IBM System Storage SAN Volume Controller

Hardware Installation Guide

Version 4.3.0

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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 4.3.0, and to all subsequent releases and modifications until otherwise indicated in new editions. This edition replaces GC27-2132-01.

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 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 GC27-2132-02 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:
- An introduction of IBM System Storage Productivity Center, which has replaced the master console that was offered in previous releases.
- IBM System Storage Productivity Center
- The implementation of IPv6 (Internet Protocol Version 6) on SAN Volume Controller in addition to the IPv4 standard currently in use.
- A description of the new Validate WWNN? option on the front panel display that allows you to choose between the WWNN that is stored either on the service controller or on the disk when the WWNN is not the same on both.
- A description of the new Version option on the front panel display that allows you to display the version of the SAN Volume Controller software that is active on the node and and the build level of the SAN Volume Controller cluster software that is active on the node.

Changed information

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

- Updated the information about ports and connections to include IPv6 (Internet Protocol Version 6) support.
- Added information about the improvements to the front panel displays that allow you to more easily display and edit the node's WWNN and the Validate WWNN? option that allows you to choose between the WWNN that is stored either on the service controller or on the disk when the WWNN is not the same on both.
- An updated description of the Select language menu option, which now allows you to display only the English and Japanese languages on the front panel display.
- Updated the part number for the SAN Volume Controller 2145-8G4 cable retention bracket.
- Enhanced the information about the 2145-1U uninterruptible power supply power switch.

Removed Information

This section lists information that was removed from this book.

- Information about the master console was moved to Appendix C, "Master console," on page 141 in the back of this book.

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 2145-1U uninterruptible power supply 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 63 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 99 in the back of this book.
- Moved most of the information about the 2145 uninterruptible power supply to Appendix B, "SAN Volume Controller 2145-4F2," on page 99 in the back of this book.

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 hardware.	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 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
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*.	GC27-2164
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

Title	Description	Order number
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
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

Title	Description	Order number
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
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

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.

The **Danger** and **Caution** notices for the SAN Volume Controller and any related uninterruptible power supply units 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 uninterruptible power supply, and the redundant ac power switch

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

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

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

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

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

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

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

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

8. If redundant ac power is used, 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 uninterruptible power supply input power cable.

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

12. After you have completed testing the grounding continuity, perform one of the following procedures, depending on the outcome of the test.

    • If the test is successful, reconnect any cables that were removed, and power on any uninterruptible power supply units and SAN Volume Controller nodes that were powered off.

    • If the test was not successful, ensure that all cables are securely connected. If the test still fails, test the individual system components. Before you test the individual components, remove all cables from the components. If any component test fails, replace the component. After each component has been tested and the failing ones have been replaced, repeat the complete system test by returning to step 1 on page xxi. Test the components in the following order:

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

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

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

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

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

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

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

Inspecting the uninterruptible power supply for unsafe conditions

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

Consider the following conditions and their potential safety hazards:

Electrical hazards (especially primary power)
> Primary voltage on the frame can cause serious or lethal electrical shock.

Explosive hazards
> A bulging capacitor can cause serious injury.

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

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

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

1. If any equipment has been damaged during the shipment, keep the shipping cartons and packing materials.
2. 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 support emergency power-off (EPO) shutdowns.

In the event of a room EPO shutdown, the 2145 uninterruptible power supply 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 uninterruptible power supply within five minutes.

Attention: The 2145 uninterruptible power supply 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 uninterruptible power supply have been powered on since the 2145 uninterruptible power supply was powered on, you must remove output power from the uninterruptible power supply. To do this, press and hold the off button on the front panel of the 2145 uninterruptible power supply 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

– Certified in Vac, Hungary

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

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

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

MACHINE TYPE 2145

MODEL:

■ 4F2

RATING:

■ 100-240V , ∿ 50/60Hz

3.5- 1.75A

P/N 64P7837

IBM ®

SAN JOSE
CA, USA

Marca Registrada

® Registered Trademark
of International Business
Machines Corporation
IBM Canada Ltd.
Registered User

CANADA ICES/NMB-003 Class/Classe (A)

This device complies with Part 15 of the FCC rules. Operation is
subject to the following two conditions: (1) this device may not
cause harmful interference, and (2) this device must accept any
interference received, including interference that may cause
undesired operation.

MIC

E-D019-00-3904(A)

PCT
ME01

LR34074C
C SP US IEC 60950

CE ✓

NOM-018

This machine is manufactured
from new parts or new and
used parts.

R33026

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。

　この装置は、クラス A 情報技術装置です。
この装置を家庭環境で使用する
と電波妨害を引き起こすことがあります。
この場合には使用者が適切な対策
を講ずるよう要求されることがあります。
VCCI-A

P/N 18P5457

- **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

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。

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

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

CSP ®

NRTL/C

11S95P5083ZN10H0YMD001

svc00316

- **Dual power cord warning label**
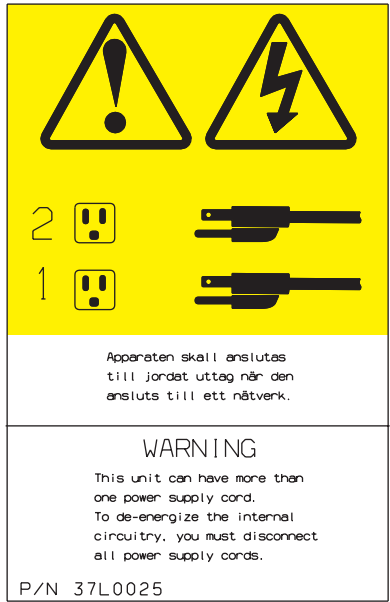
```
2 [outlet]    [plug]
1 [outlet]    [plug]

Apparaten skall anslutas
till jordat uttag när den
ansluts till ett nätverk.

WARNING

This unit can have more than
one power supply cord.
To de-energize the internal
circuitry, you must disconnect
all power supply cords.

P/N 37L0025                    svc00312
```

- **No user access label**

svc00313

- **Input ratings label**
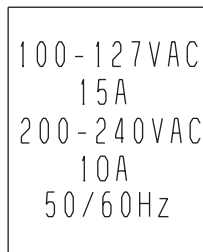

```
100-127VAC
    15A
200-240VAC
    10A
  50/60Hz         svc00317
```

- **Output port warning label**
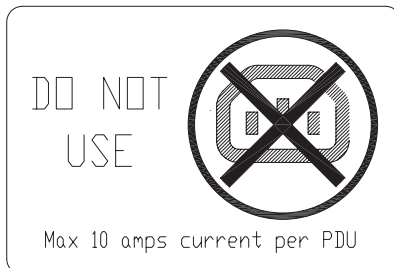

```
DO NOT
  USE

Max 10 amps current per PDU      svc00321
```

Checking the labels on the outside of the uninterruptible power supply

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

Checking the 2145-1U uninterruptible power supply labels

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

- **Weight caution label**

- **Safety label**
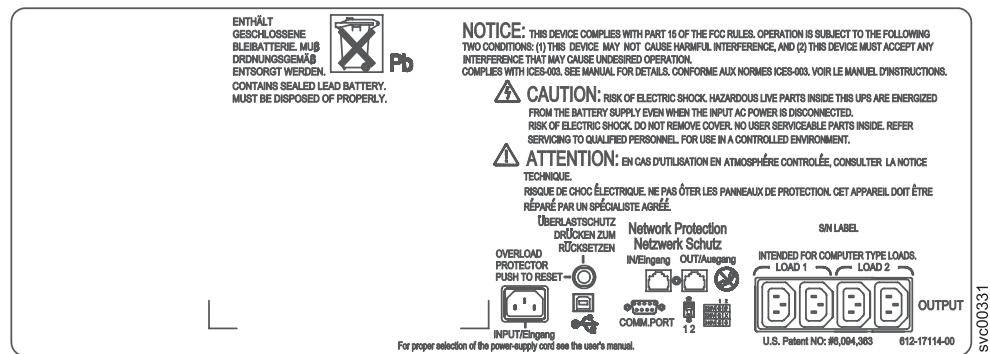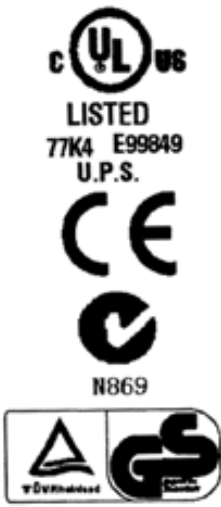
- **Power output warning label**
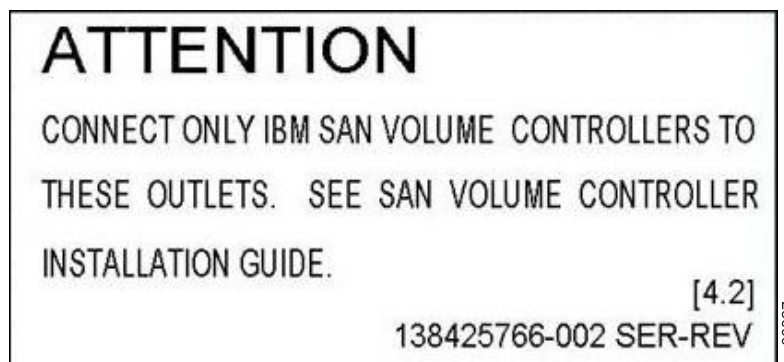
- **Agency label**

EC: G41049
IBM Model: 2145UPS-1U
P31P0875
Input~: 220/230/240V, 50/60Hz,
    4.1/4/3.7A, 1 Ø
Output~: 220/230/240V, 50/60Hz
    3.4/3.3/3.1A, 1 Ø
    750VA/520W
    2007-04-02
Made in China- U1407

c UL us
LISTED
77K4 E99849
U.P.S.

C E

N869

svc00328

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

20

- Taiwan agency label

不斷電式電源供應器
型號：2145UPS -1U
輸入：220/230/240Vac, 50/60Hz
    4.1/4/3.7A,1 Ø
輸出：220/230/240Vac, 50/60Hz
    3.4/3.3/3.1A,1 Ø
    750VA/520W

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
被要求採取某些適當的對策。

R31183

svc00326

- IT compatible label

```
┌─────────────┐
│     IT      │
│ COMPATIBLE  │
└─────────────┘
```

- **Do not discard the uninterruptible power supply or the uninterruptible power supply batteries in the trash label**

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

Checking the 2145 uninterruptible power supply labels

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

- **Agency label**

- **Rear panel configuration label**

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

COM

INPUT INLET

LOAD GROUP 1 16A MAX

1 2 3

LOAD GROUP 1 10A MAX
LOAD GROUP 2 10A MAX
LOAD GROUP 3 10A MAX

BREAKER 1
BREAKER 2
BREAKER 3

① SURGE SUPPRESSOR GROUND SCREW:
Remove to comply with national deviations:
UK DE SE.

② REPO CONNECTOR: A
Use Class 2 Input Only
Utilisez Uniquement Une
Alimentation De Classe 2

③ EXTENDED BATTERY CONNECTOR:
DO NOT DISCONNECT UNDER LOAD.
NE PAS DEBRANCER SOUS CHARGE.

Assembled in Mexico

This product is covered by one or more of the following U.S. Pat. Nos.
5177676, 6314007, 6330176, 6391489 & 6483730

- **Do not discard the uninterruptible power supply or the uninterruptible power supply batteries in the trash label**

  Notes:

  – The uninterruptible power supply can contain sealed, lead-acid batteries, which must be recycled.

  – If you have a 2145 uninterruptible power supply unit that is already installed, you might not have this label affixed to the outside of the uninterruptible power supply due to changing labeling requirements.
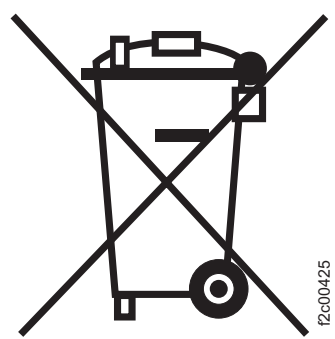
f2c00425

- **Three-person lift label**
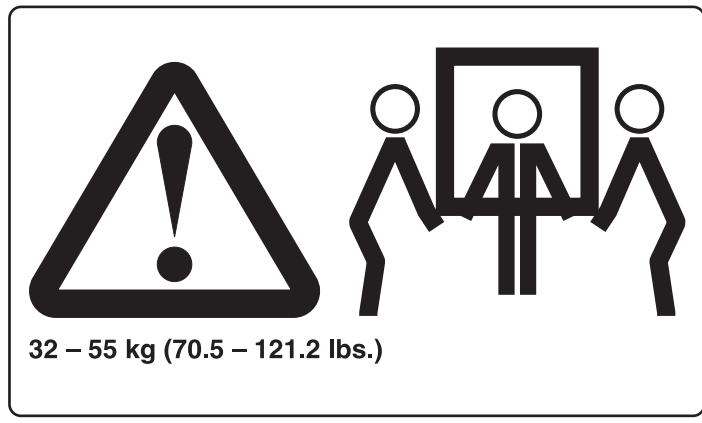
32 – 55 kg (70.5 – 121.2 lbs.)

- **Weight caution label**

39 kg
86 lbs

- **IT compatible label**

IT
COMPATIBLE

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

Rating ⎓ :120V, 30A

Checking the labels on the battery of the uninterruptible power supply

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

Checking the battery label of the 2145-1U uninterruptible power supply

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

- Battery rating label

TOTAL VOLTAGE: 24Vdc
BATTERY TYPE: 7.2Ah 6V
NUMBER OF BATTERY: 4PCS

svc00325
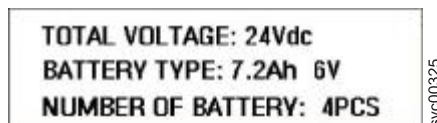
- Battery safety label

CAUTION:

.The lead acid battery may cause chemical hazard.

.The battery presents a risk of electric shock and
 energy hazard.

.For disposal instructions for the battery, see user's
 manual.

ACHTUNG:

.die Blei-Akkumulatoren können bei unsachgemäβer
 Handhabung chemische Gefahren hervorrufen.

.die Batterie birgt eine Gefahr eines elektrischen
 Schlages und sehr hoher Kurzschluβströme.

.Entsorgungsanleitungen für die Batterien, siehe
 Bedienungsanleitung.   09471

svc00329

- Electric shock hazard

CAUTION: Risk of electric shock. Battery supply
circuit is grounded. Refer to user's manual before
working on batteries.   09488

svc00330

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

- Do not discard the uninterruptible power supply or the uninterruptible power
  supply batteries in the trash label

  Note: The uninterruptible power supply can contain sealed, lead-acid batteries,
        which must be recycled.
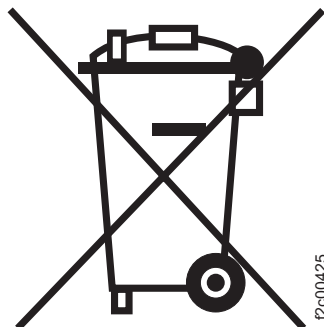
f2c00425

- **Recycling label**

Checking the battery labels of the 2145 uninterruptible power supply

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

- **Two-man lift label**
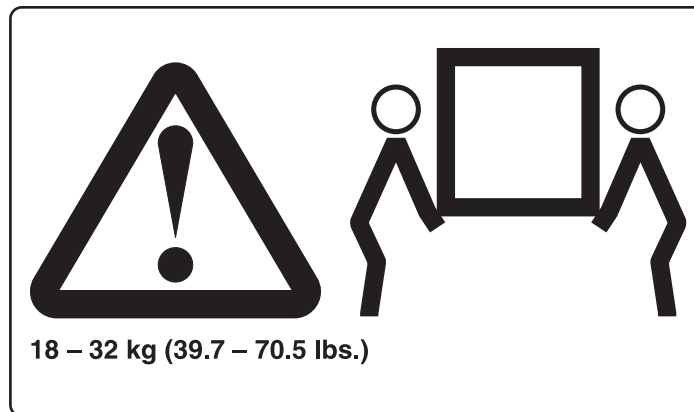
18 – 32 kg (39.7 – 70.5 lbs.)

- **Do not discard the uninterruptible power supply or the uninterruptible power
  supply batteries in the trash label**

   Note: The uninterruptible power supply can contain sealed, lead-acid batteries,
   which must be recycled.
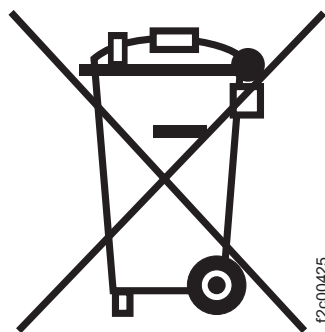
- **Recycling label**

- **Weight label**

21 kg
45 lbs

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

Rating === :120V, 30A

- **Battery faceplate label**

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

CAUTION:
- For use in a controlled environment
- More than one live circuit
- Qualified service personnel ONLY

Pas på!
- Til brug i et kontrolleret miljø
- Mere end ét strømførende kredsløb
- KUN uddannede serviceteknikere

PRECAUCIÓN:
- Para utilizar en un entorno controlado
- Más de un circuito activo
- SÓLO personal de servicio calificado

CUIDADO:
- Para utilização em um ambiente controlado
- Mais de um circuito ativo
- APENAS para equipe de manutenção qualificada

ATTENTION :
- Utilisation dans un environnement sous surveillance
- Plusieurs circuits sous tension
- Personnel de maintenance qualifié UNIQUEMENT

POZOR:
- Pro použití v řízeném prostředí,
- Více než jeden aktivní elektrický obvod.
- POUZE kvalifikovaný servisní personál.

Achtung:
- Nur in einer kontrollierten Umgebung
- Mehrere unter Spannung stehende Stromkreise
- Ausführung nur durch Fachpersonal

Varoitus:
- Käytön tulee tapahtua valvotussa ympäristössä
- Jännitteisiä virtapiirejä on enemmän kuin yksi
- VAIN valtuutetulle huoltohenkilöstölle

OPREZ:
- Za upotrebu u kontroliranom okruženju.
- Više od jednog živog strujnog kruga
- SAMO kvalificirano servisno osoblje

FIGYELMEZTETÉS:
- Csak felügyelet alatt álló környezetben használható
- Egynél több feszültség alatt álló áramkör
- CSAK kiképzett javító szakember

AVVERTENZA:
- Per l'utilizzo in un ambiente controllato
- Più di un circuito
- SOLO personale qualificato dell'assistenza tecnica

WAARSCHUWING:
- Alleen voor gebruik in een afgeschermde ruimte
- Meer dan één circuit met spanning
- UITSLUITEND bevoegd personeel

ADVARSEL:
- Til bruk i et kontrollert miljø
- Mer enn én strømførende krets
- KUN kvalifisert servicepersonale

ZAGROŻENIE:
- Do używania w środowisku kontrolowanym.
- Więcej niż jeden obwód pod napięciem.
- WYŁĄCZNIE dla wykwalifikowanych pracowników serwisu.

CUIDADO:
- Para utilização num ambiente controlado
- Mais que um circuito em tensão
- APENAS pessoal qualificado de assistência

ОСТОРОЖНО:
- Для использования в контролируемой среде
- Более одного активного контура
- ТОЛЬКО квалифицированный технический персонал

UPOZORNENIE:
- Pre použitie v riadenom prostredí
- Viac ako jeden živý obvod
- LEN kvalifikovaný servisný personál

VARNING:
- Använd endast under kontrollerade förhållanden
- Flera strömförande kretsar
- Endast för kvalificerad servicepersonal

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

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

Power and cabling information for 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 that must 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/index.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/index.shtml
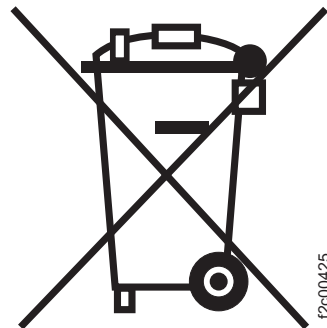
Note:

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 European Union. 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.

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.

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。

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.

Battery return program

This product may contain sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion batteries. 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/index.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:
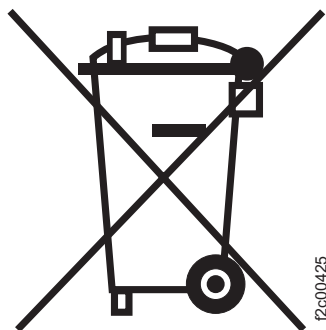
Note: This mark applies only to countries within the European Union (EU).

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.

This notice is provided in accordance with Royal Decree 106/2008 of Spain: The retail price of batteries, accumulators and power cells includes the cost of the environmental management of their waste.

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.

