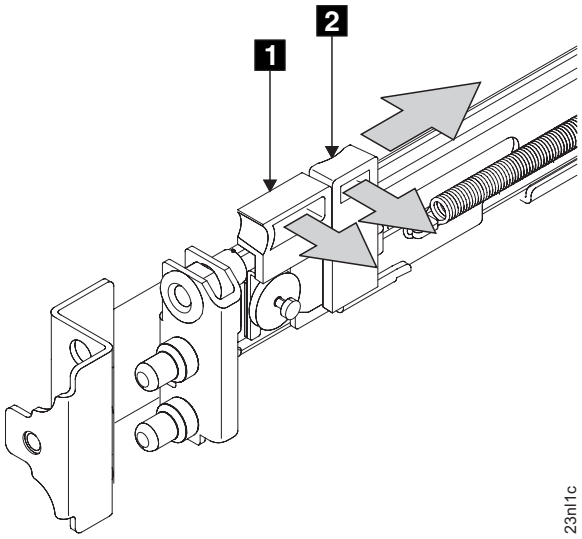


Figure 92. Opening the front latch-lock carrier assembly

1 Latch-lever

2 Latch-lock

4. Continue to slide the latch-lock carrier for approximately 13 mm (0.5 in). The latch-lever engages a hole in the back bracket assembly and holds the latch-lock carrier in the retracted position.
5. Push the back rail bracket 1 (Figure 93) toward the front of the rail until it stops. The rail is now at its shortest adjustment.

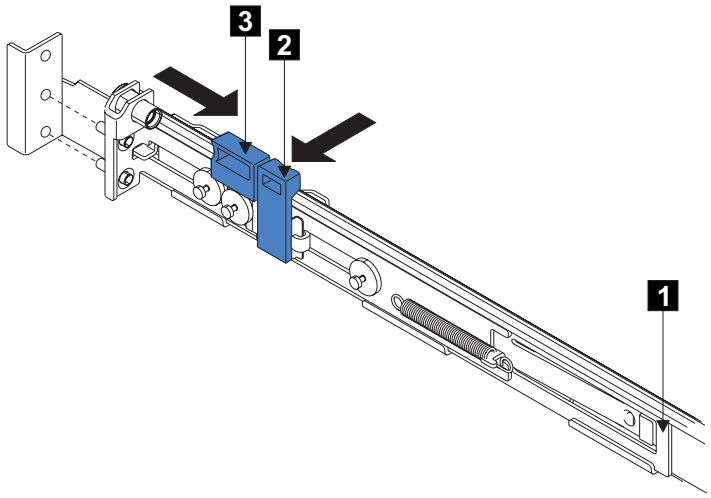


Figure 93. Opening the back latch-lock carrier assembly

1 Back rail bracket

2 Latch-lock

3 Latch-lever

6. Place the front end of the left rail in the rack cabinet. Align the top of the front bracket 1 (Figure 94) with the required EIA marking that is on the rack.

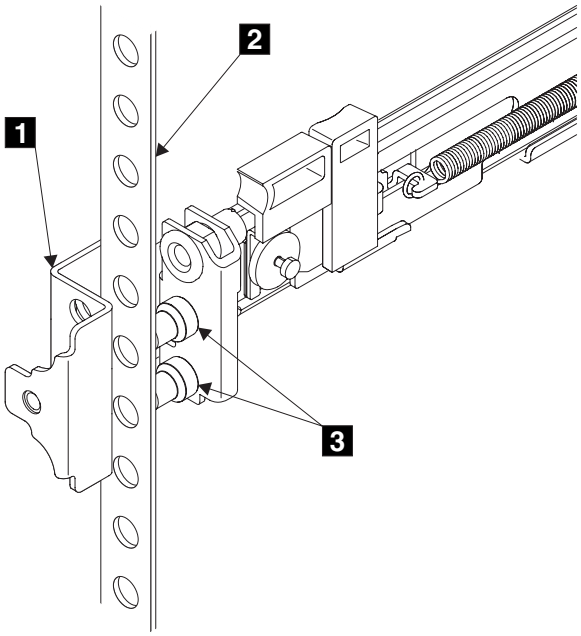


Figure 94. Installing the front end of the rail

1 Front bracket

2 Rack-mounting flange

3 Locating pins

7. Align the locating pins 3 with the holes that are in the rack-mounting flange.
8. Push the latch lock 2 (Figure 95 on page 132) away from the rail to release the carrier. The latch-lock carrier slides toward the front of the rack and the locating pins project through the holes that are in the front flange and in the front rail bracket.

   Important: Ensure that the locating pins are fully extended through the front rail bracket.

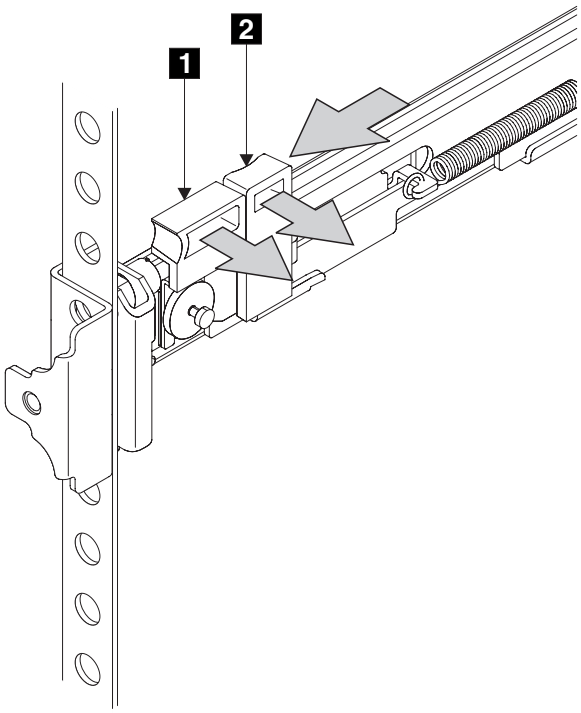


Figure 95. Closing the latch-lock carrier assembly

1 Latch-lever

2 Latch-lock

9. Push the back rail bracket toward the rear of the rack and align the locating pins with the rack-mounting flange.
10. Push the latch lock **2** away from the rail to release the carrier. The latch-lock carrier slides toward the rear of the rack, and the locating pins project through the holes that are in the rear flange and in the rear rail bracket.

    Important: Ensure that the locating pins are fully extended through the rear rail bracket.
11. On the rear of each rail, press the blue release tab and slide the shipping bracket off the slide rail. Store the shipping bracket for further use.

You must perform this procedure for both rails.

Installing the SAN Volume Controller 2145-4F2 in a rack

After installing the support rails, you can install the SAN Volume Controller 2145-4F2 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.

Perform the following steps to install the SAN Volume Controller 2145-4F2 node in the rack:

1. Stand at the front of the rack and place the back of the node onto the support rails, as low in the rack as possible.

2. Slide the node fully into the rack.
3. Fully tighten the two captive thumbscrews (1 in Figure 96).

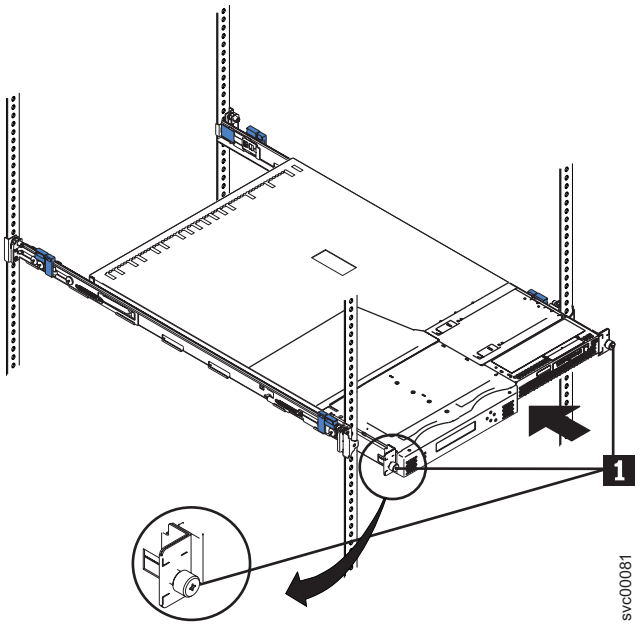


Figure 96. Installing the SAN Volume Controller 2145-4F2 into a rack

4. Repeat this procedure for each SAN Volume Controller 2145-4F2 node that needs to be installed.

   Tip: If you have available space, leave a 1U space between each node to improve the air circulation in the rack.

Connecting the SAN Volume Controller 2145-4F2 to the 2145 UPS-1U

Before you connect the SAN Volume Controller 2145-4F2 node to the 2145 uninterruptible power supply-1U (2145 UPS-1U), review the restrictions that exist between the two systems.

Note: To make the SAN Volume Controller cluster more resilient to power failure, the 2145 UPS-1Us can be connected to the redundant ac power switch. If a redundant ac power switch is not used, connecting the two UPS units that are powering an I/O group to different, independent electrical power sources allows the SAN Volume Controller cluster to continue to operate with reduced capacity if a single power source fails.

Before you begin this task, see the user's cable connection table, which is described in the *IBM System Storage SAN Volume Controller: Planning Guide* and is available at http://www.ibm.com/storage/support/2145. Use this table to identify the 2145 UPS-1U to which this node is to be connected.

Perform the following steps to connect the SAN Volume Controller 2145-4F2 to the 2145 UPS-1U:

1. At the back of the SAN Volume Controller 2145-4F2, plug the combined power and serial cable into the power connector (2 in Figure 97 on page 134).