Monitors and Workstations

New Jersey – For information about recycling covered electronic devices in the state of New Jersey, go to the New Jersey Department of Environmental Protection web site at http://www.state.nj.us/dep/dshw/recycle/Electronic_Waste/index.html

Oregon - For information about recycling covered electronic devices in the state of Oregon, go to the Oregon Department of Environmental Quality site at http://www.deq.state.or.us/lq/electronics.htm.

Washington - For information about recycling covered electronic devices in the State of Washington, contact the Washington Department of Ecology at 1-800Recycle or go to the Department of Ecology Web site at http://www.ecy.wa.gov/programs/swfa/eproductrecycle/.

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.

SAN Volume Controller installation and configuration overview

The installation and configuration of a SAN Volume Controller cluster requires some tasks that the customer typically completes and other tasks that an IBM service representative performs.

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

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

- *IBM System Storage SAN Volume Controller: Planning Guide*, GA32-0551
- *IBM System Storage SAN Volume Controller: Hardware Installation Guide*, SC26-7904
- *IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide*, SC23-6628

To access the SAN Volume Controller publications, click the product documentation link and then click your language from the following Web site:

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

IBM System Storage Productivity Center (SSPC) replaces the master console for new installations of SAN Volume Controller version 4.3.0. For SSPC planning, installation, and configuration information, see the following publications:

- *IBM System Storage Productivity Center Introduction and Planning Guide*, SC23-8824
- *IBM System Storage Productivity Center Hardware Installation and Configuration Guide*, SC23-8822
- *IBM System Storage Productivity Center Software Installation and User's Guide*, SC23-8823

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

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

Note: An existing master console can be upgraded to support clusters that are running the latest SAN Volume Controller software. Appendix E of the *IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide* provides instructions for maintaining and upgrading the master console software.

Planning tasks that customers complete before the installation

Before the installation can begin, either the customer must complete the following planning tasks or have a service contract with IBM or an IBM Business Partner to have them completed:

1. **Verify that all the SAN Volume Controller installation requirements have been met.**

Review Chapter 2 of the *IBM System Storage SAN Volume Controller: Planning Guide* to make sure that space and power requirements have been met before you begin the installation. This might include preparing for installation of an SSPC, which is described in the *IBM System Storage Productivity Center Introduction and Planning Guide*.

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

   This task helps assure a seamless configuration. For more information, see Chapters 3 and 4 of the *IBM System Storage SAN Volume Controller: Planning Guide*.

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

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

   Chapter 2 of the *IBM System Storage SAN Volume Controller: Planning Guide* provides instructions for accessing and completing the following charts and tables:

   - Hardware location chart
   - Cable connection table
   - Configuration data table
   - Redundant ac power connection chart

   The SAN Volume Controller charts and tables are available from the following Web site:

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

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

Hardware installation tasks that an IBM service representative performs

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

1. **Check to make sure that you have all the parts that you need for the installation.**

   Chapter 6 of the *IBM System Storage SAN Volume Controller: Hardware Installation Guide* provides a list of all the parts that are required for an installation. The list includes the SAN Volume Controller nodes, uninterruptible power supply units, optional redundant ac power switches, and associated parts.

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

   Chapter 6 of the *IBM System Storage SAN Volume Controller: Hardware Installation Guide* describes the procedures for installing the uninterruptible power supply units, SAN Volume Controller nodes, and the optional redundant ac power switches.

3. **Install the SSPC server, including the SAN Volume Controller Console software.**

   The *IBM System Storage Productivity Center Hardware Installation and Configuration Guide* describes how to install and configure the SSPC hardware.

   An updated version of the SAN Volume Controller CIM Agent and GUI software might be available. For the latest information, click the **Install/use** tab and then click the link for the appropriate recommended software level from the following Web site:

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

Additionally, preinstalled software on the SSPC console might need to be updated to fully support the latest level of SAN Volume Controller. For the latest information, go to the following Web site:

http://www.ibm.com/systems/support/storage/software/sspc

"Accessing the SAN Volume Controller Console" in Chapter 4 of the *IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide* describes how to access and log on to the SAN Volume Controller Console.

Configuration tasks that a customer performs

To configure the SAN Volume Controller cluster, the customer must either complete the following tasks or have a service contract with IBM or an IBM Business Partner to have them completed:

1. **Configure the IBM System Storage Productivity Center.**

   Chapter 3 of the *IBM System Storage Productivity Center Software Installation and User's Guide* describes the procedures for configuring the server and accessing the SAN Volume Controller Console and command-line interface (CLI). This chapter also describes how to use the PuTTY client to generate secure shell (SSH) key pairs that secure data flow between the SAN Volume Controller cluster configuration node and a client.

2. **Create a SAN Volume Controller cluster.**

   Chapter 4 of the *IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide* describes this procedure, which is completed in two phases:

   a. Use the Create Cluster option on the front panel of one of the SAN Volume Controller nodes that you have installed to create the cluster.

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

   b. Use the Add a Cluster function from the SAN Volume Controller Console.

3. **Complete the initial SAN Volume Controller configuration.**

   After you create the SAN Volume Controller cluster, you must perform basic configuration procedures. Such procedures include adding nodes to a cluster, setting cluster date and time, setting the license features, creating host definitions, assigning managed disks to managed disk groups, setting up virtual disks and assigning them to hosts, and setting call home and SNMP event notification. The following chapters include procedures for these tasks:

   • Chapter 5 of the *IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide* describes how to perform these steps using the SAN Volume Controller Console.

   • Chapter 6 of the *IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide* describes how to perform these steps using the CLI.

Chapter 1. Getting started with the SAN Volume Controller

This guide describes the physical characteristics of and requirements for installing the SAN Volume Controller hardware and related components in your existing SAN environment.

Use this guide to perform the following tasks:

- Install a new SAN Volume Controller system or extend an existing system.
- Install one or more SAN Volume Controller nodes and related hardware components, such as uninterruptible power supply units or an optional redundant ac power switch.
- Install the IBM System Storage Productivity Center when you install a new system, unless it is already installed.
- 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.

If you have SAN Volume Controller hardware from previous releases, see the following information for your specific SAN Volume Controller hardware model:

- Appendix A, "SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2," on page 63
- Appendix B, "SAN Volume Controller 2145-4F2," on page 99

If you have the master console hardware from a previous release, see Appendix C, "Master console," on page 141.

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
2145-1U uninterruptible power supply	"2145-1U uninterruptible power supply" on page 23
2145 uninterruptible power supply	"2145 uninterruptible power supply" on page 106
IBM System Storage Productivity Center	Chapter 5, "IBM System Storage Productivity Center," on page 33

Installing the SAN Volume Controller hardware components

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

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	"Installing the SAN Volume Controller 2145-8F4 or the SAN Volume Controller 2145-8F2 hardware" on page 77
SAN Volume Controller 2145-4F2 hardware components	"Installing the SAN Volume Controller 2145-4F2 hardware" on page 113

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 create a new SAN Volume Controller cluster, if necessary, and to add the nodes into a SAN Volume Controller cluster.

Chapter 2. SAN Volume Controller overview

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

Symmetric virtualization is achieved by creating a pool of managed disks (MDisks) from the attached storage 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.

SAN Volume Controller software

The SAN Volume Controller software performs the following functions for the host systems that attach to SAN Volume Controller over the SAN:
- Creates a single pool of storage
- Provides logical unit virtualization
- Manages logical volumes
- Mirrors logical volumes

The SAN Volume Controller also provides the following functions:
- 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
  - Space-efficient logical volumes (thin provisioning)

SAN Volume Controller hardware

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

The nodes are always installed in pairs, with a minimum of one and a maximum of four pairs of nodes constituting a *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.

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. A node resides in only one I/O group and provides access to the VDisks in that I/O group.

The SAN Volume Controller 2145-8G4 is the most current model that is available. In addition, the following models of SAN Volume Controller nodes have been available in previous releases and are still supported with the latest SAN Volume Controller software:

- 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 SAN is configured into a number of zones. A device using the SAN can only communicate with devices that are included in the same zones that it is in. A SAN Volume Controller cluster requires 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.
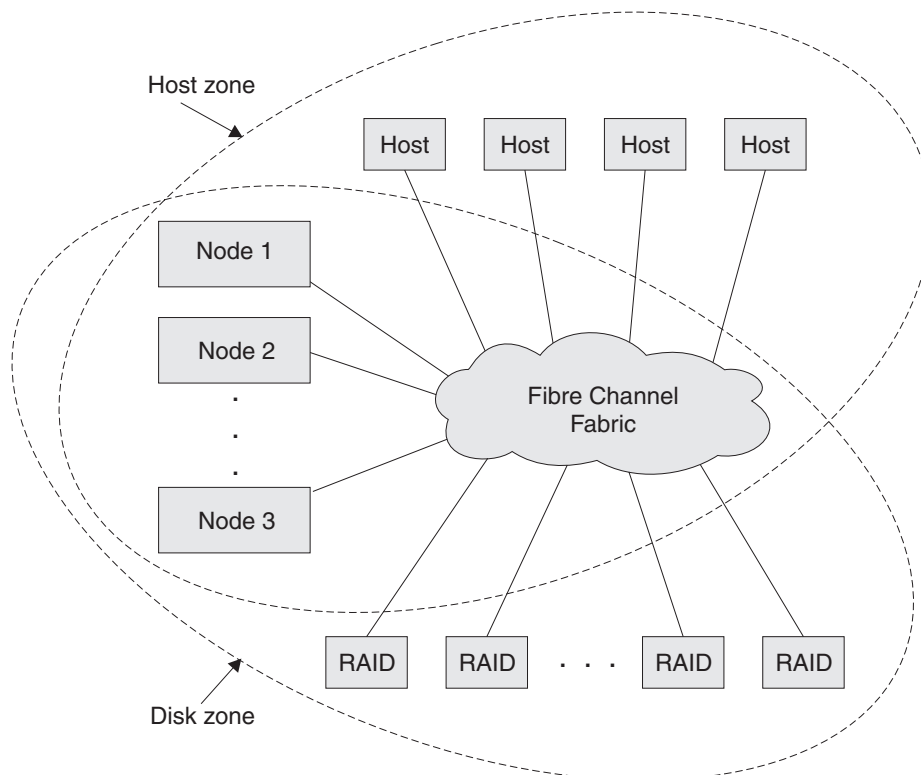
Figure 1. Example of a SAN Volume Controller cluster in a fabric

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.

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

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, with the correct access authority, that is connected to the Ethernet network can access this VPD.

SAN Volume Controller operating environment

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

Minimum requirements

You must set up your SAN Volume Controller operating environment according to the following requirements:
- Minimum of one pair of SAN Volume Controller nodes
- Minimum of two uninterruptible power supply units
- One IBM System Storage Productivity Center or one master console per SAN installation for configuration

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

In a SAN environment, hosts are the application servers that access their data from the storage controllers that are connected to the SAN. Hosts that are running in a number operating environments can connect to the storage through SAN Volume Controller. For a list of the supported operating systems on a host, go to the following Web site:

http://www.ibm.com/storage/svc

1. In the **Learn more** column, click **Interoperability**.
2. Click **Recommended software levels** for your SAN Volume Controller code version.
3. Click **Multipathing / Host Drivers, Clustering and SAN Boot Support - By Host Operating System** to view a list of supported operating systems and to access host attachment scripts.

Multipathing software

For the most current information, go to the following Web site:

http://www.ibm.com/storage/svc

1. In the **Learn more** column, click **Interoperability**.
2. Click **Recommended software levels** for your SAN Volume Controller code version.
3. Click **Multipathing / Host Drivers, Clustering and SAN Boot Support - By Host Operating System** to view a list of supported operating systems and to access multipath drivers. You can also view **Multipath Driver Co-existence with SDD** information.

User interfaces

The SAN Volume Controller software provides the following user interfaces:
- 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 software 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 controls and indicators are used for power and navigation and to indicate information, such as system activity, service and configuration options, service controller failures, and node identification.

Figure 2 shows the controls and indicators on the front panel of the SAN Volume Controller 2145-8G4.
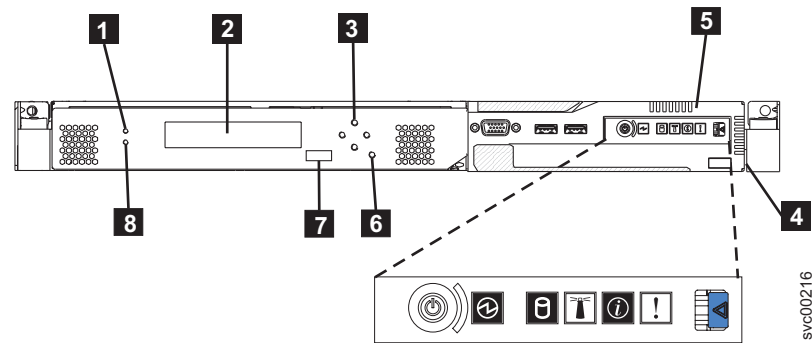
Figure 2. SAN Volume Controller 2145-8G4 front panel assembly

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.

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

The front panel displays configuration and service information about the SAN Volume Controller node 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
- Validate WWNN?
- 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 written to the system board hardware. The product serial number is also printed on the serial number label on the right side of the front panel.

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 buttons and indicators, such as the release latch for the light path diagnostics panel, the power-control button, and LEDs that indicate information, such as system-board errors, hard drive activity, and power status.

Figure 3 on page 9 shows the operator information panel for the SAN Volume Controller 2145-8G4.
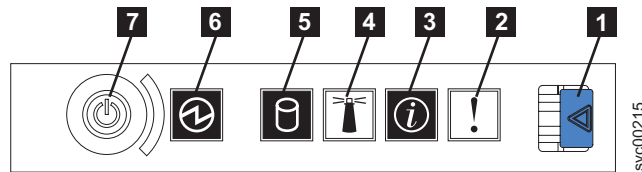
Figure 3. SAN Volume Controller 2145-8G4 operator information panel

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 method for 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" 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 noncritical 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 green power LED has the following properties:

Off One or more of the following are true:
- No power is present at the power supply input
- The power supply has failed
- The LED has failed

On The SAN Volume Controller 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*.

Notes:

1. When the node is operational and you press and immediately release the power control button, 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 you press the power control button but do not release it, an immediate power off occurs without the SAN Volume Controller control data being written to disk. Service actions are then required to make the SAN Volume Controller operational again. Therefore, during a power-off operation, do not press and hold the power control button for more than two seconds.
2. The 2145-1U uninterruptible power supply 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. Sometimes this number is called panel name or front panel id.

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

Figure 4 shows the rear panel indicators on the SAN Volume Controller 2145-8G4 back panel assembly.
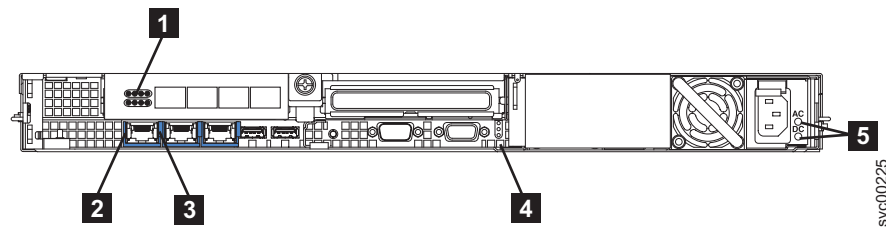
Figure 4. SAN Volume Controller 2145-8G4 rear panel indicators

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 5 on page 12 shows the fibre-channel LEDs on the SAN Volume Controller 2145-8G4.

.
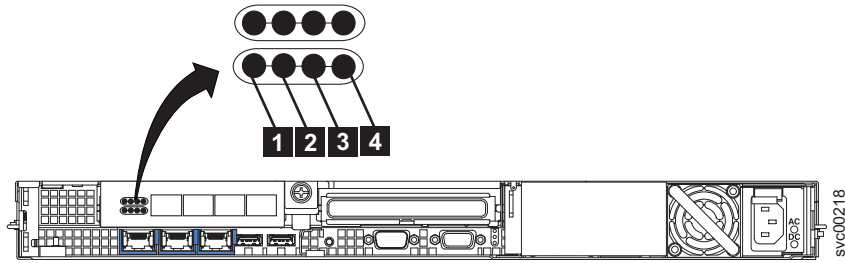
Figure 5. SAN Volume Controller 2145-8G4 fibre-channel LEDs

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 states:

Off One or more of the following are true:
- No power is present at the power supply input
- The power supply has failed
- The LED has failed

On The SAN Volume Controller is 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 6 shows the location of the ac and dc LEDs.
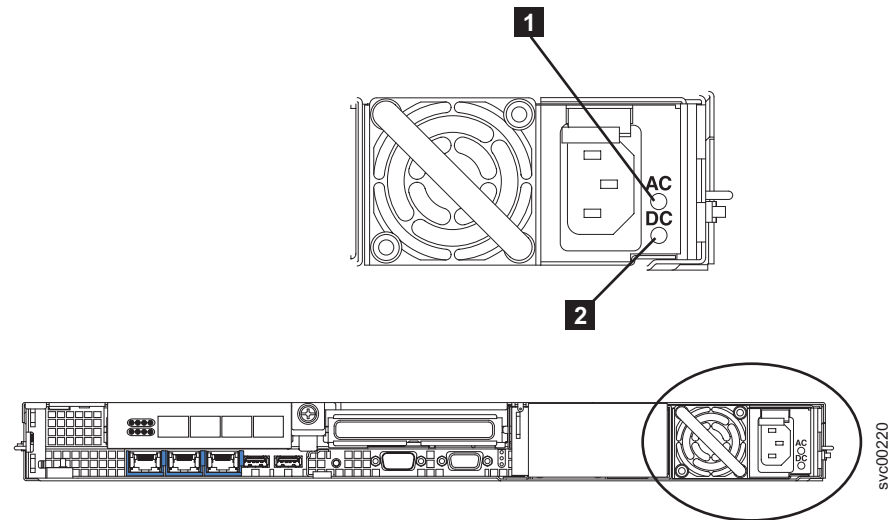
Figure 6. SAN Volume Controller 2145-8G4 ac and dc LEDs

SAN Volume Controller 2145-8G4 connectors

The external connectors consist of fibre-channel, serial, and Ethernet ports, and the power supply.

Figure 7 shows the external connectors on the SAN Volume Controller 2145-8G4 back panel assembly.
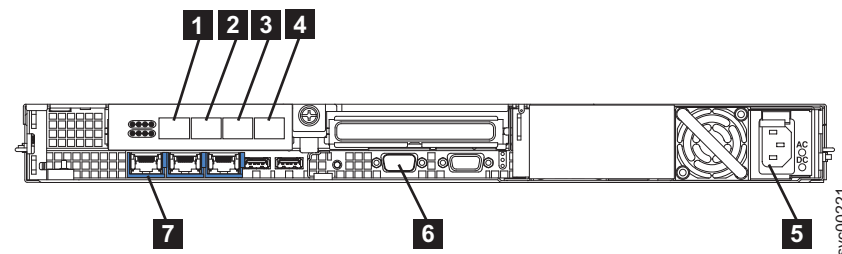
Figure 7. SAN Volume Controller 2145-8G4 external connectors

1 Fibre-channel port 1

2 Fibre-channel port 2

3 Fibre-channel port 3

4 Fibre-channel port 4

5 Power supply

6 Serial connection

7 Ethernet port 1

Figure 8 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.
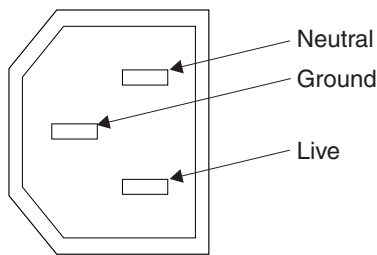
Figure 8. Power connector

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 9.
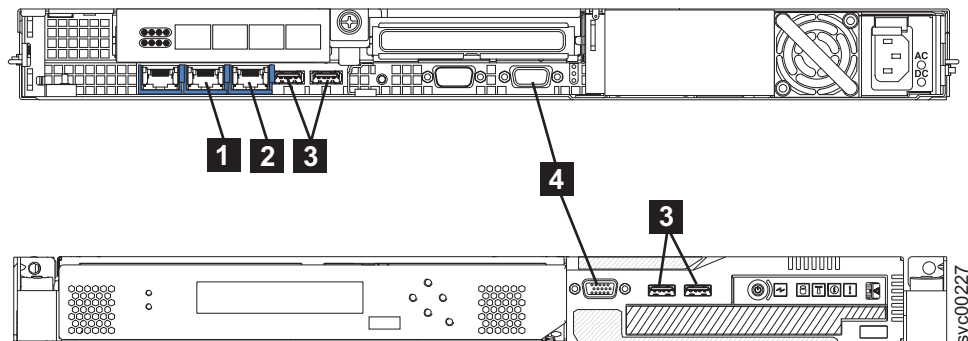
Figure 9. Service ports of the SAN Volume Controller 2145-8G4

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. Connect a device to any of these ports only when you are 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.

SAN Volume Controller 2145-8G4 environment requirements

Before the SAN Volume Controller 2145-8G4 is installed, the physical environment must meet certain requirements. This includes verifying that adequate space is available and that requirements for power and environmental conditions are met.

Input-voltage requirements

Ensure that your environment meets the following voltage requirements.

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

Power requirements for each node

Ensure that your environment meets the following power requirements.

The power that is required depends on the node type, the uninterruptible power supply type, and whether the redundant ac power feature is used.

Components	Power requirements
SAN Volume Controller 2145-8G4 + 2145-1U uninterruptible power supply	470 W

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

Circuit breaker requirements

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

Environment requirements without redundant ac power

Ensure that your environment falls within the following ranges if you are not using 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 (73°F)
Operating in higher altitudes	10°C to 32°C (50°F to 90°F)	914 to 2133 m (2998 to 6988 ft)	8% to 80% noncondensing	23°C (73°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)

Environment	Temperature	Altitude	Relative humidity	Maximum wet bulb temperature
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

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

Environment	Temperature	Altitude	Relative humidity	Maximum wet bulb temperature
Operating in lower altitudes	15°C to 32°C (59°F to 90°F)	0 to 914 m (0 to 2998 ft)	20% to 80% noncondensing	23°C (73°F)
Operating in higher altitudes	15°C to 32°C (59°F to 90°F)	914 to 2133 m (2998 to 6988 ft)	20% to 80% noncondensing	23°C (73°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 tables list the physical characteristics of the SAN Volume Controller 2145-8G4 node.

Dimensions and weight

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

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

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

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

The node dissipates the following maximum heat output.

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

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 10 provides a view of the rear of the SAN Volume Controller 2145-8G4.
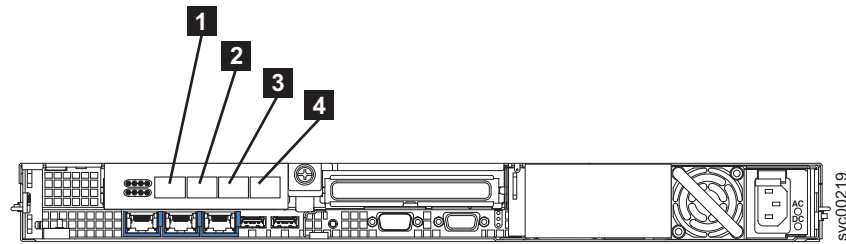
Figure 10. The physical port numbers for the SAN Volume Controller 2145-8G4

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

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. You must still use a 2145-1U uninterruptible power supply for each node.

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

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

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

Redundant ac power switch specifications

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

Dimensions and weight

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

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

Additional space requirements

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

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

Heat output (maximum)

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

Cabling of redundant ac power switch (example)

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

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

Figure 11 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
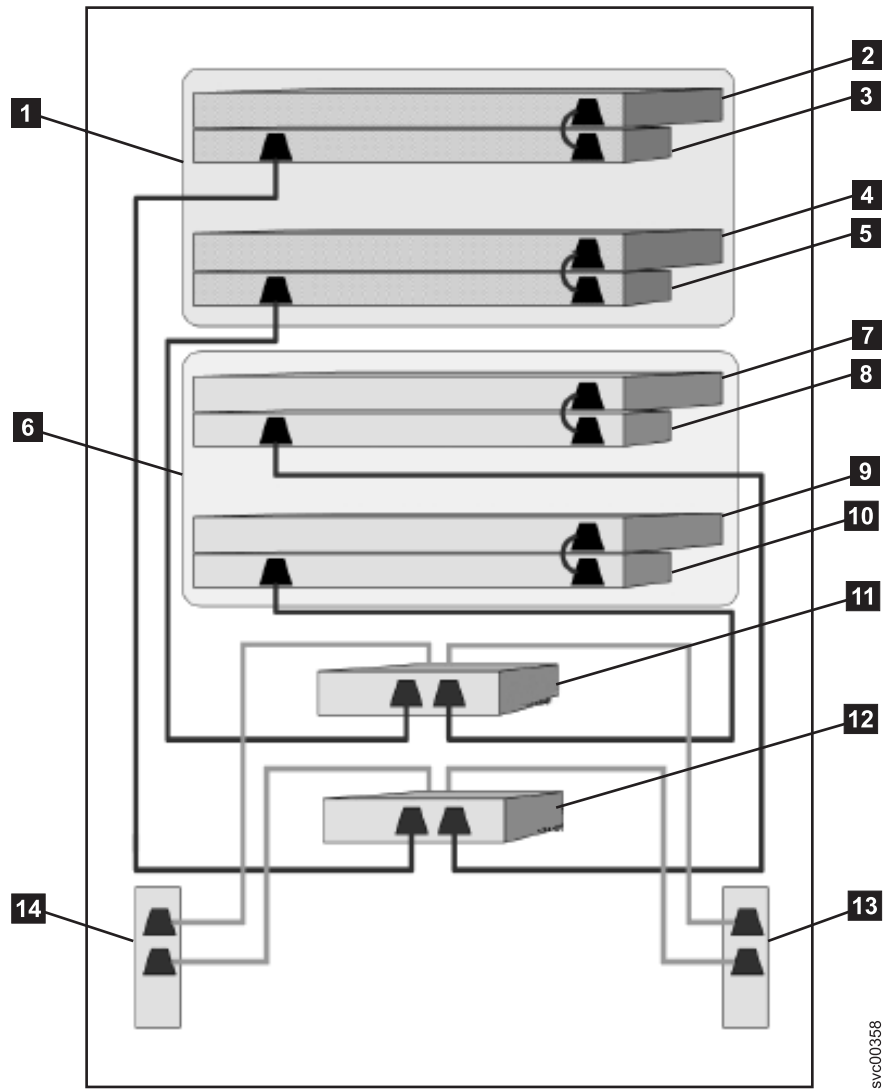
Figure 11. A four-node SAN Volume Controller cluster with the redundant ac power switch feature

1   I/O group 0

2   SAN Volume Controller node A

3   2145-1U uninterruptible power supply A

4   SAN Volume Controller node B

5   2145-1U uninterruptible power supply B

6   I/O group 1

7   SAN Volume Controller node C

8   2145-1U uninterruptible power supply C

9   SAN Volume Controller node D

10   2145-1U uninterruptible power supply D

11   Redundant ac power switch 1

12   Redundant ac power switch 2

| **13** Site PDU X (C13 outlets)

| **14** Site PDU Y (C13 outlets)

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

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

Chapter 4. Uninterruptible power supply

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

2145-1U uninterruptible power supply

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

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

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

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

2145-1U uninterruptible power supply configuration

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

To make the SAN Volume Controller cluster more resilient against power failure, the 2145-1U uninterruptible power supply units can be connected to the redundant ac power switch. If a redundant ac power switch is not used, the two uninterruptible power supply units that power an I/O group can be connected to different, independent electrical power sources. This allows the SAN Volume Controller cluster to continue to operate with reduced performance if a single power source fails.

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

Attention: Do not connect the 2145-1U uninterruptible power supply units to an input power source that does not conform to standards.

Each 2145-1U uninterruptible power supply includes one power cord that connects the uninterruptible power supply to a redundant ac power switch, if one exists, or to a rack power distribution unit (PDU), if one exists. The 2145-1U uninterruptible power supply also includes one power cable that is suitable for connecting to an external power source, which is specific to the geography of the customer.

Each 2145-1U uninterruptible power supply is connected to a SAN Volume Controller node with a power cable and a signal cable. To avoid the possibility of power and signal cables being connected to different uninterruptible power supply 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 uninterruptible power supply.

2145-1U uninterruptible power supply operation

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

If the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply battery state indicates that it has sufficient charge 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 2145-1U uninterruptible power supply has sufficient capacity for the SAN Volume Controller to save all its memory to disk at least twice. For a fully-charged 2145-1U uninterruptible power supply, even after battery charge has been used to power the SAN Volume Controller node while it saves DRAM data, sufficient battery charge 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 2145-1U uninterruptible power supply without first shutting down the SAN Volume Controller node that it supports. Data integrity can be compromised by pushing the 2145-1U uninterruptible power supply on/off button when the node is still operating. However, in the case of an emergency, you can manually shut down the 2145-1U uninterruptible power supply by pushing the 2145-1U uninterruptible power supply on/off button when the node is still operating. Service actions must then be performed before the node can resume normal operations. If multiple uninterruptible power supply units are shut down before the nodes they support, data can be corrupted.

Controls and indicators for the 2145-1U uninterruptible power supply

All controls and indicators for the 2145-1U uninterruptible power supply are located on the front panel assembly.
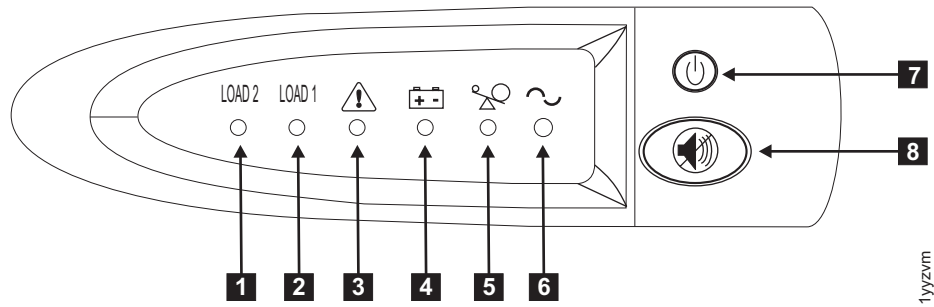
Figure 12. 2145-1U uninterruptible power supply front panel assembly

1 Load segment 2 indicator

2 Load segment 1 indicator

3 Alarm

4 On-battery indicator

5 Overload indicator

6 Power-on indicator

7 On/off button

8 Test and alarm reset button

Table 2 identifies which status and error LEDs that display on the 2145-1U uninterruptible power supply front panel assembly relate to the specified error conditions. It also lists the uninterruptible power supply alert buzzer behavior.

Table 2. Uninterruptible power supply error indicators

[1] Load2	[2] Load1	[3] Alarm	[4] Battery	[5] Overload	[6] ac-on	Buzzer	Error condition
Green (see Note 1)					Green	(see Note 3)	No errors; the uninterruptible power supply was configured by the SAN Volume Controller
Green	Amber (see Note 2)				Green		No errors; the uninterruptible power supply is not yet configured by the SAN Volume Controller
Green	Either on or off		Amber		Green	Beeps for two seconds and then stops	ac over or under limit (on battery)
		Flashing red	Flashing amber	Flashing red	Flashing green	Three beeps every ten seconds	Battery undervoltage
Green	Either on or off	Flashing red			Flashing green	solid on	Battery overvoltage

| *Table 2. Uninterruptible power supply error indicators (continued)*

[1] Load2	[2] Load1	[3] Alarm	[4] Battery	[5] Overload	[6] ac-on	Buzzer	Error condition
		Flashing red	Flashing amber		Flashing green	solid on	Output wave is abnormal when the charger is open, on battery mode
		Flashing red	Flashing amber			solid on	ac output wave is under low limit or above high limit on battery mode
Green	Either on or off		Amber			Beeps for four seconds and then stops	On battery (no ac)
Green	Either on or off		Flashing amber			Beeps for two seconds and then stops	Low battery (no ac)
Green	Either on or off			Red	Green	Beeps for one second and then stops	Overload while on line
			Amber	Red		Beeps for one second and then stops	Overload while on battery
Either on or off	Either on or off	Flashing red			Green	solid on	Fan failure
Either on or off	Either on or off	Flashing red	Amber			solid on	Battery test fail
		Flashing red		Red		solid on	Overload timeout
		Flashing red	Amber		Green	solid on	Over temperature
		Flashing red	Amber	Red	Green		Output short circuit

Notes:

1. The green Load2 LED ([1]) indicates that power is being supplied to the right pair of ac power outlets (viewed from the rear of the uninterruptible power supply).

2. The amber Load1 LED ([2]) indicates that power is being supplied to the left pair of ac power outlets (viewed from the rear of the uninterruptible power supply). These outlets are not used by the SAN Volume Controller.

   This LED might be illuminated during power-on sequences, but it is typically extinguished by the SAN Volume Controller node that is attached to the uninterruptible power supply.

3. A blank cell indicates that the light or buzzer is off.

Load segment 2 indicator

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

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

Load segment 1 indicator

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

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

Alarm

If the alarm on the 2145-1U uninterruptible power supply is flashing red, maintenance is required.

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

On-battery indicator

The on-battery indicator glows yellow when the 2145-1U uninterruptible power supply is powered by the battery. This indicates that the main power source has failed.

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

Overload indicator

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

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

Power-on indicator

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

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

On/off button

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

Turning on the 2145-1U uninterruptible power supply

After you connect the 2145-1U uninterruptible power supply to the outlet, it remains 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). On some versions of the 2145-1U uninterruptible power supply, you might need a pointed device, such as a screwdriver, to press the on/off button. A self-test is initiated that takes approximately 10 seconds, during which time the indicators are turned on

and off several times. The 2145-1U uninterruptible power supply then enters *normal* mode.

Turning off the 2145-1U uninterruptible power supply

Press and hold the on/off button until the power-on light is extinguished (approximately 5 seconds). On some versions of the 2145-1U uninterruptible power supply, you might need a pointed device, such as a screwdriver, to press the on/off button. This places the 2145-1U uninterruptible power supply in *standby* mode. You must then unplug the 2145-1U uninterruptible power supply to power-off the unit.

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

Test and alarm reset button

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

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

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

Hardware for the 2145-1U uninterruptible power supply

The hardware for the 2145-1U uninterruptible power supply consists of connectors and switches, ports and receptacles, and the power supply.

Locations for the 2145-1U uninterruptible power supply connectors and switches

Figure 13 shows the location of the connectors and switches on the 2145-1U uninterruptible power supply:
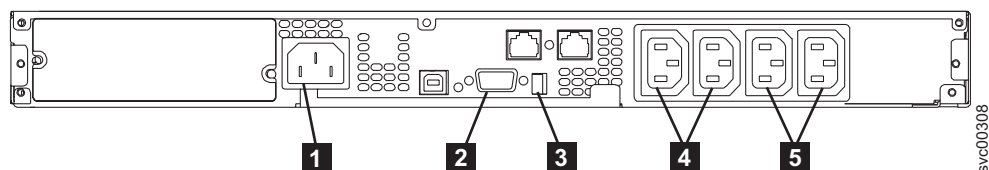
Figure 13. 2145-1U uninterruptible power supply connectors and switches

1 Main power connectors

2 Communication port

3 Dip switches

4 Load segment 1 receptacles

5 Load segment 2 receptacles

2145-1U uninterruptible power supply dip switches

Figure 14 shows the dip switches, which can be 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.
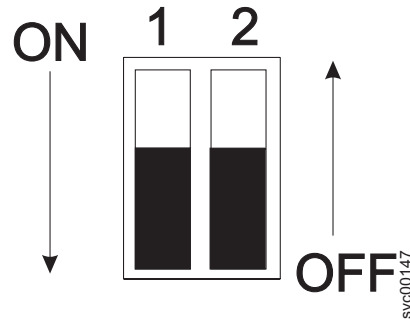
Figure 14. 2145-1U uninterruptible power supply dip switches

2145-1U uninterruptible power supply ports not used

The 2145-1U uninterruptible power supply 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 15 shows the 2145-1U uninterruptible power supply ports that are not used.
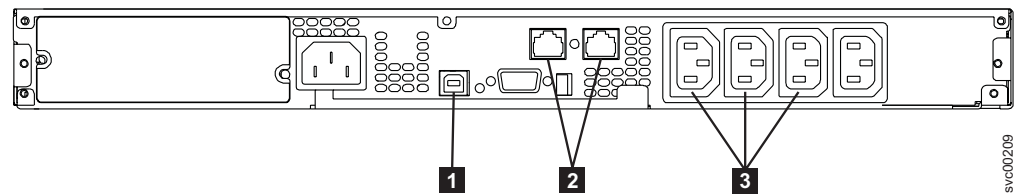
Figure 15. Ports not used by the 2145-1U uninterruptible power supply

1 USB interface port

2 Network ports

3 Load segment receptacles

2145-1U uninterruptible power supply part assembly

Figure 16 on page 30 shows the different parts that make up the 2145-1U uninterruptible power supply.
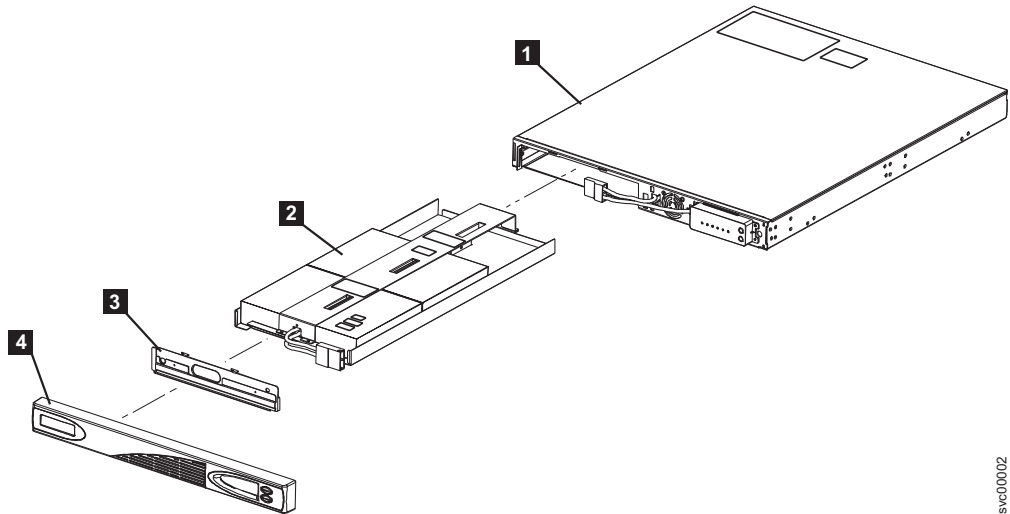
Figure 16. Exploded view of the 2145-1U uninterruptible power supply hardware

1 Frame assembly

2 Battery pack assembly

3 Battery plate

4 Front panel assembly

2145-1U uninterruptible power supply power connector

Figure 17 shows the power connector for the 2145-1U uninterruptible power supply.
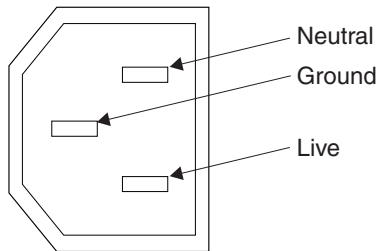
Figure 17. Power connector

Power cables for the 2145-1U uninterruptible power supply

If you do not connect the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply.

The 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply 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
Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Macao S.A.R. of China, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe	2.8 m (9 ft)	CEE 7-VII	39M5123
Antigua, Bahrain, Brunei, Channel Islands, Hong Kong S.A.R. of China, Cyprus, Dubai, Fiji, Ghana, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia	2.8 m (9 ft)	BS 1363/A	39M5151
Argentina	2.8 m (9 ft)	IRAM 2073	39M5068
Argentina, Australia, New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	2.8 m (9 ft)	AS/NZS 3112/2000	39M5102
Bangladesh, Burma, Pakistan, South Africa, Sri Lanka	2.8 m (9 ft)	SABS 164	39M5144
Chile, Ethiopia, Italy, Libya, Somalia	2.8 m (9 ft)	CEI 23-16	39M5165
People's Republic of China	2.8 m (9 ft)	GB 2099.1	39M5206

Country or region	Length	Connection type (attached plug designed for 200 - 240 V ac input)	Part number
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

Requirements for the uninterruptible power supply environment

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

2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply.

2145-1U uninterruptible power supply specifications

The following tables describe the physical characteristics of the 2145-1U uninterruptible power supply.

2145-1U uninterruptible power supply dimensions and weight

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

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 2145-1U uninterruptible power supply package, which includes support rails, weighs 18.8 kg (41.4 lb).			

Heat output

The 2145-1U uninterruptible power supply unit produces the following approximate heat output.

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

Chapter 5. IBM System Storage Productivity Center

The IBM System Storage Productivity Center (SSPC) is an integrated hardware and software solution that provides a single point of entry for managing SAN Volume Controller clusters, IBM System Storage DS8000 systems, and other components of your data storage infrastructure.