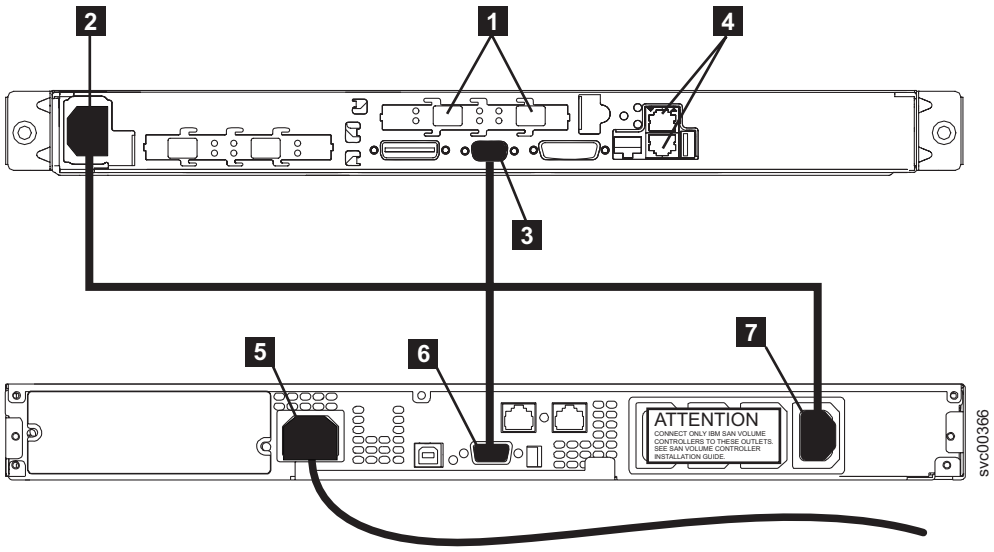


Figure 97. Connecting the SAN Volume Controller 2145-4F2 power cable to the 2145 UPS-1U

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 cable into the rightmost load segment 2 receptacle 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 that is located on the SAN Volume Controller 2145-4F2.
4. Place the other end of the signal cable into the communication port 6 on the 2145 UPS-1U.

The SAN Volume Controller 2145-4F2 power is now connected to the 2145 UPS-1U.

Connecting the SAN Volume Controller 2145-4F2 to the 2145 UPS

Connecting the SAN Volume Controller 2145-4F2 node to the 2145 uninterruptible power supply (2145 UPS) requires that you first review the restrictions that exist between the two systems.

Each SAN Volume Controller 2145-4F2 of a pair must be connected to a different 2145 UPS. Each 2145 UPS can support up to two SAN Volume Controller 2145-4F2s.

Attention: Do not connect two nodes to the same pair of 2145 UPSs. Both nodes are lost in the event that a power failure occurs on both of those 2145 UPSs.

Note: You must install 2145 UPSs in pairs. There must be at least two 2145 UPSs per cluster. A cluster can contain no more than eight SAN Volume Controller 2145-4F2s. Also, ensure that each 2145 UPS of a pair is connected to a separate electrical input power source (if possible) to reduce the chance of input power failure at both 2145 UPSs.

Before you begin this task, refer to the user's cable connection table, which you downloaded from http://www.ibm.com/storage/support/2145, to identify the 2145 UPS that you want this SAN Volume Controller 2145-4F2 to connect to.

Perform the following steps to connect the SAN Volume Controller 2145-4F2 to the 2145 UPS:

1. At the back of the SAN Volume Controller 2145-4F2, plug a power cable into the power connector **1**. See Figure 98.

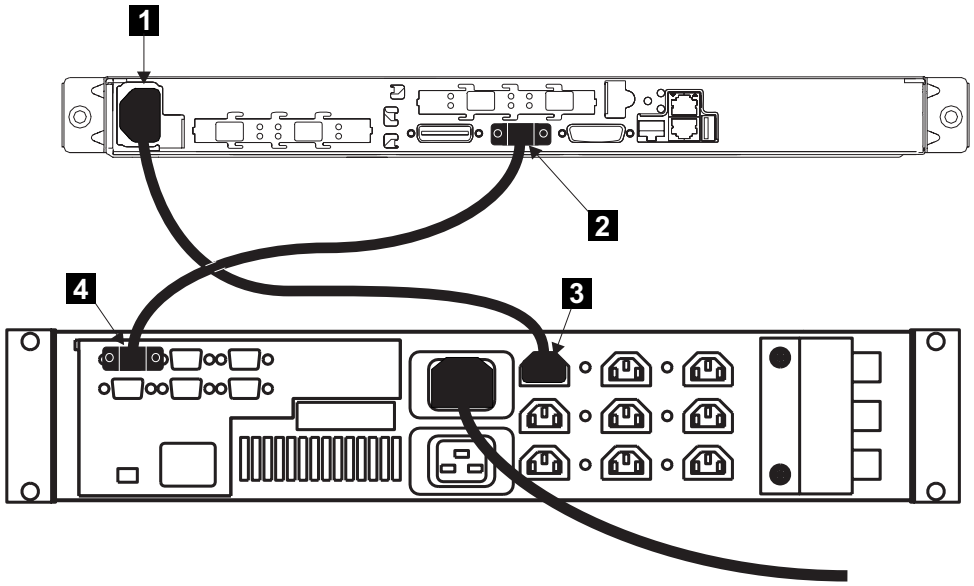


Figure 98. Connecting the SAN Volume Controller 2145-4F2 power cable to the 2145 UPS

1 Power connector

2 Serial connector

3 Output connector

4 Signal cable connector

2. Plug the signal cable of the power cable assembly into the serial connector **2**.

DANGER

You have already switched on the 2145 UPS. The output sockets of the 2145 UPS are live.

3. Place the other end of the SAN Volume Controller 2145-4F2 power cable into any vacant output connector **3** on the 2145 UPS.

4. Place the other end of the signal cable into any vacant position on the top row of serial connectors 4 on the 2145 UPS.

   Attention: Do not plug any signal cables into the bottom row of signal cable connectors or the 2145 UPS malfunctions.

The SAN Volume Controller 2145-4F2 power is now connected to the 2145 UPS.

Connecting the SAN Volume Controller 2145-4F2 to the SAN and to the Ethernet network

Before you connect the SAN Volume Controller 2145-4F2 to the SAN, you must connect the Ethernet and fibre-channel cables.

Before you begin this task, refer to the user's cable connection table to find out where to connect the Ethernet and fibre-channel cables.

1. Connect the Ethernet cable to Ethernet port 1 5 in Figure 99.

   Attention: You must use only Ethernet port 1 on the SAN Volume Controller. The software is configured only for Ethernet port 1.
2. Connect the other end of the Ethernet cable to the proper connector on the Ethernet hub or switch.

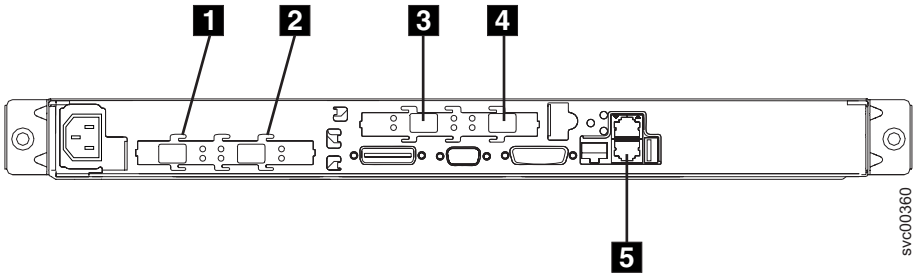


Figure 99. Connectors at the back of the SAN Volume Controller 2145-4F2

1 Fibre-channel port 1

2 Fibre-channel port 2

3 Fibre-channel port 3

4 Fibre-channel port 4

5 Ethernet port 1

   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.).
3. Connect the fibre-channel cables to the fibre-channel ports as required by the user's configuration.
4. Connect the other ends of the fibre-channel cables to the proper connectors of the fibre-channel switches.

Complete steps 1 through 4 for each node that you need to connect to the SAN and to the Ethernet network.

Verifying the SAN Volume Controller 2145-4F2 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: Start" in the *IBM System Storage SAN Volume Controller: Service Guide*, unless a different maintenance analysis procedure (MAP) is specified.

Perform the following steps to verify installation:

1. Press the SAN Volume Controller power switch. Verify that the green power light is on. If the light is not on, see "MAP 5000: Start" in the *IBM System Storage SAN Volume Controller: Service Guide* to repair the problem.

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

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

   In most cases, the battery is delivered charged, so you do not see the `Charging` message. If the Charging message is displayed, you will also see a progress bar on the second line. Battery charging can take up to three hours to complete. In the meantime, if you press any navigation buttons, the battery charging menu is replaced, but battery charging continues. (You can re-enter the menu system to view the charging progress, as described in step 4.) When the battery is charged enough, `Cluster:` is displayed on the first line of the front-panel display. The second line is left blank.
2. Press and hold the select button for five seconds. The check light comes on and a display test is performed. 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 100 shows four examples of what the front panel should display when you press the buttons. When you have finished testing the buttons, press and hold the select button for five seconds in order to exit the test.

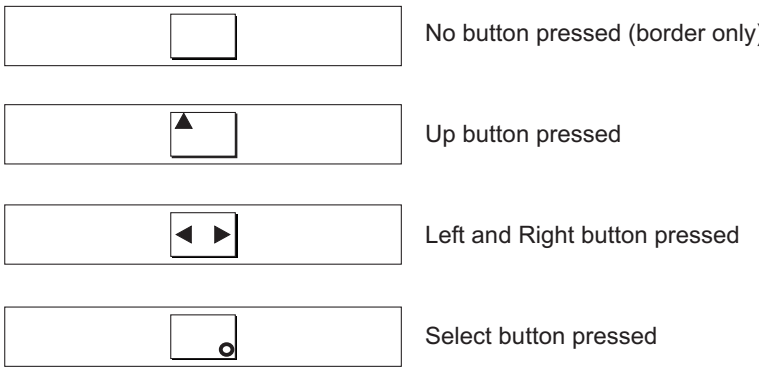


Figure 100. Front panel display when push buttons are pressed

4. If the `Charging` 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 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 101 shows how the node number appears on the front panel.

Figure 101. Node number

7. Press and release the up or down button until the `Ethernet` option is shown on the front panel display. The second line of the front-panel display in Figure 102 shows the message `Inactive`. This message indicates that, although an Ethernet connection is available, it cannot yet be used.