SSPC simplifies storage management in the following ways:

- Centralizing the management of storage network resources with IBM storage management software
- Providing greater synergy between storage management software and IBM storage devices
- Reducing the number of servers that are required to manage your software infrastructure
- Providing simple migration from basic device management to storage management applications that provide higher-level functions

SSPC includes the following software components:

- SAN Volume Controller Console, including the CIM agent
- PuTTY (SSH client software)
- IBM TotalStorage Productivity Center Basic Edition, which can be used to access the IBM System Storage DS8000 Storage Manager
- DB2® Enterprise Server Edition

Figure 18 shows an overview of how SSPC and the components of IBM TotalStorage Productivity Center, IBM System Storage DS8000, and SAN Volume Controller interrelate with each other.
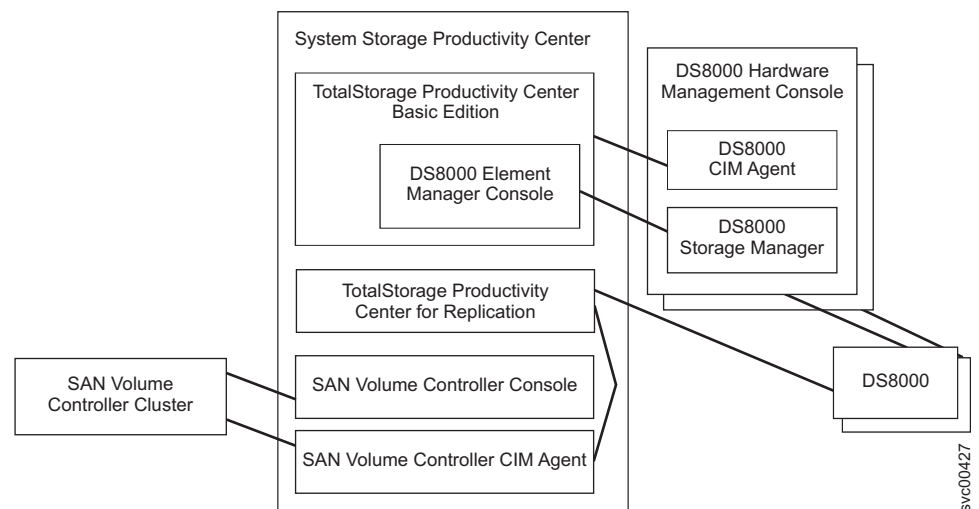
Figure 18. Overview of the IBM System Storage Productivity Center

For more information on SSPC, see the *IBM System Storage Productivity Center Introduction and Planning Guide*.

Preparing your IBM System Storage Productivity Center environment

Before an IBM service representative can install the IBM System Storage Productivity Center, you must prepare the physical environment. This includes verifying that adequate space is available and that requirements for power and environmental conditions are met.

For information about setting up the physical environment, see the *IBM System Storage Productivity Center Introduction and Planning Guide*.

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 that 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. Optionally, 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 uninterruptible power supply.
4. Install the node.
5. Connect the fibre-channel and Ethernet cables to the node.
6. Connect the node to the uninterruptible power supply.
7. Verify the node.
8. Install the IBM System Storage Productivity Center hardware. See the *IBM System Storage Productivity Center Introduction and Planning Guide* for more information. Optionally, this step can be performed first.

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

Preparing for the SAN Volume Controller hardware installation

There are several steps that you must perform to prepare for the installation of the optional redundant ac power switch, the uninterruptible power supply, the IBM System Storage Productivity Center, 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 for the installation against the following lists to ensure that everything you need has been delivered. If any piece is missing, contact the appropriate IBM representative.
   - Box 1 is labeled as containing the following part numbers:

- – Feature code 3001: initial SAN Volume Controller 2145-8G4 node or Feature code 3002: additional SAN Volume Controller 2145-8G4 node
  - – Optional feature codes 5301 and 5325 for SAN Volume Controller fiber optic cables
  - – Optional feature codes 8300: redundant ac power switch

    If optional feature code 8300: redundant ac power switch has been ordered, Box 1 contains an additional box labeled as containing the following part numbers:
    - Part number 95P5083: redundant ac power switch, quantity 1
    - Part number 31P0966: power cables, quantity 2
    - Part number 96P1728: mounting plates, quantity 2
    - Part number 12J5289: hex head screws, quantity 4
    - Part number 00N8709: ″c″ clips, quantity 4
    - Part number 24R0207: other screws, quantity 6
    - Part number 31P0876: label set, quantity 1

    The following part is located within Box 1, but is not labeled as such on the outside of Box 1:
    - Part number 42R8761: SAN Volume Controller 2145-8G4 support rail kit

- Box 2 is labeled as containing the following part numbers:
  - – Part number 31P0874: 2145-1U uninterruptible power supply kit, which contains the 2145-1U uninterruptible power supply, the support rails, and a power jumper cable to connect the uninterruptible power supply to a redundant ac power switch or to a rack power supply

- Optional Box 3 is labeled as containing the following part numbers:
  - – Part number 31P0912: Kit containing power and signal cable and the SAN Volume Controller 2145-8G4 cable retention bracket
  - – Part number 31P0914: SAN Volume Controller user publications
  - – Part number 95P5083: redundant ac power switch, quantity 1
  - – Part number 31P0966: power cables, quantity 2
  - – Part number 96P1728: mounting brackets, quantity 2
  - – Part number 12J5289: hex head screws, quantity 4
  - – Part number 00N8709: ″c″ clips, quantity 4
  - – Part number 24R0207: other screws, quantity 6
  - – Part number 31P0876: label set, quantity 1

Figure 19 on page 37 illustrates the major hardware components that you need.
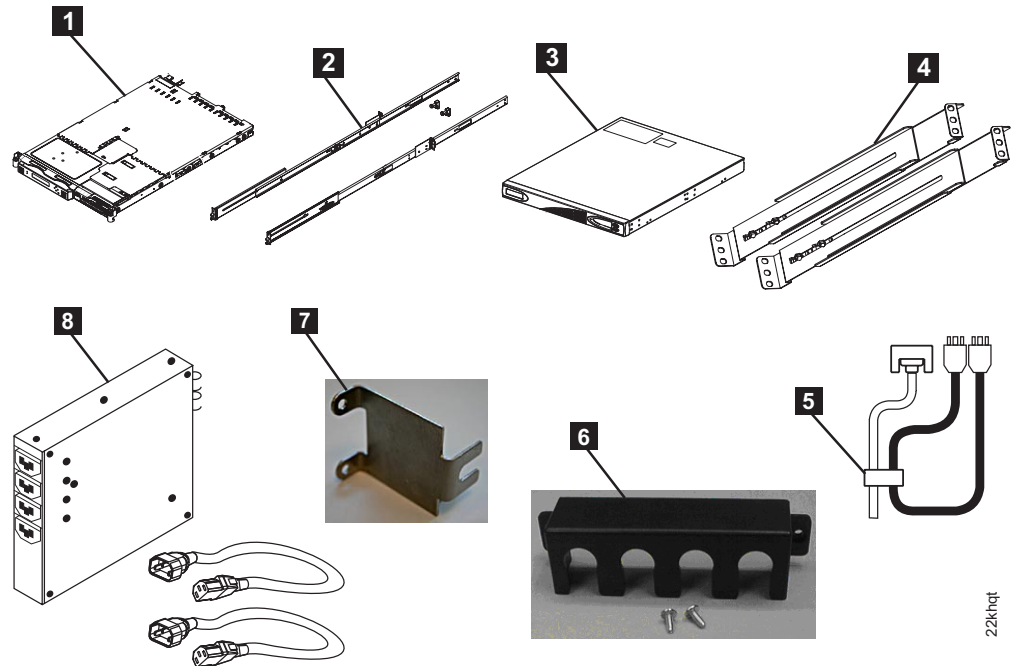
Figure 19. Parts provided for SAN Volume Controller hardware installation in a rack

1 SAN Volume Controller node

2 SAN Volume Controller support rails (2)

3 2145-1U uninterruptible power supply

4 2145-1U uninterruptible power supply support rails (2)

5 Power and signal cable

6 2145-1U uninterruptible power supply cable retention bracket

7 SAN Volume Controller 2145-8G4 cable retention bracket

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

Note:

   a. You must install at least two SAN Volume Controller nodes and each node requires an uninterruptible power supply.

   b. You must ensure that you have the appropriate power cables to connect to the site power distribution point. See "Power cables for the 2145-1U uninterruptible power supply" on page 30.

   c. Optionally, install two redundant ac power switches to power the nodes in an I/O group through two 2145-1U uninterruptible power supply units.

3. Read the safety and environmental notices to ensure that you are correctly installing the 2145-1U uninterruptible power supply units.

4. If you are installing the IBM System Storage Productivity Center, see the *IBM System Storage Productivity Center Introduction and Planning Guide* for more information.

Optionally 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)**
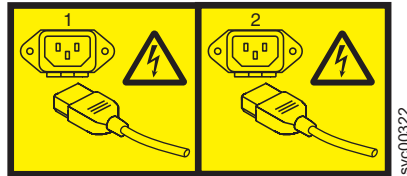
or
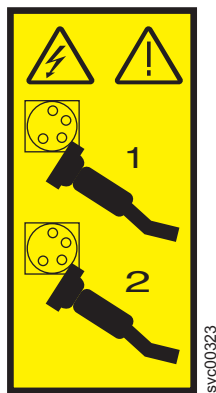
The following topics describe the redundant ac power switch installation tasks in the order that they must be performed.

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 20.

Figure 20. 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 21 on page 40.

Figure 21. Power cable clips

Installing the redundant ac power switch in the rack

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

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

1. Use the hardware location chart to determine where to install the redundant ac power switch in the rack. The redundant ac power switch can be installed horizontally in a rack slot or vertically in one of the side slots of the rack.
2. Position the four "C" clips in the rack's mounting bar, as shown in Figure 22 on page 41.
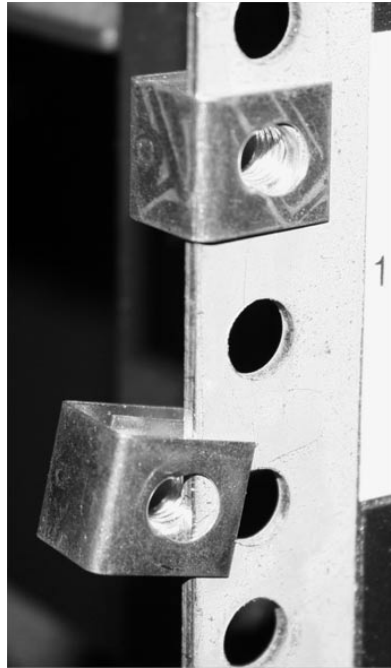
Figure 22. Positioning the clips

3. Position the redundant ac power switch in the rack first, pushing the cables through to the front of the rack. Mount in place, as shown in Figure 23, using the four M6 screws.

Figure 23. 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. In that case, power on the uninterruptible power supply (not the SAN Volume Controller node) and see if it changes to battery power. The test fails if the uninterruptible power supply switches to battery power for more than five seconds (any transient indications of battery power can be ignored).

When the instructions say to "remove power," you can either 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 2145-1U uninterruptible power supply

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

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

Installing the support rails for the 2145-1U uninterruptible power supply

You must install the support rails in the rack before installing the 2145-1U uninterruptible power supply.

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 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply. Because of its weight, position the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply:

1. Open the top of the 2145-1U uninterruptible power supply shipping carton. Grip the flaps on either side of the 2145-1U uninterruptible power supply.
2. Lift the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply using four M3 × 6 screws **2** for each bracket, as shown in Figure 24.

Figure 24. Installing the support rails for a 2145-1U uninterruptible power supply into the rack

4. Loosen the assembly wing nuts (**1** in Figure 25) on both rail assemblies and adjust the rail size to the depth of your rack.
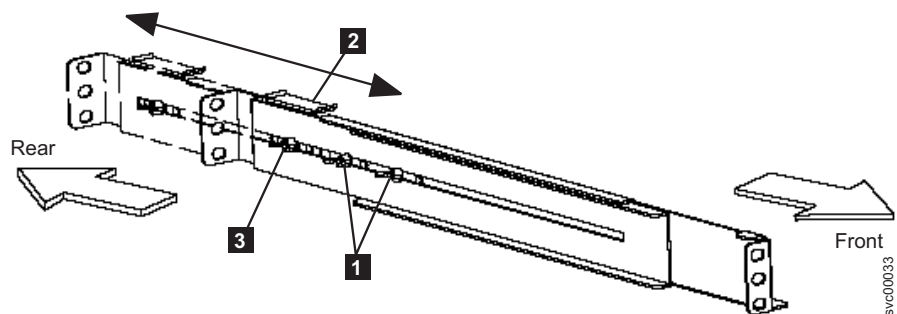
Figure 25. Adjusting the rail depth on the 2145-1U uninterruptible power supply

1 Assembly wing nuts

2 Hold-down bracket

3 Wing nut

5. Position the rear, hold-down bracket (**2** in Figure 25 on page 43) towards the end of the rail assemblies and tighten the wing nut (**3** in Figure 25 on page 43).

6. Select the holes in the rail where you want to position the 2145-1U uninterruptible power supply.

   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 26) 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.
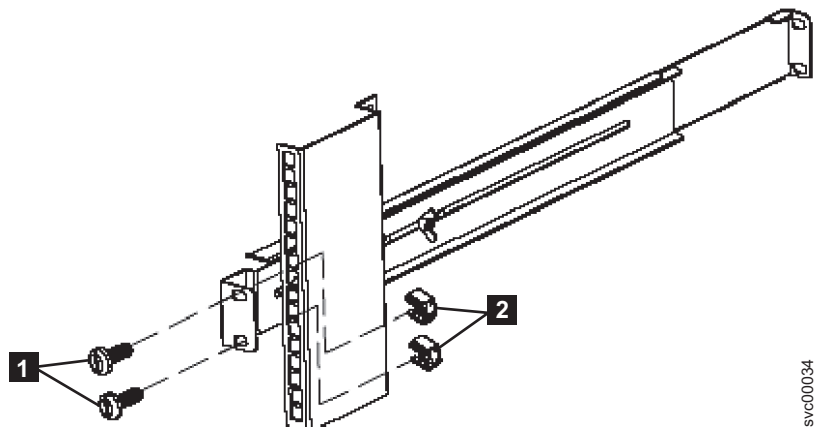
Figure 26. Securing the rear rail on the 2145-1U uninterruptible power supply

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 27).
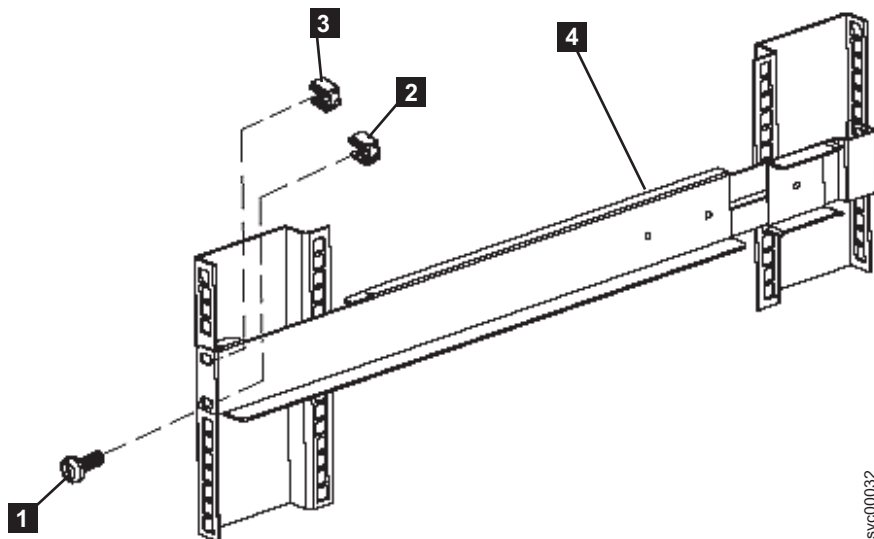
Figure 27. Securing the front rail on the 2145-1U uninterruptible power supply

9. Install a clip nut in the top hole of the rail **3** .

10. Repeat step 7 on page 44 through step 9 for the other rail.

11. Tighten the assembly wing nuts on both rail assemblies.

Installing the 2145-1U uninterruptible power supply in the rack

After you have completed the preparation procedures, you are ready to install the 2145-1U uninterruptible power supply 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 uninterruptible power supply contains its own energy source (sealed, lead-acid batteries). The output receptacles might carry live voltage, even when the uninterruptible power supply is not connected to an ac supply. (11)

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

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

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

Perform the following steps to install the 2145-1U uninterruptible power supply in the rack:

Note: You might have already completed steps 3 on page 46 through 6 on page 47 if you used the *Read Me First* pamphlet, which is included with the 2145-1U uninterruptible power supply.

1. Stand at the front of the rack and place the back of the 2145-1U uninterruptible power supply onto the support rails, and then slide the 2145-1U uninterruptible power supply into the rack.

   Note: The 2145-1U uninterruptible power supply weighs 16 kg (35.3 lb). If you feel unsure about lifting the uninterruptible power supply to its location in the rack, seek assistance or remove the battery to reduce its weight.

2. At the front of the 2145-1U uninterruptible power supply, install the two mounting screws (**1** in Figure 28 on page 46).
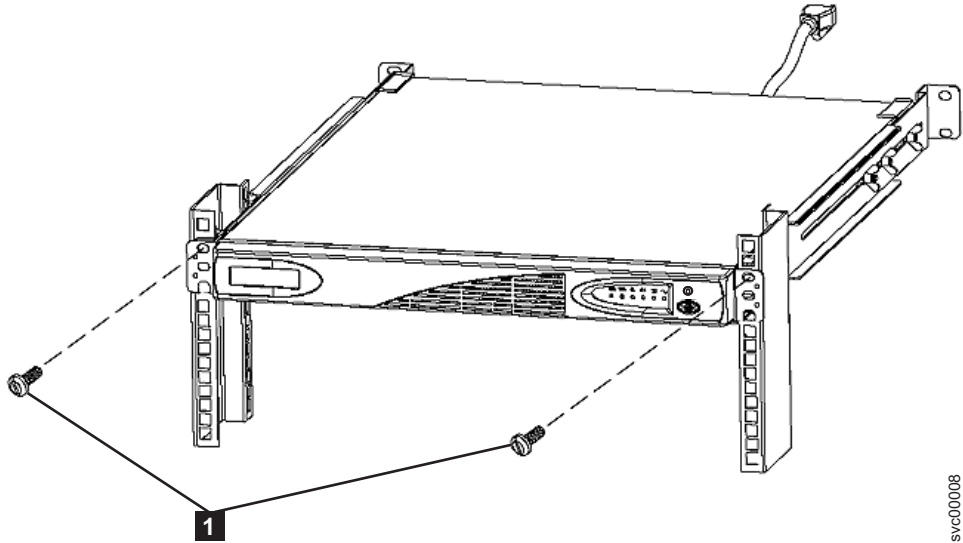
Figure 28. Mounting screws for the 2145-1U uninterruptible power supply

3. If you have not already connected the internal battery connector, remove the 2145-1U uninterruptible power supply front panel, as shown in Figure 29.
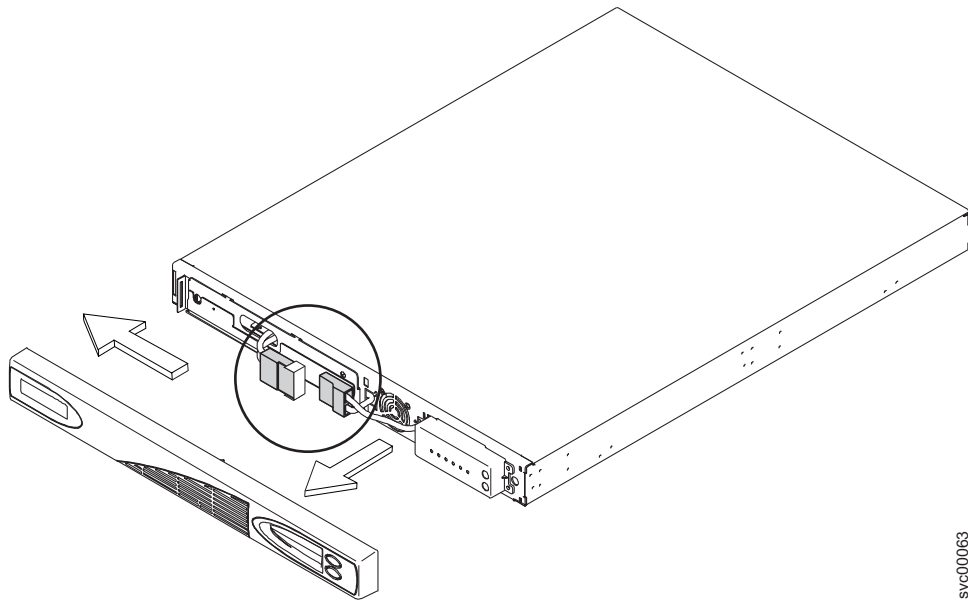
Figure 29. Removing the 2145-1U uninterruptible power supply front panel