Figure 102. Ethernet mode

8. Press and release the up or down button until the `FC Port-1` option shows in the display.
9. 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: Service Guide* to repair the fault.
10. Press and release the left or right button to display the other port options. Check whether for each port, the second line of the front-panel display shows the message `Active`. If `Active` is not shown for any port, go to "MAP 5600: Fibre channel" in the *IBM System Storage SAN Volume Controller: Service Guide* to repair the fault.
11. If the configuration data table provided by the user indicates that the SAN Volume Controller nodes are to be operated at 1 Gbps, follow these steps:
    a. Press and hold the down button.
    b. Press and release the select button.
    c. Release the down button.

    The second line of the front-panel display shows the current fibre-channel speed setting of the node. Press the up or down button until `1 Gbps` is displayed and then press the select button. This changes the fibre-channel speed for all ports on this node to 1 Gbps.
12. If you want to select a language other than English, perform the following steps:
    a. Press the up or down button until `Select Language?` is displayed.
    b. Press the select button.

c. Press the left or right button until the required language is displayed.
d. Press the select button.

When the battery is fully charged–if it needed to be charged–the `Charging` message is replaced by `Cluster:` and 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, if necessary, create a new SAN Volume Controller cluster and to add the nodes into a SAN Volume Controller cluster.

Installing the hardware master console

If the master console hardware product option is included with the SAN Volume Controller, you must install it and perform initial hardware configuration for it.

Before you begin the installation, ensure that you have completed the following tasks:

- **Important:** Review and complete all of the safety checks that are detailed in the documentation for the master console IBM eServer xSeries hardware, the keyboard, and the display.
- Ensure that you have all the customer-completed information that you need, including the configuration data table, hardware location chart, and the cable connection table, which are provided at http://www.ibm.com/storage/support/2145. The *IBM System Storage SAN Volume Controller: Planning Guide* provides guidelines for completing these tables and charts.

If you experience a problem with your master console, use the 2145 machine type and the serial number of the SAN Volume Controller node that was installed with the master console to open a hardware problem.

Perform the following steps to install the master console hardware option:

Note: Do not install the pull-out monitor and keyboard of the master console directly below a SAN Volume Controller node. The front panel of the node protrudes beyond the front of the rack and overlaps part of the monitor, which prevents you from being able to open it.

1. Install the master console hardware in the rack, following the hardware installation instructions that are provided by your xSeries Installation Guide and by the instructions that are provided with the mounting rails.

   If there are any devices directly above and below the master console server unit, it might be very difficult to reach in and connect the cables to the back of the server after it is placed in the rack. If that is the only slot available, connect the keyboard, mouse, monitor, and Ethernet cables at the back of the master console server before installing it in the rack. Leave the other end of the Ethernet cable disconnected from the network until you are directed to connect it.

   Important: Do not follow any *software* installation procedures in the xSeries Installation Guide.
2. Ensure that no cables are connected to the Ethernet ports.
3. Turn on the master console.
   a. Type `administrator` in the User ID field.

b. Type `passw0rd` in the password field; this password applies to all required password fields. The master console continues to start.

   Note: This process can take several minutes before all services are started and operations are completely responsive.

c. Click **OK** if you receive any messages that a network interface card port is offline.

4. Check that the reference identification tag is securely fastened to the front panel of the master console. The tag indicates the machine type `2145` and the serial number of the SAN Volume Controller node that is being installed with the master console.
5. **IMPORTANT**: This step must be the last step that you perform on the master console before you hand over the machine to the user. It sets up the master console so that it presents a Windows license agreement screen at the next power on and then shuts down the master console.
   a. Select **Start → Run**
   b. Type `c:\sysprep\sysprep.exe`
   c. Click **OK**. The System Preparation Tool panel is displayed.
   d. Select **Don't re-generate security ID**.
   e. Select **Reboot** from the **Shutdown Mode** list.
   f. Click **Reseal**.

   Note: It is important that you do this step; otherwise, the user is not presented later with the choice to accept or decline Windows registration conditions.

6. Connect the master console to the Ethernet port that is designated in the Cable connection table.

Appendix C. Using the front panel of the SAN Volume Controller

The front panel of the SAN Volume Controller displays indicators and switches that are useful when servicing your SAN Volume Controller.

See the related topics for the SAN Volume Controller indicators and switches.

Boot progress indicator

Boot progress is displayed on the front panel of the SAN Volume Controller.

The Boot progress display on the front panel shows that the node is starting.

During the boot operation, boot progress codes are displayed and the progress bar moves to the right while the boot operation proceeds.

Boot failed

If the boot operation fails, a boot code is displayed.

See the topic that contains the boot codes in the *IBM System Storage SAN Volume Controller: Service Guide* where you can find a description of the failure and the appropriate steps that you must perform to correct the failure.

Charging

The front panel indicates that the uninterruptible power supply (UPS) battery is charging.

A node will not start and join a cluster if there is insufficient power in the UPS battery to cope with a power failure. `Charging` is displayed until it is safe to start the node. This might take several hours.

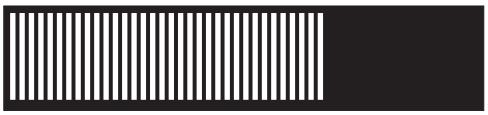
Error codes

Error codes are displayed on the front panel display.

For descriptions of the error codes that are displayed on the front panel display, see the various error code topics for a full description of the failure and the actions that you must perform to correct the failure.

Hardware boot

The hardware boot display shows system data when power is first applied to the node as the node searches for a disk drive to boot.



If this display remains active for longer than 3 minutes, there might be a problem. The cause might be a hardware failure or the software on the hard disk drive is missing or damaged. Refer to the topic on determining a hardware boot failure.

Node rescue request

If software is lost, you can use the node rescue process to copy all software from another node.

The node-rescue-request display shows that a request has been made to exchange the software on this node. The SAN Volume Controller software is preinstalled on all SAN Volume Controller nodes. This software includes the operating system, the application software, and the SAN Volume Controller publications. It is normally not necessary to replace the software on a node, but if the software is lost for some reason (if the hard disk drive in the node fails), it is possible to copy all the software from another node connected to the same fibre-channel fabric. This process is known as node rescue.

Power failure

The SAN Volume Controller runs on battery power when main power is lost.

The Power failure display shows that the SAN Volume Controller is running on battery power because main power has been lost. All I/O operations have stopped. The node is saving cluster metadata and node cache data to the internal disk drive. When the progress bar reaches zero, the node powers off.

Note: When input power is restored to the uninterruptible power supply, the SAN Volume Controller turns on without the front panel power button being pressed.

Powering off

The progress bar on the display shows the progress of the power-off operation.

The Powering-off display shows that the power button has been pressed and the node is powering off. Powering off might take several minutes.

The progress bar moves to the left when the power is removed.

Recovering

The front panel indicates that the uninterruptible power supply (UPS) battery is not fully charged.

When a node is active in a cluster but the UPS battery is not fully charged, `Recovering` is displayed. If the power fails while this message is displayed, the node does not restart until the UPS has charged to a level where it can sustain a second power failure.

Restarting

The front panel indicates when the software on a node is restarting.

The software is restarting for one of the following reasons:

- An internal error was detected
- A power-off operation ended when the power button was pressed again while the node was powering off

If a power-off operation was ended, the progress bar continues to move to the left until the node finishes saving its data. After the data is saved, the progress bar moves to the right during the restart operation.

Shutting down

The front panel indicator tracks shutdown operations.

The Shutting down display is shown when you issue a shutdown command to a SAN Volume Controller cluster or a SAN Volume Controller node. The progress bar continues to move to the left until it is safe to be powered off.

When the shutdown operation is complete, all power is removed from the node. When power is removed from the last node that is connected to a 2145 uninterruptible power supply (2145 UPS), the 2145 UPS also shuts down. When a node that is connected to a 2145 uninterruptible power supply-1U (2145 UPS-1U) is shut down, the 2145 UPS-1U remains in the normal mode.

SAN Volume Controller menu options

Menu options are available on the front panel display on the SAN Volume Controller.

Menu options enable you to review the operational status of the cluster, node, and external interfaces. They also provide access to the tools that you need to install and service the node.

Figure 103 shows the sequence of the menu options. Only one option at a time is displayed on the front panel display. For some options, additional data is displayed on line 2. The first option displayed is the cluster option.

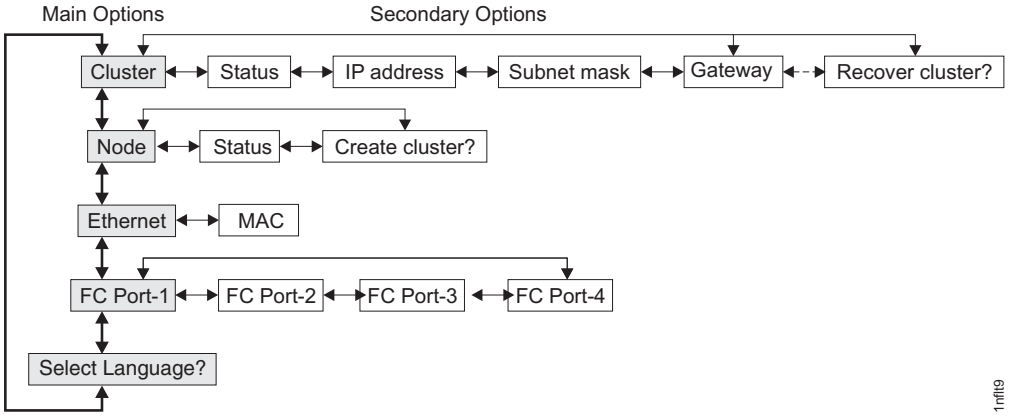


Figure 103. Menu options sequence

Use the Left and Right buttons to navigate through the secondary fields that are associated with some of the main fields.

Note: Messages might not display fully on the screen. You might see a right angle bracket (>) on the right-hand side of the display screen. If you see a right angle bracket, press the Right arrow button to scroll through the display.

This action displays the rest of the text. Press the Left arrow button to scroll back. When there is no more text to display, you can move to the next item in the menu by pressing the Right arrow button.

There are five main options available:

- Cluster
- Node
- Ethernet
- FC port–1 through 4
- Select language

Cluster options

The main cluster option from the menu can display the cluster name, IP address, or can be blank.

The main cluster option displays the cluster name that the user has assigned. If no name has been assigned, the IP address of the cluster is displayed. If this SAN Volume Controller is not assigned to a cluster, the field is blank.

Status

Status is indicated on the front panel.

This field is blank if this SAN Volume Controller node is not a member of a cluster. If this SAN Volume Controller node is a member of a cluster, the field indicates the operational status of the cluster, as follows:

Active

- Indicates that this SAN Volume Controller node is an active member of the cluster.

Inactive

- Indicates that the SAN Volume Controller node is a member of a cluster, but is not now operational. It is not operational because the other SAN Volume Controller nodes that are in the cluster cannot be accessed or because this SAN Volume Controller node was excluded from the cluster.

Degraded

- Indicates that the cluster is operational, but one or more of the member SAN Volume Controller nodes are missing or have failed.

IP address

The IP address is used to access the cluster from the command line tools or Web browser.

This field contains the existing Ethernet IP address of the cluster. It is set during the create-cluster operation. You use this address to access the cluster from the command line tools or from a Web browser. If this SAN Volume Controller is not a member of a cluster, this field is blank.

Subnet mask

The subnet mask address is set when a cluster is created.

The subnet mask option displays the subnet mask address. It is set during the create-cluster operation.

Gateway
The gateway address is set when the cluster is created.

The gateway option displays the gateway address.

Recover cluster?
The Recover cluster? option is useful if the administrator password has been lost or forgotten.

This field allows you to recover a lost administrator password or make the node accessible via the service password.

Figure 104 shows the Recover cluster? menu sequence.

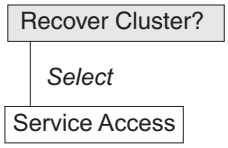


Figure 104. Recover Cluster? menu sequence

You do not need to use this field during installation. For more information about the Recover cluster? field, see the *IBM System Storage SAN Volume Controller: Service Guide*.

Node options
The node option displays the identification number or name of the SAN Volume Controller.

The main node option displays the identification number of the SAN Volume Controller or the name of the SAN Volume Controller if the user has assigned a name.

Status
Use the status to diagnose cluster failures.

Active

- The SAN Volume Controller is operational and assigned to a cluster. It has access to the fibre-channel fabric.

Inactive

- The SAN Volume Controller is operational and assigned to a cluster. It has no access to the fibre-channel fabric.

Free

- The SAN Volume Controller is operational, but has not been assigned to any cluster. It has access to the fibre-channel fabric.

Disconnected

- The SAN Volume Controller is operational, but has not been assigned to any cluster. It has no access to the fibre-channel fabric.

Failed

- The SAN Volume Controller is not operational. A hardware fault is preventing the SAN Volume Controller from being part of a cluster.

Create cluster?

Clusters can be created from the Create Cluster menu.

The Create cluster? field allows you to create a new SAN Volume Controller cluster. Press the select button to go to the create cluster menu. Figure 105 shows the create cluster menu sequence.

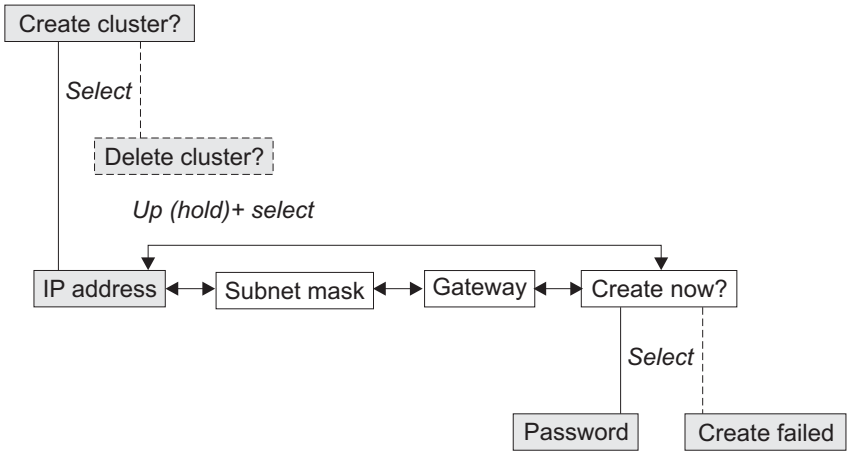


Figure 105. Create cluster? menu sequence

Press the left and right buttons to navigate through the secondary options that are associated with the Create cluster? option. When you have navigated to the desired option, press the select button. The secondary options available include:

- IP address
- Subnet mask
- Gateway
- Create now?

IP address

The IP address lets you display or change the Ethernet IP address for the cluster that you are going to create. Be sure to verify the correct IP address with the customer before you create a cluster.

Attention: If you change the IP address, ensure that you type the correct address. Otherwise, you cannot access the cluster using the command line tools or a Web browser.

Perform the following steps to change the IP address:

1. From the Create Cluster? option, press the select button. The IP address option is displayed.
2. Press the select button again. The first IP address number is highlighted.
3. Press the up button if you want to increase the value that is displayed; press the down button if you want to decrease that value. If you want to quickly increase the highlighted value, hold the up button. If you want to quickly decrease the highlighted value, hold the down button.

Note: If you want to disable the fast increase/decrease function, press and hold the down button, press and release the select button, and then release the down button. The disabling of the fast increase/decrease function lasts until cluster creation is completed or until the feature is again enabled. If the up or down buttons are pressed and held while the function is disabled, the value increases or decreases once every two seconds. To again enable the fast increase/decrease function, press and hold the up button, press and release the select button, and then release the up button.

4. Press the right or left buttons to move to the number field that you want to update.
5. Repeat steps 3 on page 147 and 4 for each number field that you want to update.
6. Press the select button to complete the change.

Press the right button to display the next secondary option or the left button to display the previous options.

Subnet Mask

This option lets you display or change the subnet mask.

Attention: If you change the subnet mask address, ensure that you type the correct address. Otherwise, you cannot access the cluster using the command line tools or a Web browser.

Perform the following steps to change the subnet mask:

1. Press the select button. The first subnet mask number is displayed.
2. Press the up button if you want to increase the value that is displayed; press the down button if you want to decrease that value. If you want to quickly increase the highlighted value, hold the up button. If you want to quickly decrease the highlighted value, hold the down button.

   Note: If you want to disable the fast increase/decrease function, press and hold the down button, press and release the select button, and then release the down button. The disabling of the fast increase/decrease function lasts until cluster creation is completed or until the feature is again enabled. If the up or down buttons are pressed and held while the function is disabled, the value increases or decreases once every two seconds. To again enable the fast increase/decrease function, press and hold the up button, press and release the select button, and then release the up button.
3. Press the right or left buttons to move to the number field that you want to update.
4. Repeat steps 2 and 3 for each number field that you want to update.
5. Press the select button to complete the change.

Gateway

Attention: If you change the gateway address, ensure that you type the correct address. Otherwise, you cannot access the cluster from the Web interface or from a command line.

Perform the following steps to change the gateway address:

1. Press the select button. The first gateway address number field is highlighted.
2. Press the up button if you want to increase the value that is displayed; press the down button if you want to decrease that value. If you want to quickly increase the highlighted value, hold the up button. If you want to quickly decrease the highlighted value, hold the down button.

   Note: If you want to disable the fast increase/decrease function, press and hold the down button, press and release the select button, and then release the down button. The disabling of the fast increase/decrease function lasts until cluster creation is completed or until the feature is again enabled. If the up or down buttons are pressed and held while the function is disabled, the value increases or decreases once every two seconds. To again enable the fast increase/decrease function, press and hold the up button, press and release the select button, and then release the up button.
3. Press the right or left buttons to move to the number field that you want to update.
4. Repeat steps 2 and 3 for each number field that you want to update.
5. Press the select button to complete the change.

Create Now?

This option lets you start an operation to create a cluster. Press the select button to start the operation.

If the create operation is successful, `Password` is displayed on line 1. The password that you can use to access the cluster is displayed on line 2. Be sure to immediately record the password; it is required on the first attempt to access the cluster.

Attention: The password displays for only 60 seconds, or until a front panel button is pressed. The cluster is created only after the password display is cleared.

If the create operation fails, `Create Failed:` is displayed on line 1 of the service display screen. Line 2 displays one of two possible error codes that you can use to isolate the cause of the failure.

Press the up button to return to the Create Cluster? option.

Delete Cluster?

The field for Delete Cluster? is displayed only if you select Create Cluster? on a SAN Volume Controller that is already a member of a cluster. Normally, you can use the command-line interface (CLI) or the graphical user interface (GUI) to delete a cluster. However, if you cannot use the CLI or GUI, you can use Delete Cluster to force the deletion of a node from a cluster. Perform the following steps to delete a node from the cluster:

1. Press and hold the up button.
2. Press and release the select button.
3. Release the up button.

The SAN Volume Controller is deleted from the cluster and the node is restarted. The display then returns to the default menu. The create cluster option must be selected again to start the create option.

Use the up button to return to the Create Cluster? option.

Ethernet option

The Ethernet option displays the operational states of the Ethernet port and its media access control (MAC) address.

When a cluster is created, only one node's Ethernet port becomes active for cluster configuration. If the node which has the active port fails, then another node in the cluster opens its Ethernet port and gains configuration access to that cluster.

Active The cluster is accessible through this port.

Inactive
The port is operational, but it cannot access the cluster. This port can be used to access the cluster if the cluster's active port fails.

Failed The port is not operational.

Press the right button to display the MAC address of the Ethernet port.

Fibre channel port-1 through 4 option

The fibre channel port-1 through 4 options display the operational status of the fibre-channel ports.

Active The port is operational and can access the fibre-channel fabric.

Inactive
The port is operational but cannot access the fibre-channel fabric. One of the following conditions caused this result:
- The fibre-channel cable has failed
- The fibre-channel cable is not installed
- The device that is at the other end of the cable has failed

Failed The port is not operational because of a hardware failure.