4. Remove the protective label from the internal battery connector (shown in Figure 30 on page 47).
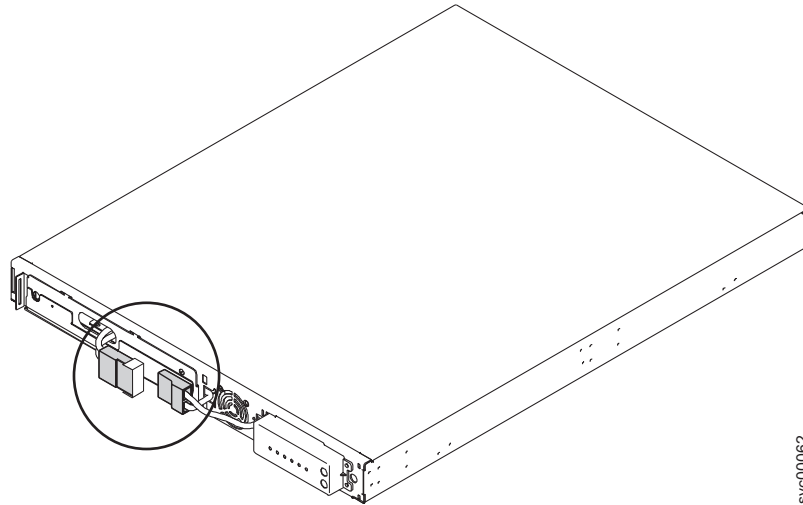
Figure 30. The 2145-1U uninterruptible power supply internal battery connector with protective tape

5. Connect the internal battery connector (shown in Figure 31). 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.
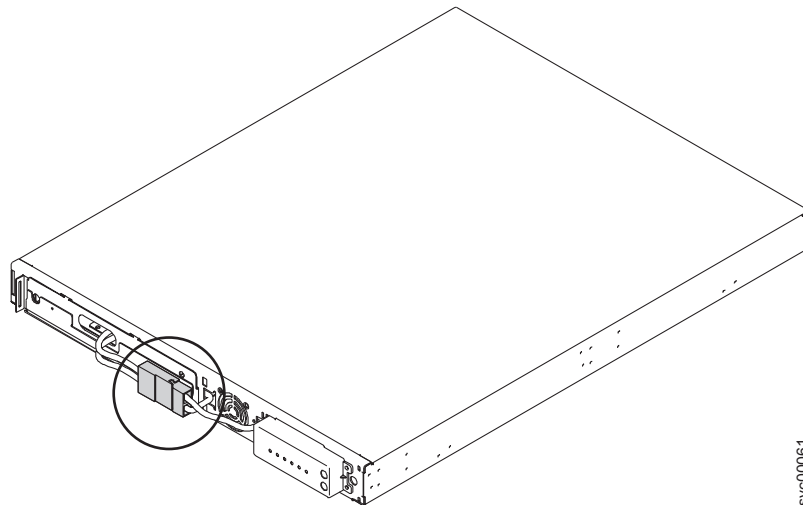
Figure 31. The 2145-1U uninterruptible power supply internal battery connector

6. Reinstall the front panel. You might first need to move the sliding section on the front of the 2145-1U uninterruptible power supply to the closed position.
7. At the back of the 2145-1U uninterruptible power supply, plug the 2145-1U uninterruptible power supply main power connector into the power socket (**1** in Figure 32 on page 48). The 2145-1U uninterruptible power supply is in standby mode, so all indicators are off.

   It is recommended that each 2145-1U uninterruptible power supply for an I/O group is connected to a different power source.
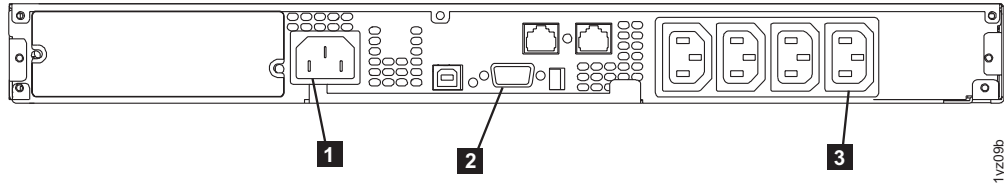
Figure 32. 2145-1U uninterruptible power supply (rear view)

1 Main power connector

2 Communication port

3 Load segment 2 receptacle

Attention: Ensure that you comply with the following requirements:

- The voltage supplied to the 2145-1U uninterruptible power supply must be 200 – 240 V single phase.
- The frequency supplied must be 50 or 60 Hz.

Notes:

    a. The 2145-1U uninterruptible power supply has an integrated circuit breaker and does not require external protection.

    b. The 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply or the SAN Volume Controller cluster malfunctions.

8. Press and hold the on/off button (**7** in Figure 33) for approximately five seconds. You might need a pointed device, such as a screwdriver, to press the on/off button. The front panel indicators cycle through a startup sequence while the 2145-1U uninterruptible power supply conducts a self-test.
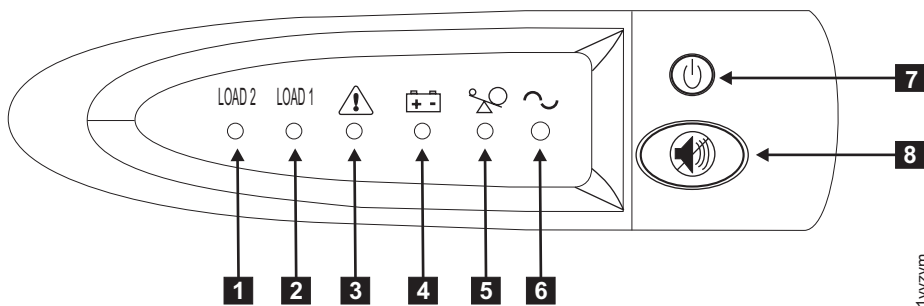
Figure 33. 2145-1U uninterruptible power supply front panel assembly

When the self-test is complete, the power-on indicator **6** and the load indicators (**1** and **2**) illuminate to indicate that power is being supplied by the 2145-1U uninterruptible power supply. The 2145-1U uninterruptible power supply is now in normal mode, and is charging its battery. If the power-on indicator **6** 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 2145-1U uninterruptible power supply, 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 2145-1U uninterruptible power supply and powered on.

9. Repeat all of these steps to install additional 2145-1U uninterruptible power supply units.

Installing the 2145-1U uninterruptible power supply cable retention bracket

The 2145-1U uninterruptible power supply cable retention bracket ensures that the power cable connection between the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply 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 outlet on the rear of the 2145-1U uninterruptible power supply.

2. Remove the bracket and the two screws (shown in Figure 34) from the packaging.
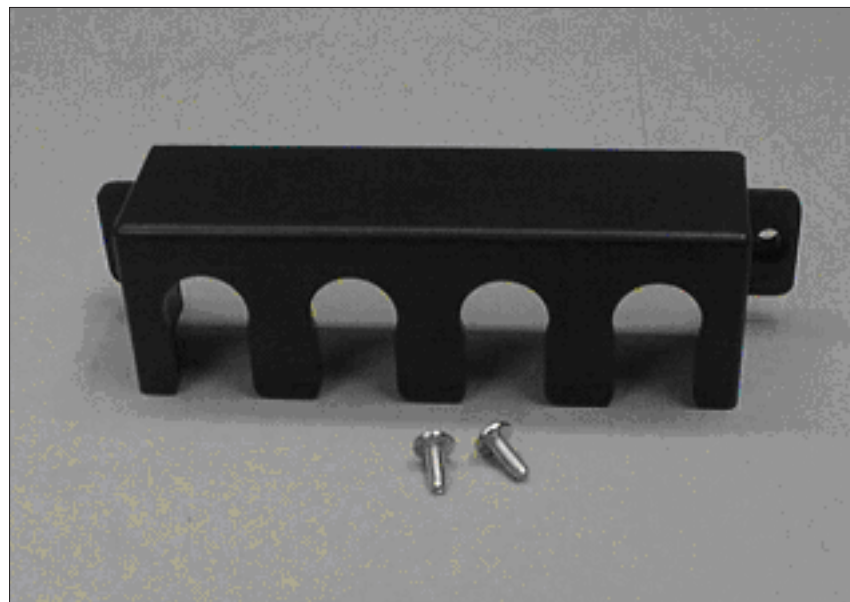
Figure 34. 2145-1U uninterruptible power supply power cable retention bracket hardware

3. Place the bracket over the power outlets on the right rear of the 2145-1U uninterruptible power supply, 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 35 on page 50.
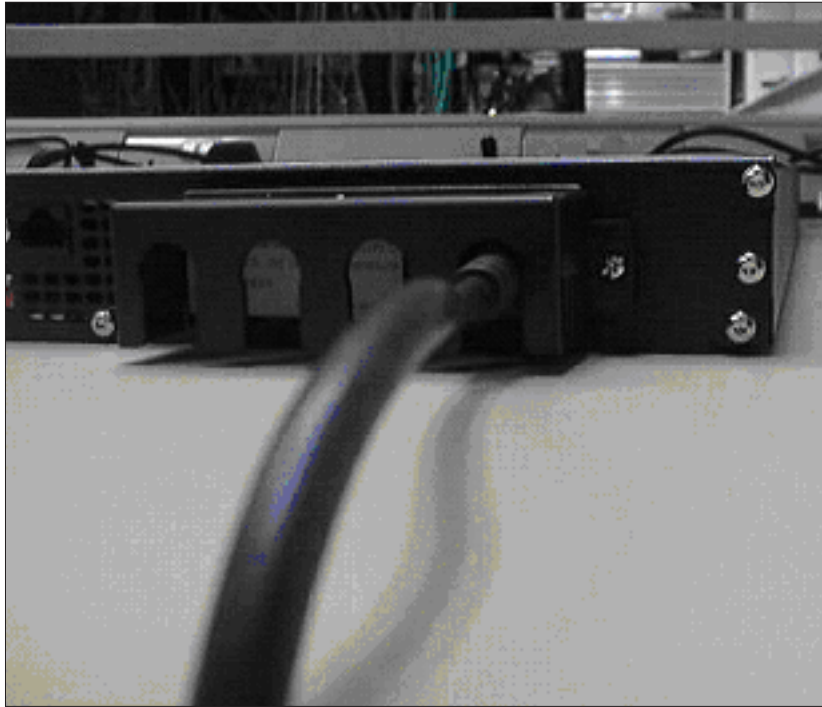
Figure 35. 2145-1U uninterruptible power supply power cable retention bracket

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 uninterruptible power supply.
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 by starting at the bottom of the rack cabinet to ensure that the rack is stable and cannot tip over.
- Install the heaviest device in the bottom of the rack cabinet.

| • Do not install a SAN Volume Controller node directly above the pull-out
| monitor and keyboard of the IBM System Storage Productivity Center. The front
| panel of the node protrudes beyond the front of the rack and overlaps part of
| the monitor, which prevents you from opening it.

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

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 36) for the SAN Volume Controller 2145-8G4:

1. Make sure you have all the items that you need for installing the support rails.
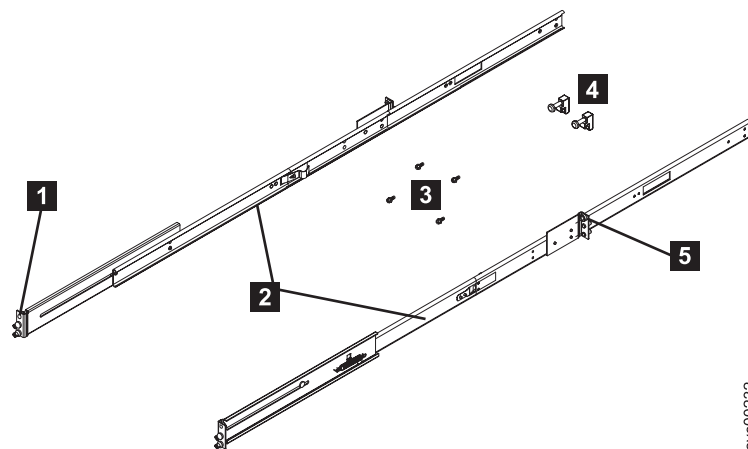
Figure 36. SAN Volume Controller 2145-8G4 support rails installation kit

   1 Rear of rail
   2 Rack mounting rails
   3 M6 screws
   4 Latches
   5 Front of rail

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

2. 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 37 on page 52, with the rail pins **1** protruding through the flange.
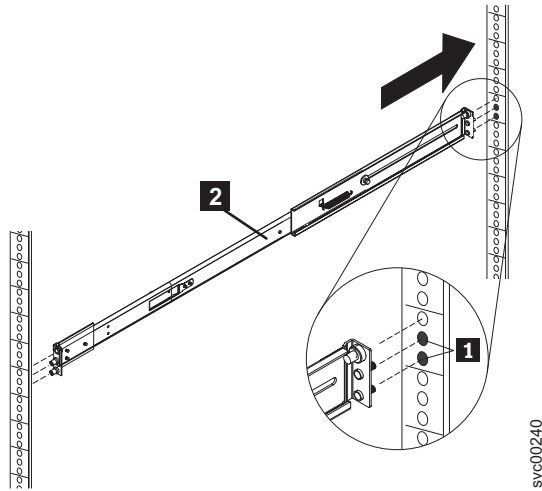
Figure 37. Inserting the right slide rail into the rear rack mounting flange

4. Extend the right slide rail **2** and insert it into the front rack mounting flange, as shown in Figure 38, with the rail pins **1** protruding through the flange. Insert the left slide rail in the same way.
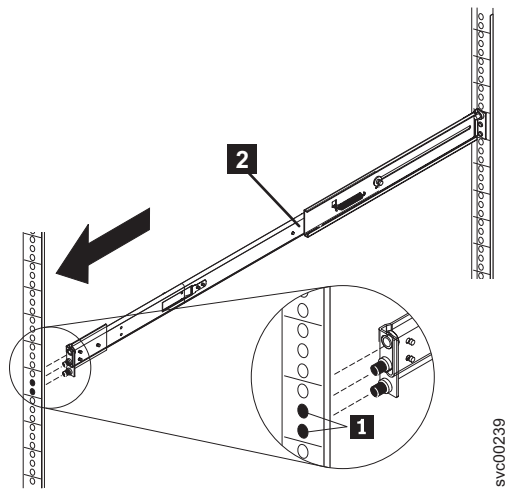
Figure 38. Extending the right slide rail

5. Attach one latch strike **1** to the front of the right rail **2**, as shown in Figure 39 on page 53, using the captive screw **3**. Turn the screw only finger tight. Attach the other latch strike to the front of the left rail in the same way.
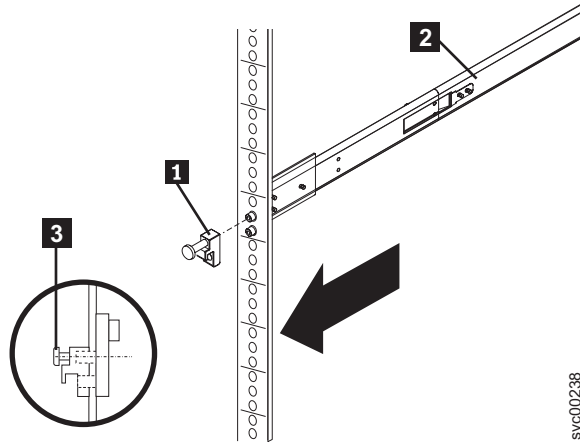
Figure 39. Attaching the latch strike to the front of the rail

6. Attach the slide rail to the left rear mounting flange with a single screw and latch strike. The screw should be only finger tight. Likewise, attach the other slide rail to the right 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.

svc00236
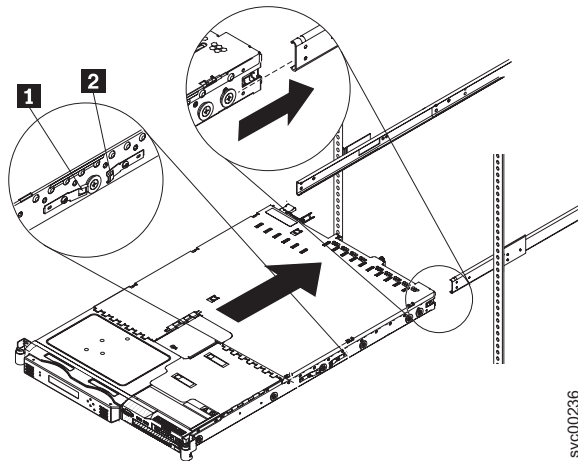
4. Pull the node out of the rack so the slides are fully extended.

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.

svc00229
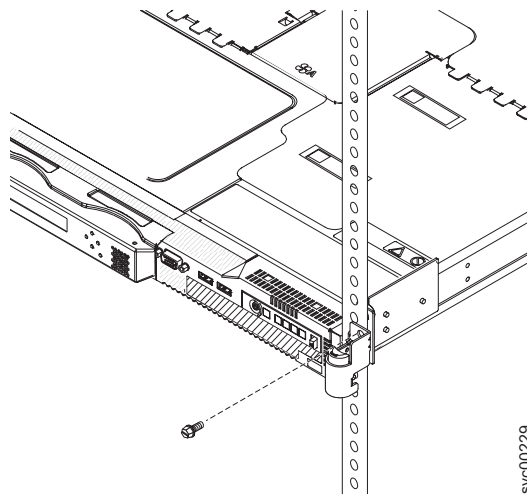
7. Press the front slide release latches **1** and push the node all the way into the rack cabinet.

   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 1∪ space between each node to improve the air circulation in the rack.

Connecting the SAN Volume Controller 2145-8G4 to the 2145-1U uninterruptible power supply

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

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

Before you begin this task, see the completed user's cable connection table, which is described in the *IBM System Storage SAN Volume Controller: Planning Guide* and was downloaded from http://www.ibm.com/storage/support/2145.

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

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

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 40.
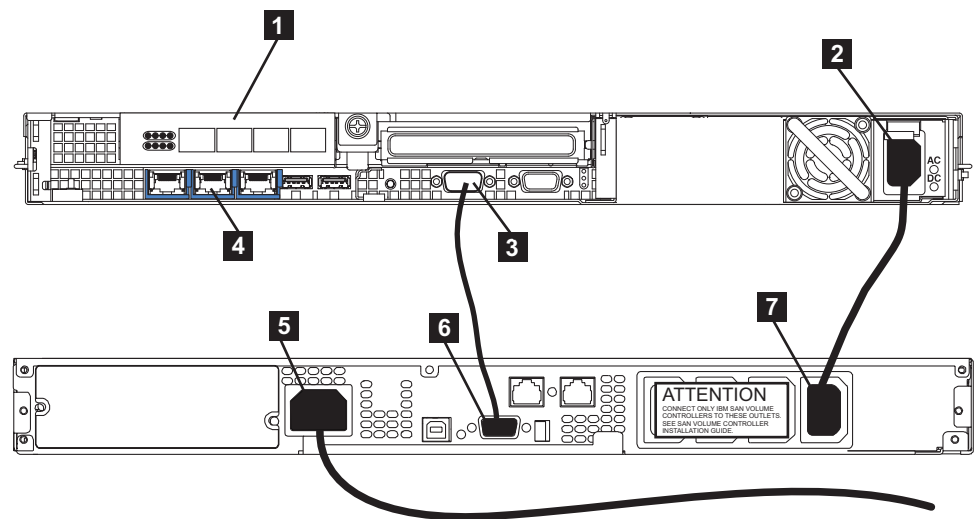
Figure 40. Connecting the SAN Volume Controller 2145-8G4 power cable to the 2145-1U uninterruptible power supply

> **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 2145-1U uninterruptible power supply.

DANGER

> **You have already switched on the 2145-1U uninterruptible power supply. The output sockets of the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply.

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

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.