Not installed
This port is not installed.

To display the current fibre-channel port speed, press and hold the down button, press and release the select button, and release the down button. For the SAN Volume Controller 2145-4F2 or the SAN Volume Controller 2145-8F2, this action also allows you to change the fibre-channel port speed of a node that is not participating in a cluster, by pressing the up or down buttons.

Select language? option

The language displayed can be changed from the menu.

The Select language? option allows you to change the language that is displayed on the menu. Figure 106 shows the Select language? option sequence.

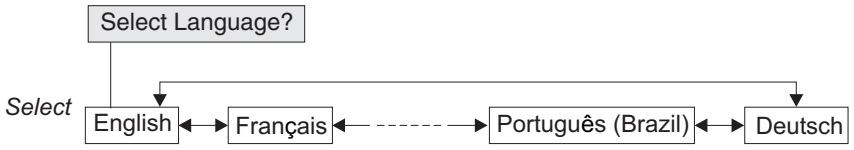


Figure 106. Select language? menu sequence

Press the right button to display the language that you want. When the required language is displayed, press the select button.

Note: Line 1 of the menu displays an option. For some options, additional data is displayed on line 2. If, the front panel is set to Japanese, Korean, or Chinese, the menu shows only line 1. To display line 2, press the select button. To return to the option on line 1, press the select button again.

The following languages are available:
- English
- French
- German
- Italian
- Japanese
- Korean
- Portuguese
- Spanish
- Chinese (simplified)
- Chinese (traditional)

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. To select the required language, perform the following steps:

1. Press the up button once.
2. Press the select button once. If the display changes, go to step 5.
3. Press the up button once.
4. Press the select button once.
5. Press the right button until your required language is displayed.
6. Press the select button.

Note: This procedure does not work if the node is displaying a boot error.

Accessibility

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

Features

These are the major accessibility features in the SAN Volume Controller Console :

- You can use screen-reader software and a digital speech synthesizer to hear what is displayed on the screen. The following screen readers have been tested: WebKing v5.5 and Window-Eyes v5.5.
- You can operate all features using the keyboard instead of the mouse.
- You can change the initial delay and repeat rate of the up and down buttons to two seconds when you use the front panel of the SAN Volume Controller to set or change an IP address. This feature is documented in the applicable sections of the SAN Volume Controller publications.

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 SAN Volume Controller Console and help system from the keyboard by using the following key combinations:

- To traverse to the next link, button, or topic, press Tab inside a frame (page).
- To expand or collapse a tree node, press → or ←, respectively.
- To move to the next topic node, press V or Tab.
- To move to the previous topic node, press ^ or Shift+Tab.
- To scroll all the way up or down, press Home or End, respectively.
- To go back, press Alt+←.
- To go forward, press Alt+→.
- To go to the next frame, press Ctrl+Tab.
- To move to the previous frame, press Shift+Ctrl+Tab.
- To print the current page or active frame, press Ctrl+P.
- To select, press Enter.

Accessing the publications

You can view the publications for the SAN Volume Controller in Adobe Portable Document Format (PDF) using the Adobe Acrobat Reader. The PDFs are provided at the following Web site:

http://www.ibm.com/storage/support/2145

Related reference

"SAN Volume Controller library and related publications" on page xii
A list of other publications that are related to this product are provided to you for your reference.

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"Trademarks" on page 157

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European community contact:

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Pascalstr. 100, Stuttgart, Germany 70569
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Tele: 0049 (0)711 785 1176
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Glossary

This glossary includes terms for the IBM System Storage SAN Volume Controller.

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See Refers the reader to one of two kinds of related information:

- A term that is the expanded form of an abbreviation or acronym. This expanded form of the term contains the full definition.
- A synonym or more preferred term.

See also
Refers the reader to one or more related terms.

Contrast with
Refers the reader to a term that has an opposite or substantively different meaning.

Numerics

2145 A hardware machine type for the IBM System Storage SAN Volume Controller. Models of the SAN Volume Controller are expressed as the number 2145 followed by "-xxx", such as 2145-8G4. Hardware models for the 2145 include 2145-4F2, 2145-8F2, 2145-8F4, and 2145-8G4.

A

access mode
One of three different modes in which a logical unit (LU) in a disk controller system can operate. See also *image mode*, *managed space mode*, and *unconfigured mode*.

Address Resolution Protocol (ARP)
A protocol that dynamically maps an IP address to a network adapter address in a local area network.

agent code
An open-systems standard that interprets Common Information Model (CIM) requests and responses as they transfer between the client application and the device.

application server
A host that is attached to the storage area network (SAN) and that runs applications.

ARP See *Address Resolution Protocol*.

array An ordered collection, or group, of physical storage devices that are used to define logical volumes or devices.

association
A class that contains two references that define a relationship between two referenced objects.

asymmetric virtualization
A virtualization technique in which the virtualization engine is outside the data path and performs a metadata-style service. The metadata server contains all the mapping and locking tables while the storage devices contain only data. See also *symmetric virtualization*.

auxiliary virtual disk
The virtual disk that contains a backup copy of the data and that is used in disaster recovery scenarios. See also *master virtual disk*.

availability
The ability of a system to continue working, with perhaps a decrease in performance, after individual components fail.

B

bandwidth
The range of frequencies an electronic system can transmit or receive. The greater the bandwidth of a system, the more information the system can transfer in a given period of time.

bitmap
A coded representation in which each bit, or group of bits, represents or corresponds to an item; for example, a configuration of bits in main storage in which each bit indicates whether a peripheral device or a storage block is available or in which each group of bits corresponds to one pixel of a display image.

blade One component in a system that is designed to accept some number of components (blades). Blades could be individual servers that plug into a multiprocessing system or individual port cards that add connectivity to a switch. A blade is typically a hot-swappable hardware device.

block A unit of data storage on a disk drive.

block virtualization
The act of applying virtualization to one or more block-based (storage) services for the purpose of providing a new aggregated, higher-level, richer, simpler, or secure block service to clients. Block virtualization functions can be nested. A disk drive, RAID system, or volume manager all perform some form of block-address to (different) block-address mapping or aggregation. See also *virtualization*.

Boolean
Pertaining to the processes used in the algebra formulated by George Boole.

C

cache A high-speed memory or storage device used to reduce the effective time required to read data from or write data to lower-speed memory or a device. Read cache holds data in anticipation that it will be requested by a client. Write cache holds data written by a client until it can be safely stored on more permanent storage media such as disk or tape.

Call Home
A communication service that links a machine to a service provider. The

machine can use this link to place a call to IBM or to another service provider when service is required. With access to the machine, service personnel can perform service tasks, such as viewing error and problem logs or initiating trace and dump retrievals.

cascading
The process of connecting two or more fibre-channel hubs or switches together to increase the number of ports or extend distances.

CIM See *Common Information Model*.

CIM object manager (CIMOM)
The common conceptual framework for data management that receives, validates, and authenticates the CIM requests from the client application. It then directs the requests to the appropriate component or service provider.

CIMOM
See *CIM object manager*.

class The definition of an object within a specific hierarchy. A class can have properties and methods and can serve as the target of an association.

CLI See *command line interface*.

client A computer system or process that requests a service of another computer system or process that is typically referred to as a server. Multiple clients can share access to a common server.

client application
A storage management program that initiates Common Information Model (CIM) requests to the CIM agent for the device.

cluster
In SAN Volume Controller, up to four pairs of nodes that provide a single configuration and service interface.

command line-interface (CLI)
A type of computer interface in which the input command is a string of text characters.

Common Information Model (CIM)
A set of standards developed by the Distributed Management Task Force (DMTF). CIM provides a conceptual framework for storage management and an open approach to the design and implementation of storage systems, applications, databases, networks, and devices.

concurrent maintenance
Service that is performed on a unit while it is operational.

In SAN Volume Controller, the ability for one node in the cluster to be turned off for maintenance without interrupting access to the VDisk data provided by the cluster.

configuration node
A node that acts as the focal point for configuration commands and manages the data that describes the cluster configuration.

connected
In a Global Mirror relationship, pertaining to the status condition that occurs when two clusters can communicate.

consistency group
A group of copy relationships between virtual disks that are managed as a single entity.

consistent copy
In a Metro or Global Mirror relationship, a copy of a secondary virtual disk (VDisk) that is identical to the primary VDisk from the viewpoint of a host system, even if a power failure occurred while I/O activity was in progress.

consistent-stopped
In a Global Mirror relationship, the state that occurs when the secondary virtual disk (VDisk) contains a consistent image, but the image might be out-of-date with respect to the primary VDisk. This state can happen when a relationship was in the consistent-synchronized state when an error occurred that forced a freeze of the consistency group. This state can also happen when a relationship is created with the create-consistent flag set to `TRUE`.

consistent-synchronized
In a Global Mirror relationship, the status condition that occurs when the primary virtual disk (VDisk) is accessible for read and write I/O operations. The secondary VDisk is accessible for read-only I/O operations. See also *primary virtual disk* and *secondary virtual disk*.

container
A data storage location; for example, a file, directory, or device.

A software object that holds or organizes other software objects or entities.

copied
In a FlashCopy mapping, a state that indicates that a copy has been started after the copy relationship was created. The copy process is complete and the target disk has no further dependence on the source disk.

copying
A status condition that describes the state of a pair of virtual disks (VDisks) that have a copy relationship. The copy process has been started but the two virtual disks are not yet synchronized.

Copy Services
The services that enable you to copy virtual disks (VDisks): FlashCopy, Metro, and Global Mirror.

counterpart SAN
A nonredundant portion of a redundant storage area network (SAN). A counterpart SAN provides all the connectivity of the redundant SAN but without the redundancy. Each counterpart SANs provides an alternate path for each SAN-attached device. See also *redundant SAN*.

cross-volume consistency
In SAN Volume Controller, a consistency group property that guarantees consistency between virtual disks when an application issues dependent write operations that span multiple virtual disks.