The SAN Volume Controller 2145-8G4 comes with a cable retention bracket.

svc00363

Installing the cable retention bracket

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, 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 42 on page 58.
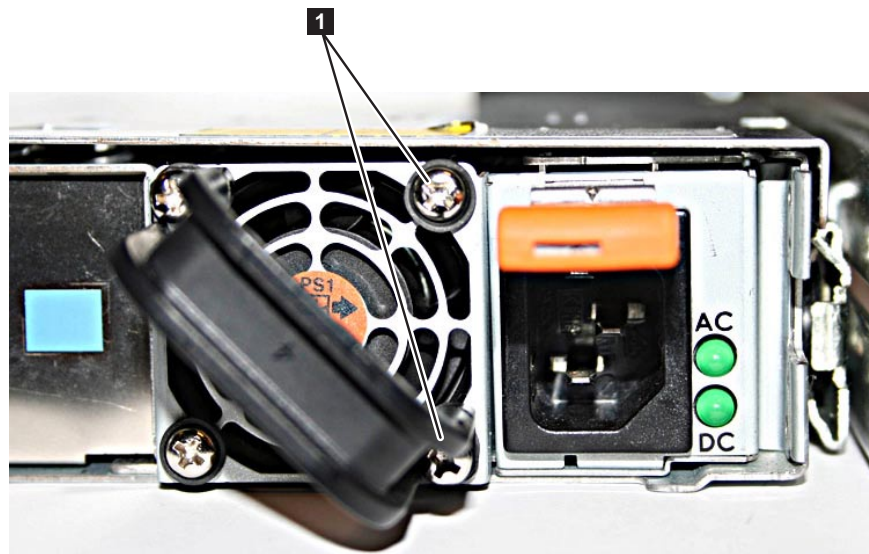
2. Insert the power cable.
3. Position the cable retention bracket so that the power cable runs through the slot in the bracket, as shown in Figure 42 on page 58. Align the screw holes in the bracket with the holes that are in the rear plate where you removed the two screws.
4. Replace the top screw.
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 42. The SAN Volume Controller 2145-8G4 with the cable retention bracket attached

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 43.

   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.
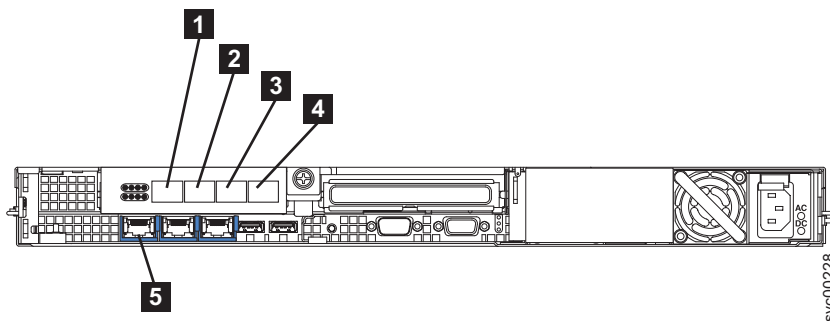
Figure 43. SAN Volume Controller 2145-8G4 connectors on the rear panel

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`, `Recovering`, or the `Cluster:` message 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` or `Recovering` message. If the `Charging` or `Recovering` message is displayed, you will also see a progress bar on the second line. Battery charging can take up to two 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 on page 60.) When the battery is charged enough, the `Cluster:` message 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 44 on page 60 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.

| | No button pressed (border only) |

| ▲ | Up button pressed |

| ◄ ► | Left and Right button pressed |

| ○ | Select button pressed |
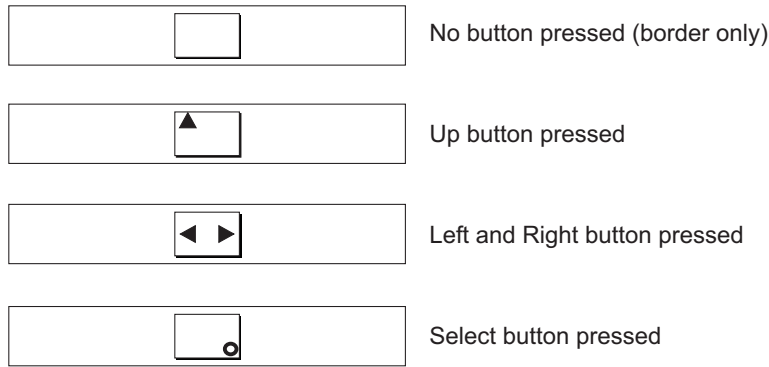
Figure 44. Front panel display when push buttons are pressed

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

5. Press and release the up 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 45 shows how the node number is displayed on the front panel. If the node number is not the same, contact the IBM Support Center.

```
Node:
xxxxxx
```

Figure 45. 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 46 shows the message `Inactive`. This message indicates that, although an Ethernet connection is available, it cannot yet be used.

```
Ethernet:
Inactive
```
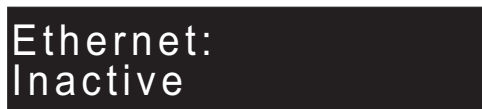
Figure 46. Ethernet mode

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 ensure that the port is active and the speed is correct.

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.

If the battery needed to be charged, the `Charging` or `Recovering` message is replaced by the `Cluster:` message when the battery is fully charged. The progress bar no longer displays. The installation of the SAN Volume Controller hardware is now complete. No software installation is required. Continue with the instructions in the *IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide* to create, if necessary, a new SAN Volume Controller cluster and to add the nodes into a SAN Volume Controller cluster.

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

SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 environment requirements

Before the SAN Volume Controller 2145-8F4 or SAN Volume Controller 2145-8F2 is installed, the physical environment must meet certain requirements. This includes verifying that adequate space is available and that requirements for power and environmental conditions are met.

Input-voltage requirements

Ensure that your environment meets the following voltage requirements.

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

Power requirements for each node

Ensure that your environment meets the following power requirements.

The power that is required depends on the node type, the uninterruptible power supply type, and whether the redundant ac power feature is used.

Components	Power requirements
SAN Volume Controller 2145-8F4 + 2145-1U uninterruptible power supply	520 W
SAN Volume Controller 2145-8F2 + 2145-1U uninterruptible power supply	520 W

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

Circuit breaker requirements

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

Environment requirements without redundant ac power

Ensure that your environment falls within the following ranges if you are not using 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

Ensure that your environment falls within the following ranges if you are using 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 tables list the physical characteristics of the SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 nodes.

Dimensions and weight

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

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

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

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

The nodes dissipate the following maximum heat output.

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

Figure 47 on page 66 shows the controls and indicators on the front panel of the SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2.
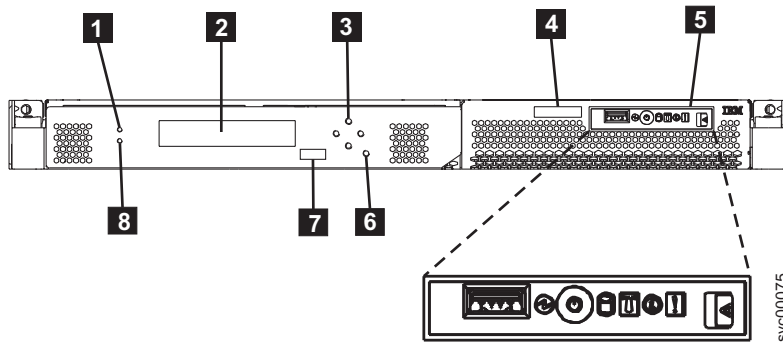
Figure 47. SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 front panel assembly

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 3 describes the system activity indicators.

Table 3. 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.

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

The front panel displays configuration and service information about the SAN Volume Controller node 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
- Validate WWNN?
- 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 written to the system board hardware. The product serial number is also printed on the serial number label on the right side of the front panel.

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 buttons and indicators, such as the release latch for the light path diagnostics panel, the power-control button, and LEDs that indicate information, such as system-board errors, hard drive activity, and power status.

Figure 48 on page 68 shows the operator panel used by the SAN Volume Controller 2145-8F4 and the SAN Volume Controller 2145-8F2 models.
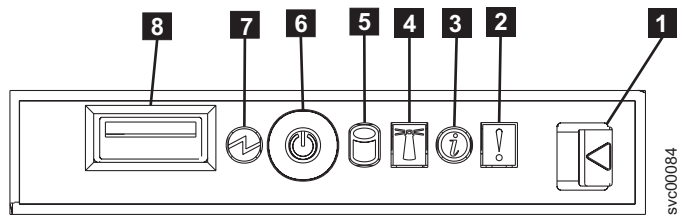
Figure 48. SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 operator information panel

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 method for 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" 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 noncritical 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*.

Notes:

1. When the node is operational and you press and immediately release the power control button, 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 you press the power control button but do not release it, an immediate power off occurs without the SAN Volume Controller control data being written to disk. Service actions are then required to make the SAN Volume Controller operational again. Therefore, during a power-off operation, do not press and hold the power control button for more than two seconds.

2. The 2145-1U uninterruptible power supply 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 green power LED has the following properties:

Off   One or more of the following are true:
- No power is present at the power supply input
- The power supply has failed
- The LED has failed

On   The SAN Volume Controller 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. Sometimes this number is called panel name or front panel id.

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 consist of LEDs that indicate the status of the fibre-channel ports, Ethernet connection and activity, power, electrical current, and system board errors.

SAN Volume Controller 2145-8F4 rear panel indicators

The rear panel indicators are located on the back panel assembly.

Figure 49 shows the rear panel indicators on the SAN Volume Controller 2145-8F4 back panel assembly.
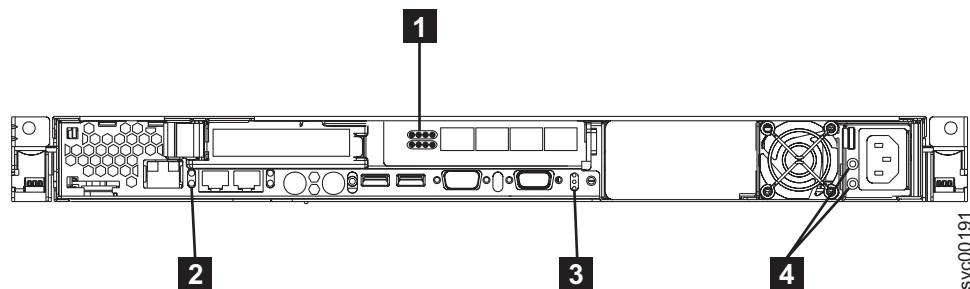
Figure 49. SAN Volume Controller 2145-8F4 rear panel indicators

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 rear panel indicators are located on the back panel assembly.

Figure 50 shows the rear panel indicators on the SAN Volume Controller 2145-8F2 back panel assembly.
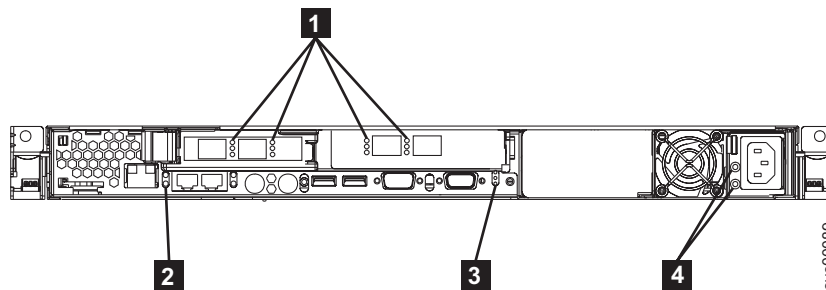
Figure 50. SAN Volume Controller 2145-8F2 rear panel indicators

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 4 describes the status of the link LEDs.

Table 4. 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 51 shows the fibre-channel LEDs on the SAN Volume Controller 2145-8F4.
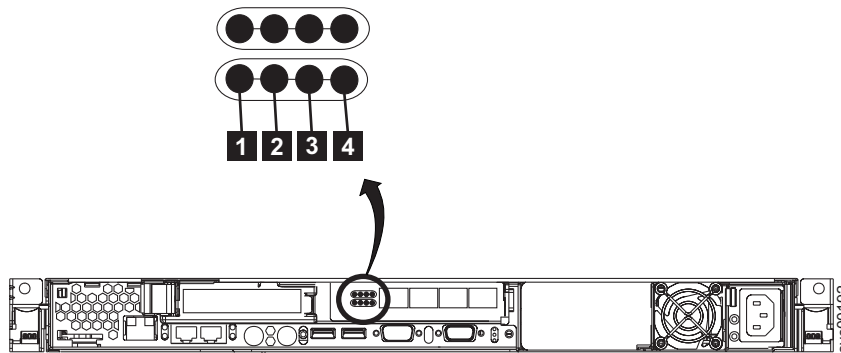
Figure 51. SAN Volume Controller 2145-8F4 fibre-channel LEDs

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 states:
>
> **Off** One or more of the following are true:
> - No power is present at the power supply input
> - The power supply has failed
> - The LED has failed
>
> **On** The SAN Volume Controller is 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 52 shows the location of the ac and dc LEDs.
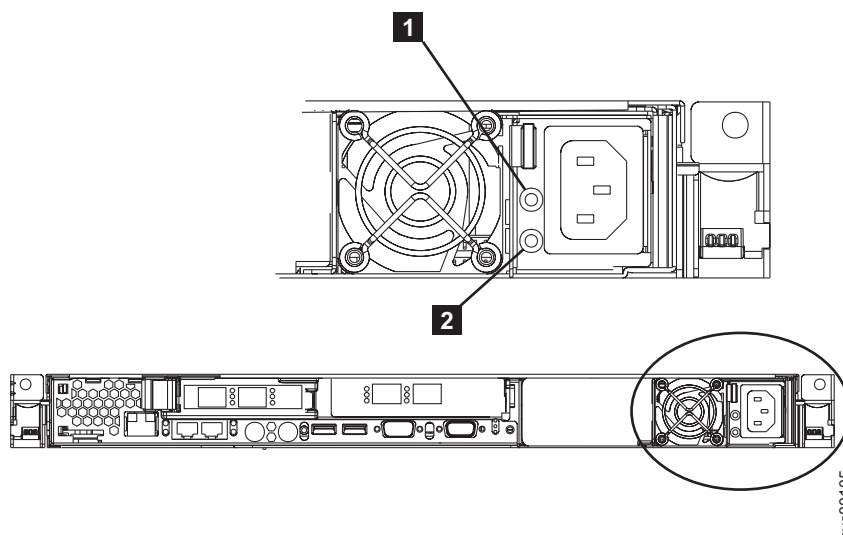
Figure 52. SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 ac and dc LEDs

External connectors on the SAN Volume Controller 2145-8F4 and the SAN Volume Controller 2145-8F2

The external connectors consist of PCI slots, fibre-channel, Ethernet, and serial ports, and the power supply.

SAN Volume Controller 2145-8F4 connectors

The external connectors consist of Ethernet, serial, and fibre-channel ports, and the power supply.

Figure 53 on page 74 shows the external connectors on the SAN Volume Controller 2145-8F4 back panel assembly.

Figure 53. SAN Volume Controller 2145-8F4 external connectors

1 Ethernet port 1

2 Serial connection

3 Fibre-channel port 1

4 Fibre-channel port 2

5 Fibre-channel port 3

6 Fibre-channel port 4

7 Power supply

Figure 54 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.

Figure 54. Power connector

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 55 provides the locations of the service ports.
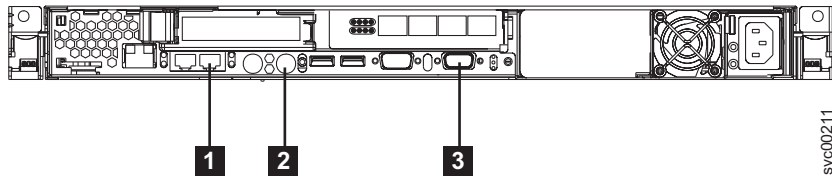
Figure 55. Service ports of the SAN Volume Controller 2145-8F4

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. Figure 56 and Figure 56 show the ports that are not used by the SAN Volume Controller.
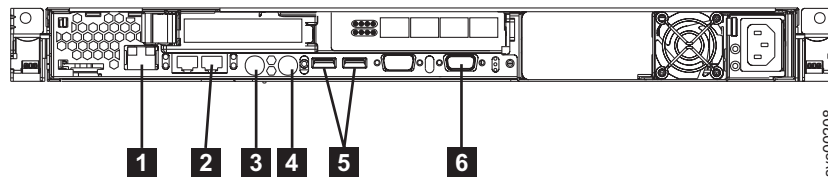
Figure 56. Ports not used by the SAN Volume Controller 2145-8F4

1 System management port

2 Ethernet port 2

3 Mouse port

4 Keyboard port

5 USB ports

6 Monitor port
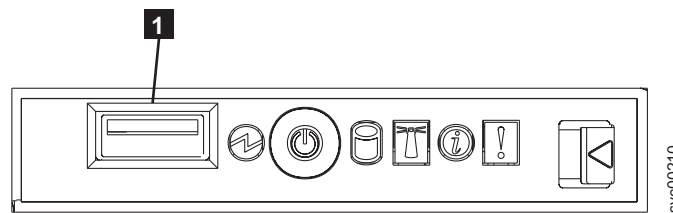
Figure 57. Ports not used on the front panel of the SAN Volume Controller 2145-8F4

1 USB port

SAN Volume Controller 2145-8F2 connectors

The external connectors consist of the power supply and Ethernet, fibre-channel, and serial ports.

Figure 58 on page 76 shows the external connectors on the SAN Volume Controller 2145-8F2 back panel assembly.
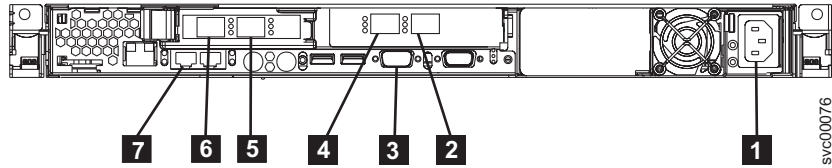
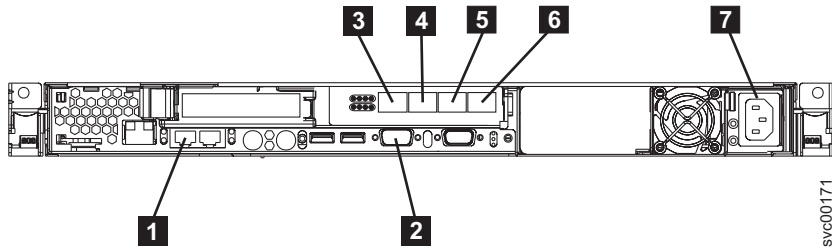*Figure 58. SAN Volume Controller 2145-8F2 external connectors*

1 Power supply

2 Fibre-channel port 4

3 Serial connection

4 Fibre-channel port 3

5 Fibre-channel port 2

6 Fibre-channel port 1

7 Ethernet port 1

Figure 58 shows the type of connector that is 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.
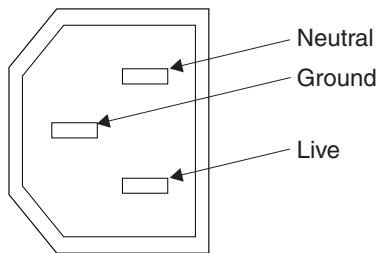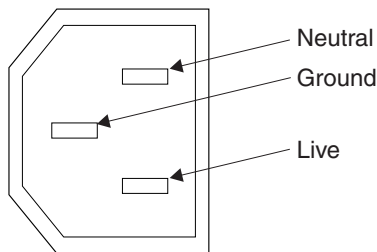

Figure 59. Power connector

SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 fibre-channel port numbers and worldwide port names

The SAN Volume Controller 2145-8F4 and SAN Volume Controller 2145-8F2 fibre-channel ports are identified by their physical port number and by a worldwide port name (WWPN).

Figure 60 provides a view of the rear of the SAN Volume Controller 2145-8F4.
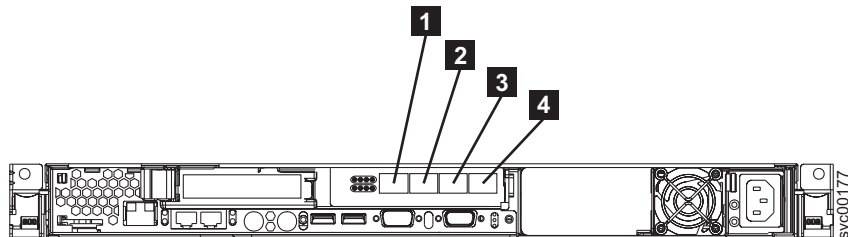
Figure 60. The physical port numbers for the SAN Volume Controller 2145-8F4

Figure 61 provides a view of the rear of the SAN Volume Controller 2145-8F2.
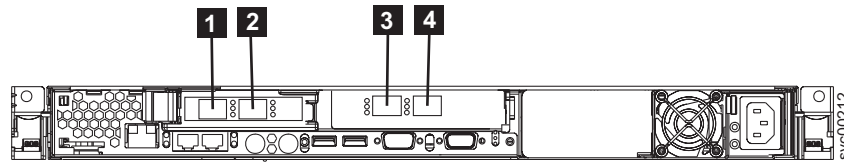
Figure 61. The physical port numbers for the SAN Volume Controller 2145-8F2

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

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 that 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. Optionally, 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 uninterruptible power supply.

4. Install the node.

5. Connect the fibre-channel and Ethernet cables to the node.

6. Connect the node to the uninterruptible power supply.

7. Verify the node.

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

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

Installing the 2145-1U uninterruptible power supply

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

Complete the following steps to install the 2145-1U uninterruptible power supply:

1. Install the support rails for the 2145-1U uninterruptible power supply.

2. Install the 2145-1U uninterruptible power supply in the rack.

3. Install the 2145-1U uninterruptible power supply cable retention bracket.

Installing the support rails for the 2145-1U uninterruptible power supply

You must install the support rails in the rack before installing the 2145-1U uninterruptible power supply.

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 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply. Because of its weight, position the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply:

1. Open the top of the 2145-1U uninterruptible power supply shipping carton. Grip the flaps on either side of the 2145-1U uninterruptible power supply.

2. Lift the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply using four M3 × 6 screws **2** for each bracket, as shown in Figure 62 on page 79.

Figure 62. Installing the support rails for a 2145-1U uninterruptible power supply into the rack

4. Loosen the assembly wing nuts (**1** in Figure 63) on both rail assemblies and adjust the rail size to the depth of your rack.
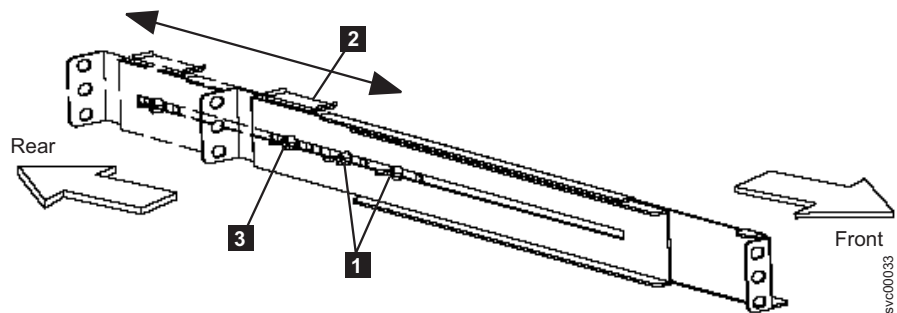
Figure 63. Adjusting the rail depth on the 2145-1U uninterruptible power supply

1 Assembly wing nuts

2 Hold-down bracket

3 Wing nut

5. Position the rear, hold-down bracket (**2** in Figure 63) towards the end of the rail assemblies and tighten the wing nut (**3** in Figure 63).

6. Select the holes in the rail where you want to position the 2145-1U uninterruptible power supply.

   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 64 on page 80) 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.
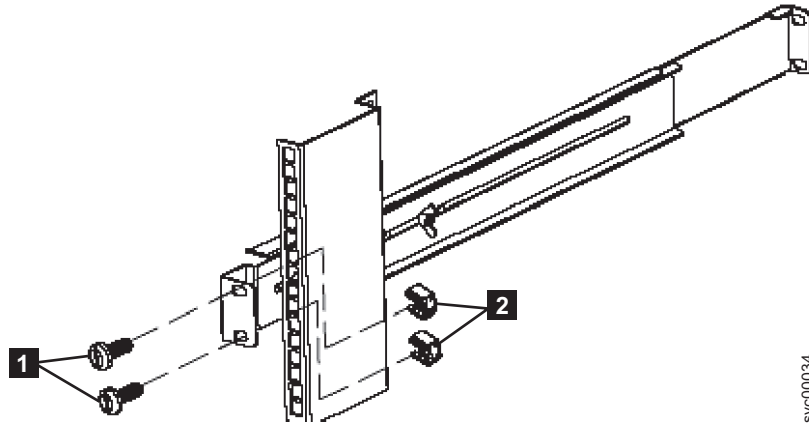
Figure 64. Securing the rear rail on the 2145-1U uninterruptible power supply

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 65).
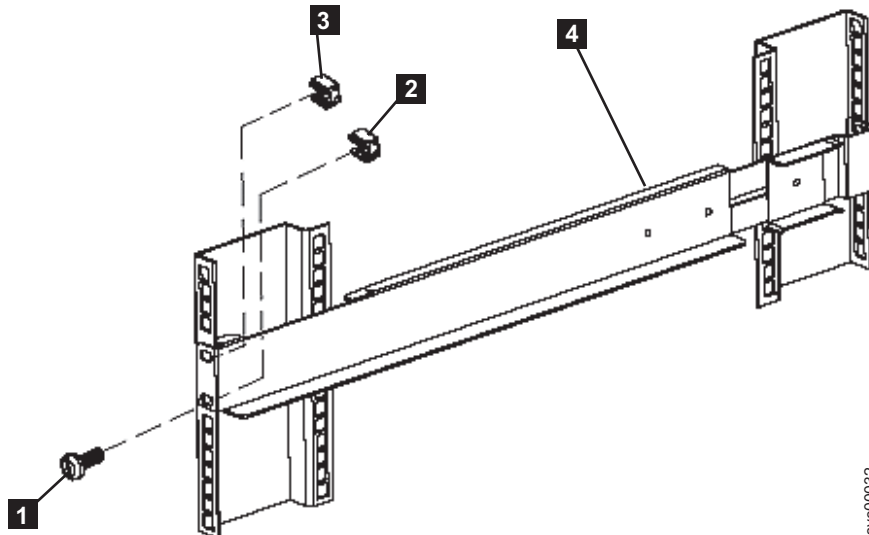
Figure 65. Securing the front rail on the 2145-1U uninterruptible power supply

9. Install a clip nut in the top hole of the rail **3** .
10. Repeat step 7 on page 79 through step 9 for the other rail.
11. Tighten the assembly wing nuts on both rail assemblies.

Installing the 2145-1U uninterruptible power supply in the rack

After you have completed the preparation procedures, you are ready to install the 2145-1U uninterruptible power supply 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 uninterruptible power supply contains its own energy source (sealed, lead-acid batteries). The output receptacles might carry live voltage, even when the uninterruptible power supply is not connected to an ac supply. (11)

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

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

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

Perform the following steps to install the 2145-1U uninterruptible power supply in the rack:

Note: You might have already completed steps 3 on page 82 through 6 on page 83 if you used the *Read Me First* pamphlet, which is included with the 2145-1U uninterruptible power supply.

1. Stand at the front of the rack and place the back of the 2145-1U uninterruptible power supply onto the support rails, and then slide the 2145-1U uninterruptible power supply into the rack.

   Note: The 2145-1U uninterruptible power supply weighs 16 kg (35.3 lb). If you feel unsure about lifting the uninterruptible power supply to its location in the rack, seek assistance or remove the battery to reduce its weight.

2. At the front of the 2145-1U uninterruptible power supply, install the two mounting screws (**1** in Figure 66 on page 82).

Figure 66. Mounting screws for the 2145-1U uninterruptible power supply

3. If you have not already connected the internal battery connector, remove the 2145-1U uninterruptible power supply front panel, as shown in Figure 67.
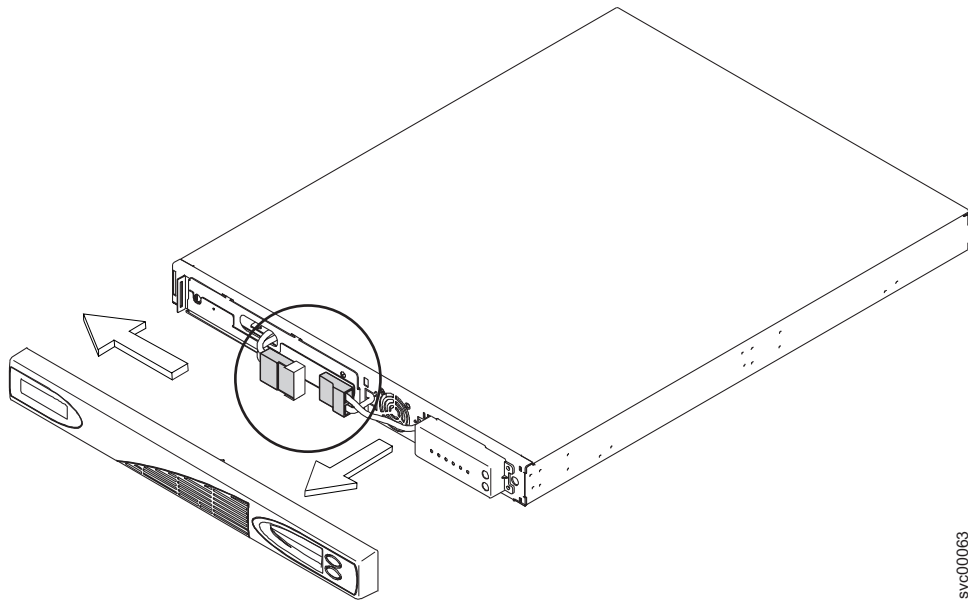
Figure 67. Removing the 2145-1U uninterruptible power supply front panel

4. Remove the protective label from the internal battery connector (shown in Figure 68 on page 83).
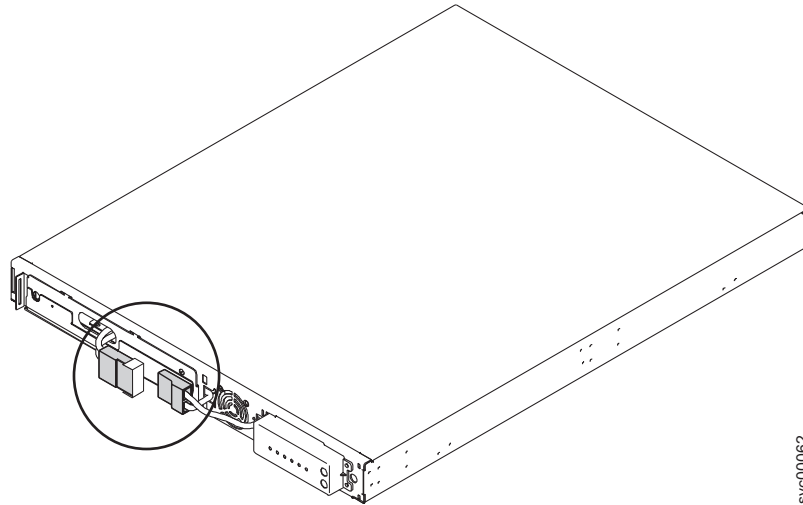
Figure 68. The 2145-1U uninterruptible power supply internal battery connector with protective tape

5. Connect the internal battery connector (shown in Figure 69). 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.
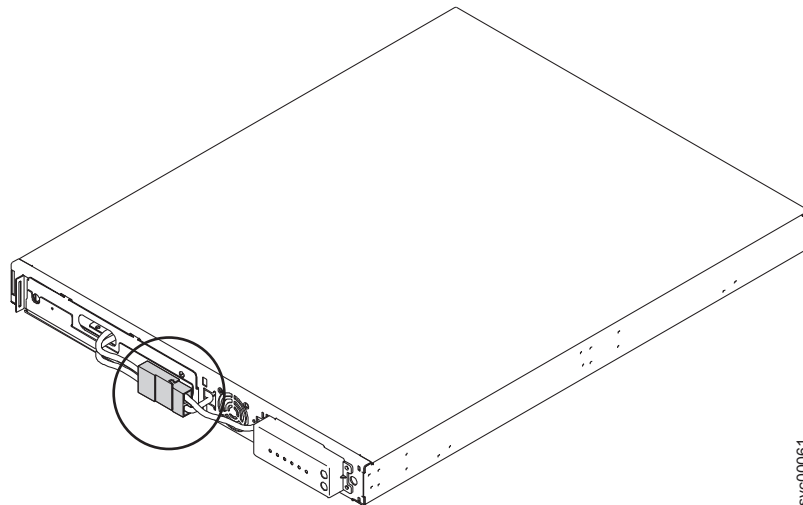
Figure 69. The 2145-1U uninterruptible power supply internal battery connector

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

7. At the back of the 2145-1U uninterruptible power supply, plug the 2145-1U uninterruptible power supply main power connector into the power socket (**1** in Figure 70 on page 84). The 2145-1U uninterruptible power supply is in standby mode, so all indicators are off.

   It is recommended that each 2145-1U uninterruptible power supply for an I/O group is connected to a different power source.
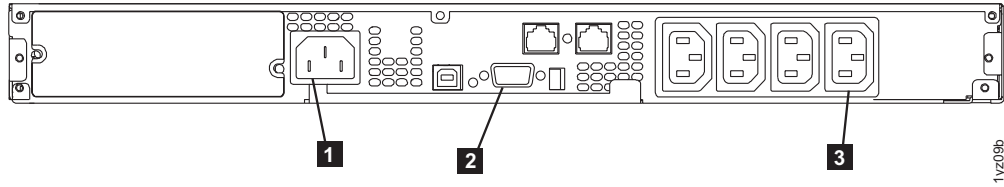
Figure 70. 2145-1U uninterruptible power supply (rear view)

1 Main power connector

2 Communication port

3 Load segment 2 receptacle

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

Notes:

    a. The 2145-1U uninterruptible power supply has an integrated circuit breaker and does not require external protection.

    b. The 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply or the SAN Volume Controller cluster malfunctions.

8. Press and hold the on/off button (**7** in Figure 71) for approximately five seconds. You might need a pointed device, such as a screwdriver, to press the on/off button. The front panel indicators cycle through a startup sequence while the 2145-1U uninterruptible power supply conducts a self-test.
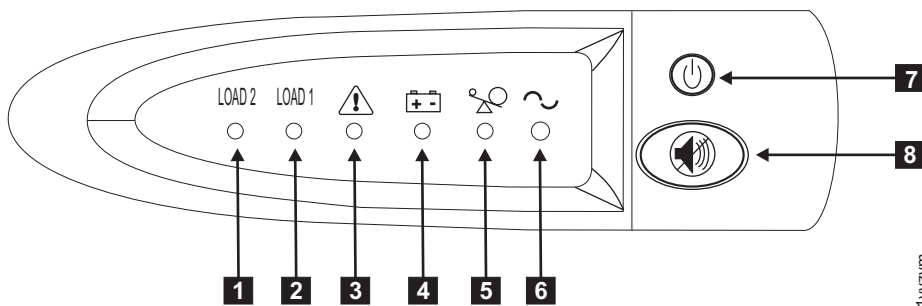
Figure 71. 2145-1U uninterruptible power supply front panel assembly

When the self-test is complete, the power-on indicator **6** and the load indicators (**1** and **2**) illuminate to indicate that power is being supplied by the 2145-1U uninterruptible power supply. The 2145-1U uninterruptible power supply is now in normal mode, and is charging its battery. If the power-on indicator **6** 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 2145-1U uninterruptible power supply, 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 2145-1U uninterruptible power supply and powered on.

9. Repeat all of these steps to install additional 2145-1U uninterruptible power supply units.

Installing the 2145-1U uninterruptible power supply cable retention bracket

The 2145-1U uninterruptible power supply cable retention bracket ensures that the power cable connection between the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply 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 outlet on the rear of the 2145-1U uninterruptible power supply.

2. Remove the bracket and the two screws (shown in Figure 72) from the packaging.
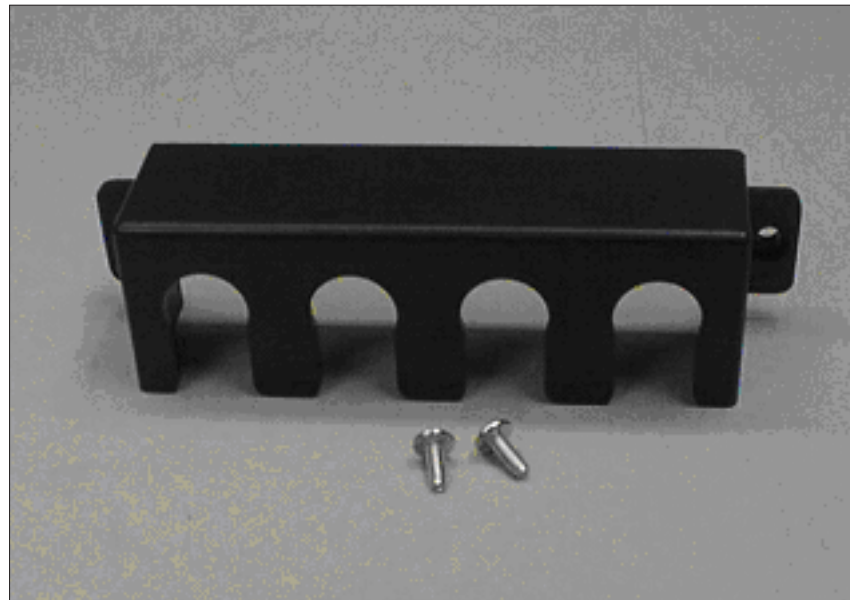
Figure 72. 2145-1U uninterruptible power supply power cable retention bracket hardware

3. Place the bracket over the power outlets on the right rear of the 2145-1U uninterruptible power supply, 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 73 on page 86.
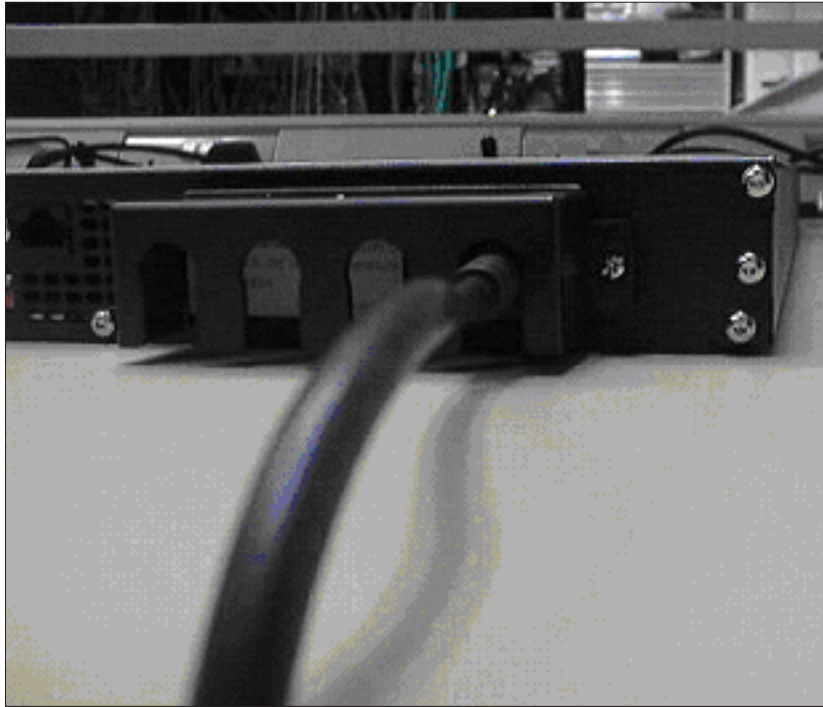
Figure 73. 2145-1U uninterruptible power supply power cable retention bracket

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 2145-8F4 or the SAN Volume Controller 2145-8F2 nodes.