D

data migration
The movement of data from one physical location to another without disrupting I/O operations.

degraded
Pertaining to a valid configuration that has suffered a failure but continues to be supported and legal. Typically, a repair action can be performed on a degraded configuration to restore it to a valid configuration.

dense wavelength division multiplexing (DWDM)
A technology that places many optical signals onto one single-mode fiber using slightly different optical frequencies. DWDM enables many data streams to be transferred in parallel.

dependent write operations
A set of write operations that must be applied in the correct order to maintain cross-volume consistency.

destage
A write command initiated by the cache to flush data to disk storage.

device In the CIM Agent, the storage server that processes and hosts client application requests.

IBM definition: A piece of equipment that is used with the computer and does not generally interact directly with the system, but is controlled by a controller.

HP definition: In its physical form, a magnetic disk that can be attached to a SCSI bus. The term is also used to indicate a physical device that has been made part of a controller configuration; that is, a physical device that is known to the controller. Units (virtual disks) can be created from devices after the devices have been made known to the controller.

device provider
A device-specific handler that serves as a plug-in for the Common Information Model (CIM); that is, the CIM object manager (CIMOM) uses the handler to interface with the device.

directed maintenance procedures
The set of maintenance procedures that can be run for a cluster. These procedures are run from within the SAN Volume Controller application and are documented in the *IBM System Storage SAN Volume Controller: Service Guide*.

disconnected
In a Metro or Global Mirror relationship, pertains to two clusters when they cannot communicate.

discovery
The automatic detection of a network topology change, for example, new and deleted nodes or links.

disk controller
A device that coordinates and controls the operation of one or more disk drives and synchronizes the operation of the drives with the operation of the system as a whole. Disk controllers provide the storage that the cluster detects as managed disks (MDisks).

disk drive
A disk-based, nonvolatile, storage medium.

disk zone
A zone defined in the storage area network (SAN) fabric in which the SAN Volume Controller can detect and address the logical units that the disk controllers present.

Distributed Management Task Force (DMTF)
An organization that defines standards for the management of distributed systems. See also *Common Information Model*.

DMP See *directed maintenance procedures*.

DMTF
See *Distributed Management Task Force*.

domain name server
In the Internet suite of protocols, a server program that supplies name-to-address conversion by mapping domain names to IP addresses.

DRAM
See *dynamic random access memory*.

DWDM
See *dense wavelength division multiplexing*.

dynamic random access memory (DRAM)
A storage in which the cells require repetitive application of control signals to retain stored data.

E

EC See *engineering change.*

EIA See *Electronic Industries Alliance*.

Electronic Industries Alliance (EIA)
An alliance of four trade associations: The Electronic Components, Assemblies & Materials Association (ECA); the Government Electronics and Information Technology Association (GEIA); the JEDEC Solid State Technology Association (JEDEC); and the Telecommunications Industry Association (TIA). Prior to 1998, EIA was the Electronic Industries Association and the group dates back to 1924.

empty In a Global Mirror relationship, a status condition that exists when the consistency group contains no relationships.

engineering change (EC)
A correction for a defect of hardware or software that is applied to a product.

error code
A value that identifies an error condition.

ESS See *IBM TotalStorage® Enterprise Storage Server®*.

exclude
To remove a managed disk (MDisk) from a cluster because of certain error conditions.

excluded
In SAN Volume Controller, the status of a managed disk that the cluster has removed from use after repeated access errors.

extent A unit of data that manages the mapping of data between managed disks and virtual disks.

F

fabric In fibre-channel technology, a routing structure, such as a switch, that receives addressed information and routes it to the appropriate destination. A fabric can consist of more than one switch. When multiple fibre-channel switches are interconnected, they are described as cascading. See also *cascading*.

fabric port (F_port)
A port that is part of a fibre-channel fabric. An F_port on a fibre-channel fabric connects to the node port (N_port) on a node.

failover
In SAN Volume Controller, the function that occurs when one redundant part of the system takes over the workload of another part of the system that has failed.

FCIP See *Fibre Channel over IP*.

fibre channel
A technology for transmitting data between computer devices at a data rate of up to 4 Gbps. It is especially suited for attaching computer servers to shared storage devices and for interconnecting storage controllers and drives.

fibre-channel extender
A device that extends a fibre-channel link over a greater distance than is supported by the standard, usually a number of miles or kilometers. Devices must be deployed in pairs at each end of a link.

Fibre Channel over IP (FCIP)
A network storage technology that combines the features of the Fibre Channel Protocol and the Internet Protocol (IP) to connect distributed SANs over large distances.

Fibre Channel Protocol (FCP)
A protocol that is used in fibre-channel communications with five layers that define how fibre-channel ports interact through their physical links to communicate with other ports.

field replaceable unit (FRU)
An assembly that is replaced in its entirety when any one of its components fails. An IBM service representative performs the replacement. In some cases, a field replaceable unit might contain other field replaceable units.

FlashCopy mapping
A relationship between two virtual disks.

FlashCopy relationship
See *FlashCopy mapping*.

FlashCopy service
In SAN Volume Controller, a copy service that duplicates the contents of a source virtual disk (VDisk) to a target VDisk. In the process, the original contents of the target VDisk are lost. See also *point-in-time copy.*

F_port See *fabric port*.

FRU See *field replaceable unit*.

G

gateway
An entity that operates above the link layer and translates, when required, the interface and protocol used by one network into those used by another distinct network.

GB See *gigabyte*.

GBIC See *gigabit interface converter*.

gigabit interface converter (GBIC)
An interface module that converts the light stream from a fibre-channel cable into electronic signals for use by the network interface card.

gigabyte (GB)
In decimal notation, 1 073 741 824 bytes.

Global Mirror
An asynchronous copy service that enables host data on a particular source virtual disk (VDisk) to be copied to the target VDisk that is designated in the relationship.

grain In a FlashCopy bitmap, the unit of data represented by a single bit.

GUI See *graphical user interface*.

graphical user interface (GUI)
A type of computer interface that presents a visual metaphor of a real-world scene, often of a desktop, by combining high-resolution graphics, pointing devices, menu bars and other menus, overlapping windows, icons and the object-action relationship.

H

hardcoded
Pertaining to software instructions that are statically encoded and not intended to be altered.

HBA See *host bus adapter*.

HLUN
See *virtual disk*.

host An open-systems computer that is connected to the SAN Volume Controller through a fibre-channel interface.

host bus adapter (HBA)
In SAN Volume Controller, an interface card that connects a host bus, such as a peripheral component interconnect (PCI) bus, to the storage area network.

host ID
In SAN Volume Controller, a numeric identifier assigned to a group of host fibre-channel ports for the purpose of logical unit number (LUN) mapping. For each host ID, there is a separate mapping of Small Computer System Interface (SCSI) IDs to virtual disks (VDisks).

host zone
A zone defined in the storage area network (SAN) fabric in which the hosts can address the SAN Volume Controllers.

hub A fibre-channel device that connects nodes into a logical loop by using a physical star topology. Hubs will automatically recognize an active node and insert the node into the loop. A node that fails or is powered off is automatically removed from the loop.

A communications infrastructure device to which nodes on a multi-point bus or loop are physically connected. Commonly used in Ethernet and fibre-channel networks to improve the manageability of physical cables. Hubs maintain the logical loop topology of the network of which they are a part, while creating a “hub and spoke” physical star layout. Unlike

switches, hubs do not aggregate bandwidth. Hubs typically support the addition or removal of nodes from the bus while it is operating. (S) Contrast with *switch*.

I

ID See *identifier*.

identifier (ID)
A sequence of bits or characters that identifies a user, program device, or system to another user, program device, or system.

idle In a FlashCopy mapping, the state that occurs when the source and target virtual disks (VDisks) act as independent VDisks even if a mapping exists between the two. Read and write caching is enabled for both the source and the target.

idling The status of a pair of virtual disks (VDisks) that have a defined copy relationship for which no copy activity has yet been started.

In a Metro or Global Mirror relationship, the state that indicates that the master virtual disks (VDisks) and auxiliary VDisks are operating in the primary role. Consequently, both VDisks are accessible for write I/O operations.

idling-disconnected
In a Global Mirror relationship, the state that occurs when the virtual disks (VDisks) in this half of the consistency group are all operating in the primary role and can accept read or write I/O operations.

illegal configuration
A configuration that will not operate and will generate an error code to indicate the cause of the problem.

image mode
An access mode that establishes a one-to-one mapping of extents in the managed disk (MDisk) with the extents in the virtual disk (VDisk). See also *managed space mode* and *unconfigured mode*.

image VDisk
A virtual disk (VDisk) in which there is a direct block-for-block translation from the managed disk (MDisk) to the VDisk.

IML See *initial microcode load*.

inconsistent
In a Metro or Global Mirror relationship, pertaining to a secondary virtual disk (VDisk) that is being synchronized with the primary VDisk.

inconsistent-copying
In a Global Mirror relationship, the state that occurs when the primary virtual disk (VDisk) is accessible for read and write input/output (I/O) operations, but the secondary VDisk is not accessible for either. This state occurs after a **start** command is issued to a consistency group that is in the inconsistent-stopped state. This state also occurs when a **start** command is issued, with the force option, to a consistency group that is in the idling or consistent-stopped state.

inconsistent-disconnected
In a Global Mirror relationship, a state that occurs when the virtual disks (VDisks) in the half of the consistency group that is operating in the secondary role are not accessible for either read or write I/O operations.

inconsistent-stopped
In a Global Mirror relationship, the state that occurs when the primary virtual disk (VDisk) is accessible for read and write input/output (I/O) operations, but the secondary VDisk is not accessible for either read or write I/O operations.

indication
An object representation of an event.

initial microcode load (IML)
In SAN Volume Controller, the process by which the run-time code and data for a node are loaded into memory and initialized.

initiator
The system component that originates an I/O command over an I/O bus or network. I/O adapters, network interface cards, and intelligent controller device I/O bus control ASICs are typical initiators. (S) See also *logical unit number*.

input/output (I/O)
Pertaining to a functional unit or communication path involved in an input process, an output process, or both, concurrently or not, and to the data involved in such a process.

instance
An individual object that is a member of some class. In object-oriented programming, an object is created by instantiating a class.

integrity
The ability of a system to either return only correct data or respond that it cannot return correct data.

Internet Protocol (IP)
In the Internet suite of protocols, a connectionless protocol that routes data through a network or interconnected networks and acts as an intermediary between the higher protocol layers and the physical network.

interswitch link (ISL)
The physical connection that carries a protocol for interconnecting multiple routers and switches in a storage area network.

I/O See *input/output.*

I/O group
A collection of virtual disks (VDisks) and node relationships that present a common interface to host systems.

I/O throttling rate
The maximum rate at which an I/O transaction is accepted for this virtual disk (VDisk).

IP See *Internet Protocol*.

IP address
The unique 32-bit address that specifies the location of each device or workstation in the Internet. For example, 9.67.97.103 is an IP address.

ISL See *interswitch link*.

ISL hop
Considering all pairs of node ports (N-ports) in a fabric and measuring distance only in terms of interswitch links (ISLs) in the fabric, the number

of ISLs traversed is the number of ISL hops on the shortest route between the pair of nodes that are farthest apart in the fabric.

J

JBOD (just a bunch of disks)
IBM definition: See *non-RAID*.

HP definition: A group of single-device logical units not configured into any other container type.

L

LBA See *logical block address*.

least recently used (LRU)
An algorithm used to identify and make available the cache space that contains the least-recently used data.

line card
See *blade*.

local fabric
In SAN Volume Controller, those storage area network (SAN) components (such as switches and cables) that connect the components (nodes, hosts, switches) of the local cluster together.

local/remote fabric interconnect
The storage area network (SAN) components that are used to connect the local and remote fabrics together.

logical block address (LBA)
The block number on a disk.

logical unit (LU)
An entity to which Small Computer System Interface (SCSI) commands are addressed, such as a virtual disk (VDisk) or managed disk (MDisk).

logical unit number (LUN)
The SCSI identifier of a logical unit within a target. (S)

longitudinal redundancy check (LRC)
A method of error checking during data transfer that involves checking parity.

LRC See *longitudinal redundancy check*.

LRU See *least recently used*.

LU See *logical unit*.

LUN See *logical unit number*.

LUN masking
A process that allows or prevents I/O to the disk drives through the host-bus-adapter (HBA) device or operating-system device driver.

M

managed disk (MDisk)
A Small Computer System Interface (SCSI) logical unit that a redundant array of independent disks (RAID) controller provides and a cluster manages. The MDisk is not visible to host systems on the storage area network (SAN).

managed disk group
A collection of managed disks (MDisks) that, as a unit, contain all the data for a specified set of virtual disks (VDisks).

managed space mode
An access mode that enables virtualization functions to be performed. See also *image mode* and *unconfigured mode*.

Management Information Base (MIB)
Simple Network Management Protocol (SNMP) units of managed information that specifically describe an aspect of a system, such as the system name, hardware number, or communications configuration. A collection of related MIB objects is defined as a MIB.

mapping
See *FlashCopy mapping*.

master console
A single point from which to manage the IBM System Storage SAN Volume Controller. The master console can be purchased as software that is installed and configured on a server or as a hardware platform with the operating system and master console software preinstalled.

master virtual disk
The virtual disk (VDisk) that contains a production copy of the data and that an application accesses. See also *auxiliary virtual disk.*

MB See *megabyte*.

MDisk
See *managed disk*.

megabyte (MB)
In decimal notation, 1 048 576 bytes.

mesh configuration
A network that contains a number of small SAN switches configured to create a larger switched network. With this configuration, four or more switches are connected together in a loop with some of the paths short circuiting the loop. An example of this configuration is to have four switches connected together in a loop with ISLs for one of the diagonals.

method
A way to implement a function on a class.

Metro Mirror
A synchronous copy service that enables host data on a particular source virtual disk (VDisk) to be copied to the target VDisk that is designated in the relationship.

MIB See *Management Information Base*.

migration
See *data migration*.

mirrorset
IBM definition: See *RAID-1*.

HP definition: A RAID storageset of two or more physical disks that maintain a complete and independent copy of the data from the virtual disk. This type of storageset has the advantage of being highly reliable and extremely tolerant of device failure. Raid level 1 storagesets are referred to as mirrorsets.

N

namespace
The scope within which a Common Information Model (CIM) schema applies.

node One SAN Volume Controller. Each node provides virtualization, cache, and Copy Services to the storage area network (SAN).

node name
A name identifier associated with a node. (SNIA)

node port (N_port)
A port that connects a node to a fabric or to another node. N_ports connect to fabric ports (F_ports) or to other N_ports of other nodes. N_ports handle creation, detection, and flow of message units to and from the connected systems. N_ports are end points in point-to-point links.

node rescue
In SAN Volume Controller, the process by which a node that has no valid software installed on its hard disk drive can copy the software from another node connected to the same fibre-channel fabric.

non-RAID
Disks that are not in a redundant array of independent disks (RAID). HP definition: See *JBOD*.

N_port
See *node port*.

O

object In object-oriented design or programming, a concrete realization of a class that consists of data and the operations associated with that data.

object model
A representation, such as a diagram, of objects in a given system. Using symbols similar to standard flowchart symbols, an object model depicts the classes the objects belong to, their associations with each other, the attributes that make them unique, and the operations that the objects can perform and that can be performed on them.

object name
An object that consists of a namespace path and a model path. The namespace path provides access to the Common Information Model (CIM) implementation managed by the CIM Agent, and the model path provides navigation within the implementation.

object path
An object that consists of a namespace path and a model path. The namespace path provides access to the Common Information Model (CIM) implementation managed by the CIM Agent, and the model path provides navigation within the implementation.

offline
Pertaining to the operation of a functional unit or device that is not under the continual control of the system or of a host.

online Pertaining to the operation of a functional unit or device that is under the continual control of the system or of a host.

operating set
In SAN Volume Controller, the set of nodes that are operating together to deliver storage services.

oversubscription
The ratio of the sum of the traffic that is on the initiator N-node connections to the traffic that is on the most heavily loaded interswitch links (ISLs), where more than one ISL is connected in parallel between these switches. This definition assumes a symmetrical network and a specific workload that is applied equally from all initiators and sent equally to all targets. See also *symmetrical network*.

P

partition
IBM definition: A logical division of storage on a fixed disk.

HP definition: A logical division of a container represented to the host as a logical unit.

partner node
The other node that is in the I/O group to which this node belongs.

partnership
In Metro or Global Mirror operations, the relationship between two clusters. In a cluster partnership, one cluster is defined as the local cluster and the other cluster as the remote cluster.

paused
In SAN Volume Controller, the process by which the cache component quiesces all ongoing I/O activity below the cache layer.

pend To cause to wait for an event.

petabyte (PB)
In decimal notation, 1 125 899 906 842 624 bytes.

PDU See *power distribution unit*.

PLUN See *managed disk*.

point-in-time copy
The instantaneous copy that the FlashCopy service makes of the source virtual disk (VDisk). In some contexts, this copy is known as a T_0 *copy*.

port The physical entity within a host, SAN Volume Controller, or disk controller system that performs the data communication (transmitting and receiving) over the fibre channel.

port ID
An identifier associated with a port.

power distribution unit (PDU)
A device that distributes electrical power to multiple devices in the rack. It typically is rack-mounted and provides circuit breakers and transient voltage suppression.

power-on self-test
A diagnostic test that servers or computers run when they are turned on.

prepared
In a Global Mirror relationship, the state that occurs when the mapping is ready to start. While in this state, the target virtual disk (VDisk) is offline.

preparing
In a Global Mirror relationship, the state that occurs when any changed write data for the source virtual disk (VDisk) is flushed from the cache. Any read or write data for the target VDisk is discarded from the cache.

primary virtual disk
In a Metro or Global Mirror relationship, the target of write operations issued by the host application.

property
In the Common Information Model (CIM), an attribute that is used to characterize instances of a class.

PuTTY
A client program that allows you to run remote sessions on your computer through specific network protocols, such as SSH, Telnet, and Rlogin.

Q

qualifier
A value that provides additional information about a class, association, indication, method, method parameter, instance, property, or reference.

quorum
A set of nodes that operates as a cluster. Each node has a connection to every other node in the cluster. If a connection failure causes the cluster to split into two or more groups of nodes that have full connection within the group, the quorum is the group that is selected to operate as the cluster. Typically, this is the larger group of nodes, but the quorum disk serves as a tiebreaker if the groups are the same size.

queue depth
The number of I/O operations that can be run in parallel on a device.

quorum disk
A managed disk (MDisk) that contains a reserved area that is used exclusively for cluster management. The quorum disk is accessed in the event that it is necessary to determine which half of the cluster continues to read and write data.

quorum index
The pointer that indicates the order used to resolve a tie. Nodes attempt to lock the first quorum disk (index 0), followed by the next disk (index 1), and finally the last disk (index 2). The tie is broken by the node that locks them first.

R

rack A free-standing framework that holds the devices and card enclosure.

RAID See *redundant array of independent disks*.

RAID 0
IBM definition: RAID 0 allows a number of disk drives to be combined and presented as one large disk. RAID 0 does not provide any data redundancy. If one drive fails, all data is lost.

HP definition: A RAID storageset that stripes data across an array of disk drives. A single logical disk spans multiple physical disks, allowing parallel data processing for increased I/O performance. While the

performance characteristics of RAID level 0 is excellent, this RAID level is the only one that does not provide redundancy. Raid level 0 storagesets are referred to as stripesets.

RAID 1
SNIA dictionary definition: A form of storage array in which two or more identical copies of data are maintained on separate media. (S)

IBM definition: A form of storage array in which two or more identical copies of data are maintained on separate media. Also known as mirrorset.

HP definition: See *mirrorset*.

RAID 5
SNIA definition: A form of parity RAID in which the disks operate independently, the data strip size is no smaller than the exported block size, and parity check data is distributed across the array's disks. (S)

IBM definition: See the SNIA definition.

HP definition: A specially developed RAID storageset that stripes data and parity across three or more members in a disk array. A RAIDset combines the best characteristics of RAID level 3 and RAID level 5. A RAIDset is the best choice for most applications with small to medium I/O requests, unless the application is write intensive. A RAIDset is sometimes called parity RAID. RAID level 3/5 storagesets are referred to as RAIDsets.

RAID 10
A type of RAID that optimizes high performance while maintaining fault tolerance for up to two failed disk drives by striping volume data across several disk drives and mirroring the first set of disk drives on an identical set.

redundant ac power switch
A device that provides input power redundancy by attaching a SAN Volume Controller to two independent power sources. If the main source becomes unavailable, the redundant ac power switch automatically provides power from a secondary (backup) source. When power is restored, the redundant ac power switch automatically changes back to the main power source.

redundant array of independent disks (RAID)
A collection of two or more disk drives that present the image of a single disk drive to the system. In the event of a single device failure, the data can be read or regenerated from the other disk drives in the array.

redundant SAN
A storage area network (SAN) configuration in which any one single component might fail, but connectivity between the devices within the SAN is maintained, possibly with degraded performance. This configuration is normally achieved by splitting the SAN into two, independent, counterpart SANs. See also *counterpart SAN.*

reference
A pointer to another instance that defines the role and scope of an object in an association.

rejected
A status condition that describes a node that the cluster software has removed from the working set of nodes in the cluster.

relationship
In Metro or Global Mirror, the association between a master virtual disk (VDisk) and an auxiliary VDisk. These VDisks also have the attributes of a primary or secondary VDisk. See also *auxiliary virtual disk, master virtual disk, primary virtual disk, and secondary virtual disk.*

reliability
The ability of a system to continue to return data even if a component fails.

remote fabric
In Global Mirror, the storage area network (SAN) components (switches and cables) that connect the components (nodes, hosts, and switches) of the remote cluster.

roles Authorization is based on roles that map to the administrator and service roles in an installation. The switch translates these roles into SAN Volume Controller administrator and service user IDs when a connection is made to the node for the SAN Volume Controller.

S

SAN See *storage area network*.

SAN Volume Controller fibre-channel port fan in
The number of hosts that can see any one SAN Volume Controller port.

SATA See *Serial Advanced Technology Attachment*.

schema
A group of object classes defined for and applicable to a single namespace. Within the CIM Agent, the supported schemas are the ones that are loaded through the managed object format (MOF).

SCSI See *Small Computer Systems Interface*.

SCSI back-end layer
The layer in a Small Computer Systems Interface (SCSI) network that performs the following functions: controls access to individual disk controller systems that are managed by the cluster; receives requests from the virtualization layer, processes them, and sends them to managed disks; addresses SCSI-3 commands to the disk controller systems on the storage area network (SAN).

SCSI front-end layer
The layer in a Small Computer Systems Interface (SCSI) network that receives I/O commands sent from hosts and provides the SCSI-3 interface to hosts. SCSI logical unit numbers (LUNs) are mapped to virtual disks (VDisks) in this layer as well. Thus, the layer converts SCSI read and write commands that are addressed to LUNs into commands that are addressed to specific VDisks.

SDD See *subsystem device driver (SDD).*

secondary virtual disk
In Metro or Global Mirror, the virtual disk (VDisk) in a relationship that contains a copy of data written by the host application to the primary VDisk.

Secure Shell (SSH)
A program to log in to another computer over a network, to execute commands in a remote machine, and to move files from one machine to another.

sequential VDisk
A virtual disk that uses extents from a single managed disk.

Serial Advanced Technology Attachment (SATA)
The evolution of the ATA interface from a parallel bus to serial connection architecture. (S)

Serial ATA
See *Serial Advanced Technology Attachment*.

server In a network, the hardware or software that provides facilities to other stations; for example, a file server, a printer server, a mail server. The station making the request of the server is usually called the client.

Service Location Protocol (SLP)
In the Internet suite of protocols, a protocol that identifies and uses network hosts without having to designate a specific network host name.

Simple Mail Transfer Protocol (SMTP)
An Internet application protocol for transferring mail among users of the Internet. SMTP specifies the mail exchange sequences and message format. It assumes that the Transmission Control Protocol (TCP) is the underlying protocol.

Simple Network Management Protocol (SNMP)
In the Internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application-layer protocol. Information on devices managed is defined and stored in the application's Management Information Base (MIB).

SLP See *Service Location Protocol*.

Small Computer System Interface (SCSI)
A standard hardware interface that enables a variety of peripheral devices to communicate with one another.

SMI-S See *Storage Management Initiative Specification*.

SMTP See *Simple Mail Transfer Protocol*.

SNIA See *Storage Networking Industry Association*.

SNMP
See *Simple Network Management Protocol*.

SSH See *Secure Shell*.

stand-alone relationship
In FlashCopy, Metro Mirror, and Global Mirror, relationships that do not belong to a consistency group and that have a null consistency group attribute.

stop A configuration command that is used to stop the activity for all copy relationships in a consistency group.

stopped
The status of a pair of virtual disks (VDisks) that have a copy relationship that the user has temporarily broken because of a problem.

storage area network (SAN)
A network whose primary purpose is the transfer of data between computer systems and storage elements and among storage elements. A SAN consists of a communication infrastructure, which provides physical connections, and a management layer, which organizes the connections, storage elements, and computer systems so that data transfer is secure and robust. (S)

Storage Management Initiative Specification (SMI-S)
A design specification developed by the Storage Networking Industry Association (SNIA) that specifies a secure and reliable interface that allows storage management systems to identify, classify, monitor, and control physical and logical resources in a storage area network. The interface is intended as a solution that integrates the various devices to be managed in a storage area network (SAN) and the tools used to manage them.

Storage Networking Industry Association (SNIA)
An association of producers and consumers of storage networking products whose goal is to further storage networking technology and applications. See www.snia.org.

striped
Pertains to a virtual disk (VDisk) that is created from multiple managed disks (MDisks) that are in the MDisk group. Extents are allocated on the MDisks in the order specified.

stripeset
See *RAID 0*.

subsystem device driver (SDD)
An IBM pseudo device driver designed to support the multipath configuration environments in IBM products.

superuser authority
The level of access required to add users.

suspended
The status of a pair of virtual disks (VDisks) that have a copy relationship that has been temporarily broken because of a problem.

switch A network infrastructure component to which multiple nodes attach. Unlike hubs, switches typically have internal bandwidth that is a multiple of link bandwidth, and the ability to rapidly switch node connections from one to another. A typical switch can accommodate several simultaneous full link bandwidth transmissions between different pairs of nodes. (S) Contrast with *hub*.

symmetrical network
A network in which all the initiators are connected at the same level and all the controllers are connected at the same level.

symmetric virtualization
A virtualization technique in which the physical storage in the form of Redundant Array of Independent Disks (RAID) is split into smaller chunks of storage known as *extents*. These extents are then concatenated, using various policies, to make virtual disks (VDisks). See also *asymmetric virtualization*.

synchronized
In Metro or Global Mirror, the status condition that exists when both virtual disks (VDisks) of a pair that has a copy relationship contain the same data.

system
A functional unit, consisting of one or more computers and associated software, that uses common storage for all or part of a program and also for all or part of the data necessary for the execution of the program. A computer system can be a stand-alone unit, or it can consist of multiple connected units.

T

terabyte
In decimal notation, 1 099 511 628 000 bytes.

topology
The logical layout of the components of a computer system or network and their interconnections. Topology deals with questions of what components are directly connected to other components from the standpoint of being able to communicate. It does not deal with questions of physical location of components or interconnecting cables. (S)

IBM TotalStorage Enterprise Storage Server (ESS)
An IBM product that provides an intelligent disk-storage subsystem across an enterprise.

trigger
To initiate or reinitiate copying between a pair of virtual disks (VDisks) that have a copy relationship.

U

UID See *unique identifier*.

unconfigured mode
A mode in which I/O operations cannot be performed. See also *image mode* and *managed space mode*.

uninterruptible power supply (UPS)
A device that is connected between a computer and its power source that protects the computer 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.

unique identifier (UID)
An identifier that is assigned to storage system logical units when they are created. It is used to identify the logical unit regardless of the logical unit number (LUN), status of the logical unit, or whether alternate paths exist to the same device. Typically, a UID is only used once.

unmanaged
An access mode that pertains to a managed disk (MDisk) that is not used by the cluster.

UPS See *uninterruptible power supply*.

V

valid configuration
A configuration that is supported.

VDisk See *virtual disk*.

virtual disk (VDisk)
In SAN Volume Controller, a device that host systems attached to the storage area network (SAN) recognize as a Small Computer System Interface (SCSI) disk.

virtualization
In the storage industry, a concept in which a pool of storage is created that contains several disk subsystems. The subsystems can be from various vendors. The pool can be split into virtual disks that are visible to the host systems that use them.

virtualized storage
Physical storage that has virtualization techniques applied to it by a virtualization engine.

virtual storage area network (VSAN)
A fabric within the SAN.

vital product data (VPD)
Information that uniquely defines system, hardware, software, and microcode elements of a processing system.

VLUN See *managed disk*.

VPD See *vital product data*.

VSAN See *virtual storage area network*.

W

WBEM
See *Web-Based Enterprise Management*.

Web-Based Enterprise Management (WBEM)
A tiered, enterprise-management architecture that was developed by the Distributed Management Task Force (DMTF). This architecture provides the management design framework that consists of devices, device providers, the object manager, and the messaging protocol for the communication between client applications and the object manager.

worldwide node name (WWNN)
An identifier for an object that is globally unique. WWNNs are used by Fibre Channel and other standards.

worldwide port name (WWPN)
A unique 64-bit identifier that is associated with a fibre-channel adapter port. The WWPN is assigned in an implementation- and protocol-independent manner.

WWNN
See *worldwide node name*.

WWPN
See *worldwide port name*.

Z

zoning

In fibre-channel environments, the grouping of multiple ports to form a virtual, private, storage network. Ports that are members of a zone can communicate with each other, but are isolated from ports in other zones.

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