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 uninterruptible power supply.
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 74, and put your thumb against the front of the latch-lock **2** .
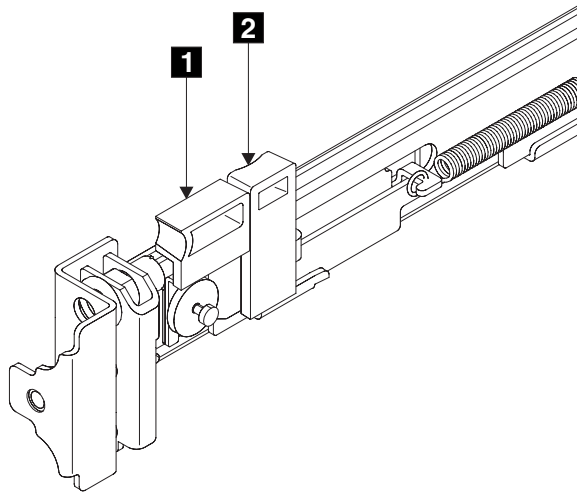
Figure 74. Retracting the latch lock carrier

      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 75). The latch-lock carrier assembly slides against the spring tension.
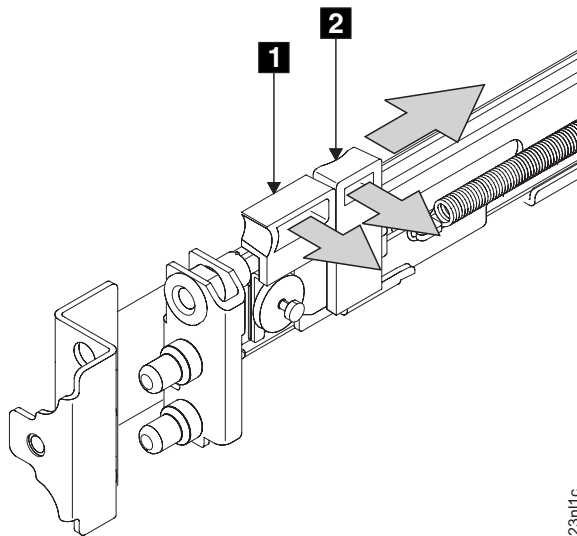
Figure 75. Opening the front latch-lock carrier assembly

      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 76) toward the front of the rail until it stops. The rail is now at its shortest adjustment.
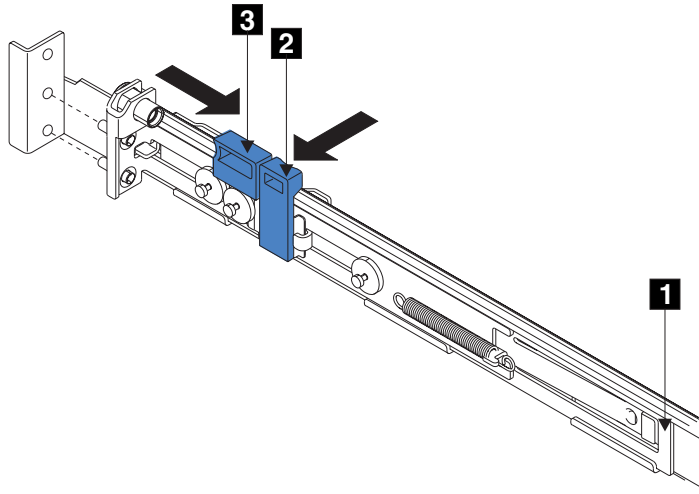
Figure 76. Opening the back latch-lock carrier assembly

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 77 on page 89) with the required EIA marking that is on the rack.
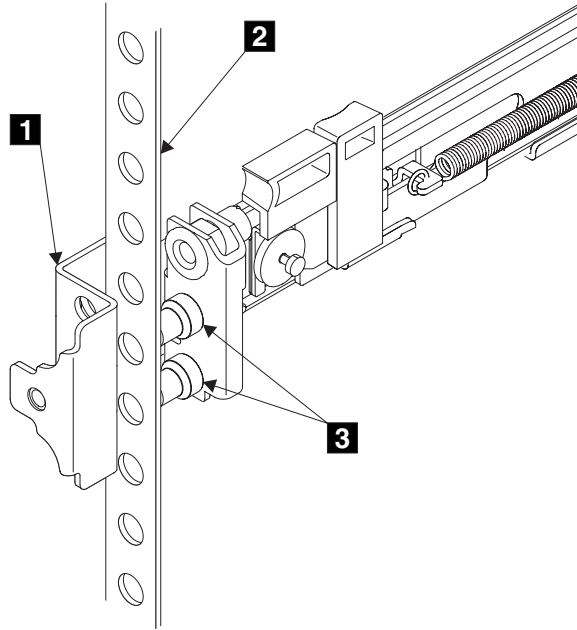
Figure 77. Installing the front end of the rail

  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 78 on page 90) 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.
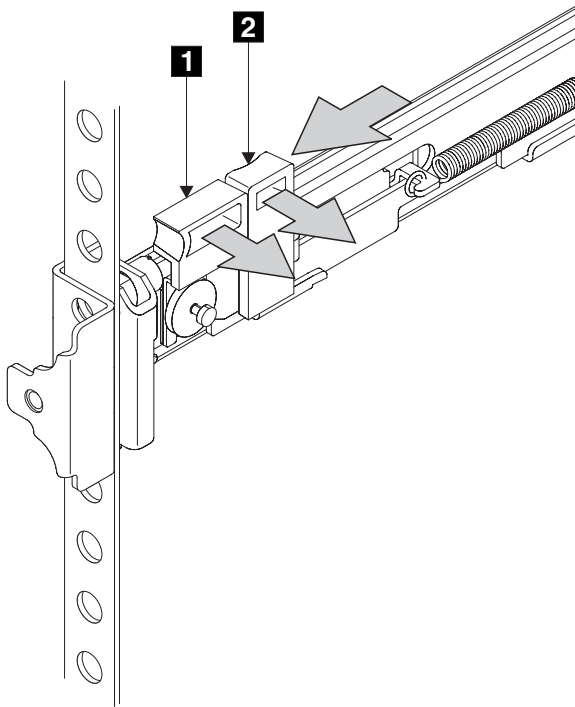
Figure 78. Closing the latch-lock carrier assembly

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 1∪ 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 2145-1U uninterruptible power supply

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

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

Before you begin this task, see the completed user's cable connection table, which is described in the *IBM System Storage SAN Volume Controller: Planning Guide* and was downloaded from http://www.ibm.com/storage/support/2145.

Use the information in this table to identify the 2145-1U uninterruptible power supply unit to which this node 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 2145-1U uninterruptible power supply:

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 79 on page 92.
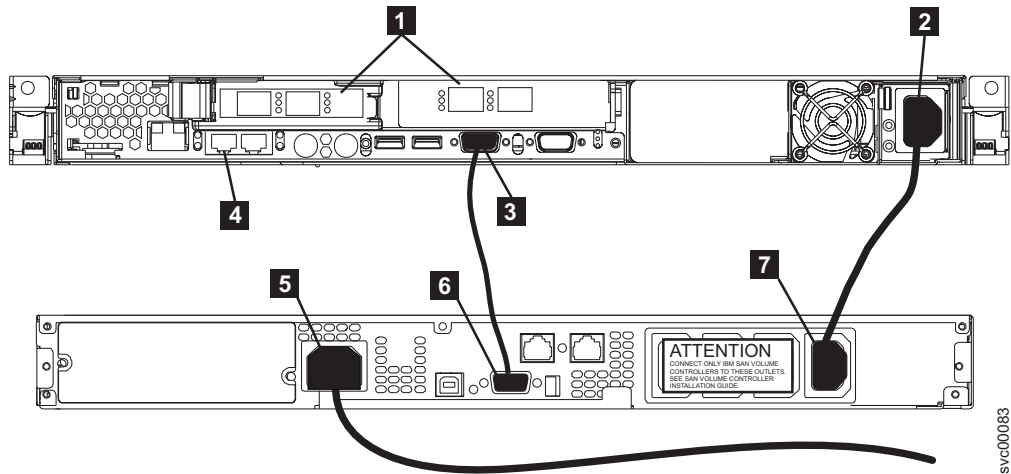
Figure 79. Connecting the SAN Volume Controller 2145-8F2 power cable to the 2145-1U uninterruptible power supply

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 2145-1U uninterruptible power supply.

   DANGER

   > **You have already switched on the 2145-1U uninterruptible power supply. The output sockets of the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply.

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

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.

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 80 provides a view of how to align the cable retention bracket with the cable.

Figure 80. 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 81 provides a view of the cable retention bracket that is attached to the SAN Volume Controller 2145-8F4.
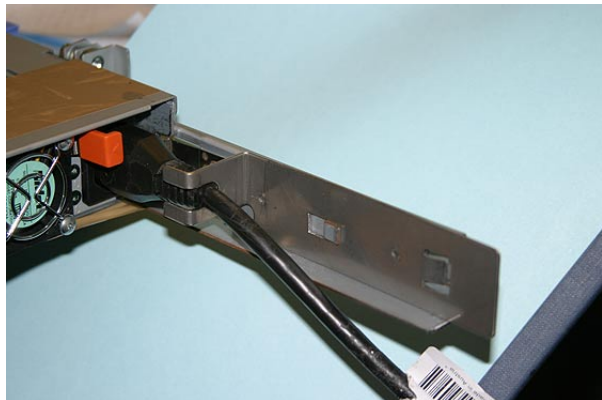
Figure 81. The SAN Volume Controller 2145-8F4 with cable retention bracket attached

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 82 on page 94 or Figure 83 on page 94.

   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.
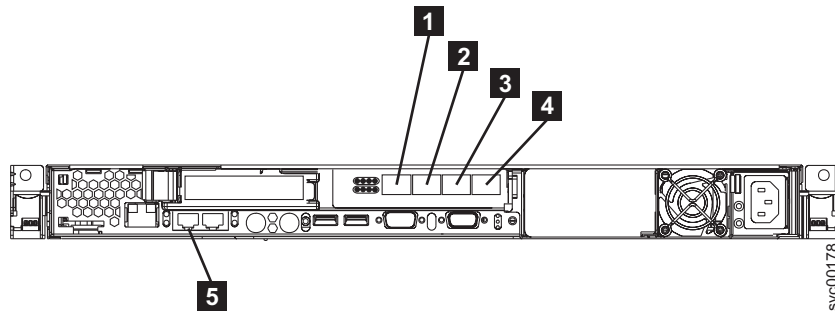
Figure 82. Connectors at the back of the SAN Volume Controller 2145-8F4

1 Fibre-channel port 1

2 Fibre-channel port 2

3 Fibre-channel port 3

4 Fibre-channel port 4
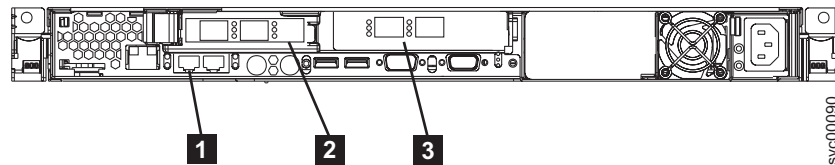
5 Ethernet port 1

Figure 83. 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 93 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`, `Recovering`, or the `Cluster:` message 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` or `Recovering` message. If the `Charging` or `Recovering` message is displayed, you will also see a progress bar on the second line. Battery charging can take up to two 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, the `Cluster:` message 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 84 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.

No button pressed (border only)

Up button pressed

Left and Right button pressed
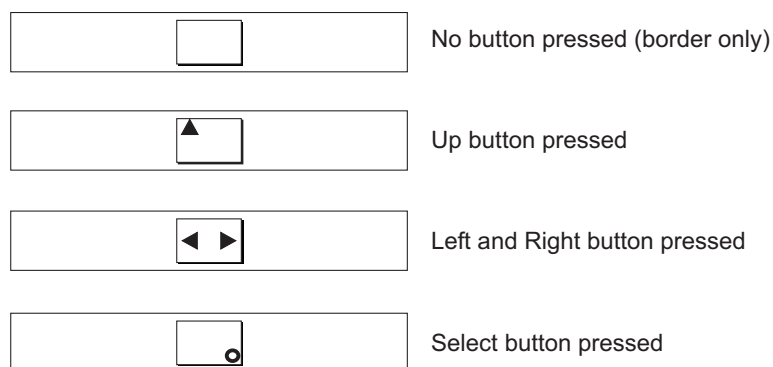
Select button pressed

Figure 84. Front panel display when push buttons are pressed

4. If the `Charging` or `Recovering` message is displayed on the front panel display, press the select button to switch to the menu. The menu continues to be displayed while you press the buttons on the front panel. If you do not press

any buttons within 60 seconds, the menu changes to display the charging progress. You can switch the front panel display to the menu at any time by pressing the select button again.

5. Press and release the up 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 85 shows how the node number is displayed on the front panel. If the node number is not the same, contact the IBM Support Center.

```
Node:
xxxxxx
```

Figure 85. 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 86 shows the message `Inactive`. This message indicates that, although an Ethernet connection is available, it cannot yet be used.

```
Ethernet:
Inactive
```

Figure 86. 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 node, go to step 16. If you are installing a SAN Volume Controller 2145-8F4 node, 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 ensure that the port is active. Go to step 18 on page 97

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.

If the battery needed to be charged, the `Charging` or `Recovering` message is replaced by the `Cluster:` message when the battery is fully charged. The progress bar no longer displays. The installation of the SAN Volume Controller hardware is now complete. No software installation is required. Continue with the instructions in the *IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide* to create, if necessary, a new SAN Volume Controller cluster and to add the nodes into a SAN Volume Controller cluster.

Installing the hardware master console

If your system includes the master console hardware product option, 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, 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 available slot, connect the keyboard, mouse, monitor, and Ethernet cables at the back of the master console before you install 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. 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.

SAN Volume Controller 2145-4F2 environment requirements

Before the SAN Volume Controller 2145-4F2 is installed, the physical environment must meet certain requirements. This includes verifying that adequate space is available and that requirements for power and environmental conditions are met.

Input-voltage requirements

Ensure that your environment meets the following voltage requirements.

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

Power requirements for each node

Ensure that your environment meets the following power requirements.

The power that is required depends on the node type, the uninterruptible power supply type, and whether the redundant ac power feature is used.

Components	Power requirements
SAN Volume Controller 2145-4F2 + 2145-1U uninterruptible power supply	420 W
One SAN Volume Controller 2145-4F2 + one 2145 uninterruptible power supply	760 W
Two SAN Volume Controller 2145-4F2 nodes + one 2145 uninterruptible power supply	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 2145-1U uninterruptible power supply has an integrated circuit breaker and does not require additional protection.
- Each 2145 uninterruptible power supply is connected to a separate branch circuit, which includes a UL-listed 15 A circuit breaker.

Environment requirements without redundant ac power

Ensure that your environment falls within the following ranges if you are not using 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

Ensure that your environment falls within the following ranges if you are using 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 tables list the physical characteristics of the SAN Volume Controller 2145-4F2 node.

Dimensions and weight

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

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

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

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

The node dissipates the following maximum heat output.

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

SAN Volume Controller 2145-4F2 controls and indicators

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

Figure 87 shows the controls and indicators on the front panel of the SAN Volume Controller 2145-4F2.

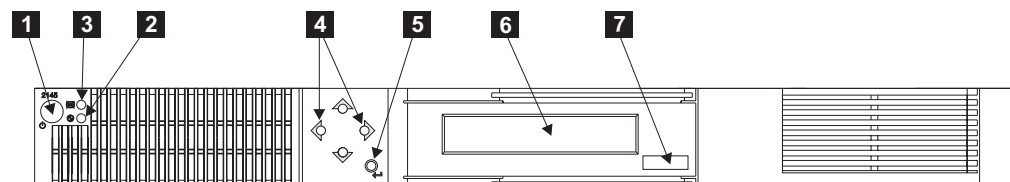### SAN Volume Controller 2145-4F2 controls and indicators

Figure 87. SAN Volume Controller 2145-4F2 front panel assembly

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 turns 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 "MAP 5350: Powering off a SAN Volume Controller node".

Note: When the SAN Volume Controller is operational and you press and immediately release the power button, 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 you press the power button but do not release it, an immediate power off occurs without the SAN Volume Controller control data being written to disk. Service actions are then required to make the SAN Volume Controller operational again. Therefore, during a power-off operation, do not press and hold the power button for more than two seconds.

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 a 2145 uninterruptible power supply, the 2145 uninterruptible power supply also powers off. To power on the SAN Volume Controller, you must first power on the 2145 uninterruptible power supply to which it is connected.

Note: The 2145-1U uninterruptible power supply 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 green power LED has the following properties:

Off One or more of the following are true:
  - No power is present at the power supply input
  - The power supply has failed
  - The LED has failed

On The SAN Volume Controller 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.

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

The front panel displays configuration and service information about the SAN Volume Controller node 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
- Validate WWNN?
- Error codes

Node identification label

The node identification label on the front panel displays a six-digit node identification number. Sometimes this number is called panel name or front panel id.

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 rear panel indicators consist of LEDs that indicate the status of the power supply and Ethernet operation. They can also indicate system board errors.

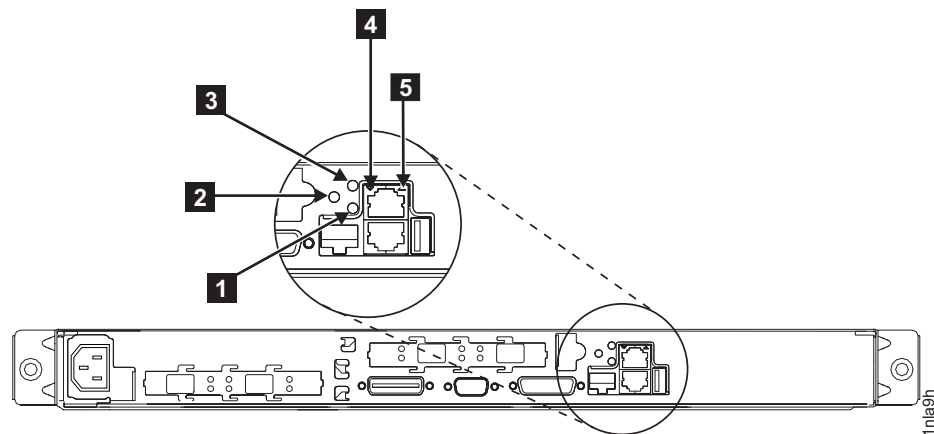Figure 88 shows the rear panel indicators on the SAN Volume Controller 2145-4F2 back panel assembly.

Figure 88. SAN Volume Controller 2145-4F2 rear panel indicators

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 consist of the power supply and the fibre-channel, Ethernet, and serial ports.

Figure 89 shows the external connectors on the SAN Volume Controller 2145-4F2 back panel assembly.
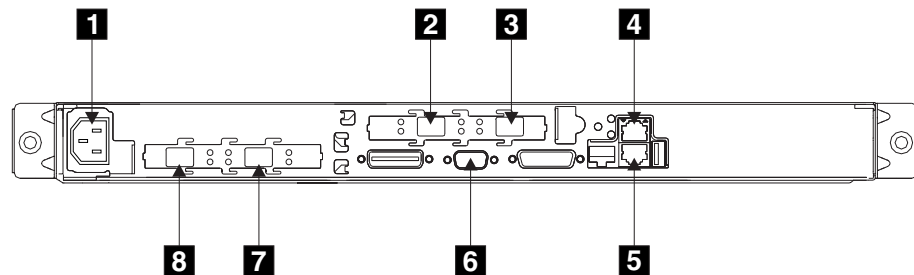

Figure 89. SAN Volume Controller 2145-4F2 external connectors

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

Figure 90 on page 106 the type of connector that is located on the power supply assembly. The connector enables you to connect the SAN Volume Controller

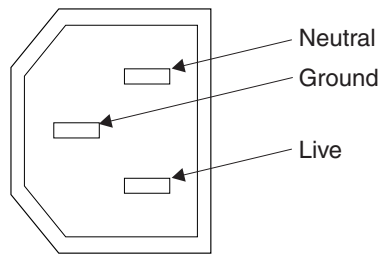2145-4F2 to the power source from the uninterruptible power supply.

Figure 90. Power connector

2145 uninterruptible power supply

The 2145 uninterruptible power supply 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 uninterruptible power supply or the 2145-1U uninterruptible power supply. For information about the 2145-1U uninterruptible power supply, see "2145-1U uninterruptible power supply" on page 23.

2145 uninterruptible power supply configuration

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

A 2145 uninterruptible power supply 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 uninterruptible power supply guidelines for the SAN Volume Controller 2145-4F2:

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

2145 uninterruptible power supply operation

If input power is disconnected from a 2145 uninterruptible power supply, a fully-operational SAN Volume Controller 2145-4F2 node that is connected to that 2145 uninterruptible power supply 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 uninterruptible power supply. In the event of a delay in the completion of the power-down sequence, the

2145 uninterruptible power supply output power is removed five minutes after the power is disconnected from the 2145 uninterruptible power supply. Because this operation is controlled by the SAN Volume Controller 2145-4F2 node, a 2145 uninterruptible power supply 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 an uninterruptible power supply without first shutting down the SAN Volume Controller 2145-4F2 node that it supports. Data integrity can be compromised by pushing the 2145 uninterruptible power supply power-off button when the node is still operating. However, in the case of an emergency, you can manually shut down the uninterruptible power supply by pushing the 2145 uninterruptible power supply power-off button when the node is still operating. Service actions must then be performed before the node can resume normal operations. If multiple uninterruptible power supply units 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 uninterruptible power supply units in the same I/O group, you must connect these nodes to different 2145 uninterruptible power supply units. This configuration ensures that cache and cluster state information is protected in the event of a failure of either the uninterruptible power supply or the mainline power source.

2145 uninterruptible power supply environment

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

Uninterruptible power supply specifications

The following tables describe the physical characteristics of the 2145 uninterruptible power supply.

Attention: Ensure that you comply with the following requirements for the 2145 uninterruptible power supply units:

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

2145 uninterruptible power supply dimensions and weight

Ensure that space is available in a rack that is capable of supporting the 2145 uninterruptible power supply.

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

The 2145 uninterruptible power supply unit produces the following approximate heat output.

Model	Heat output during normal operation	Heat output during battery operation
2145 uninterruptible power supply 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 uninterruptible power supply

All controls and indicators for the 2145 uninterruptible power supply are located on the front panel assembly.
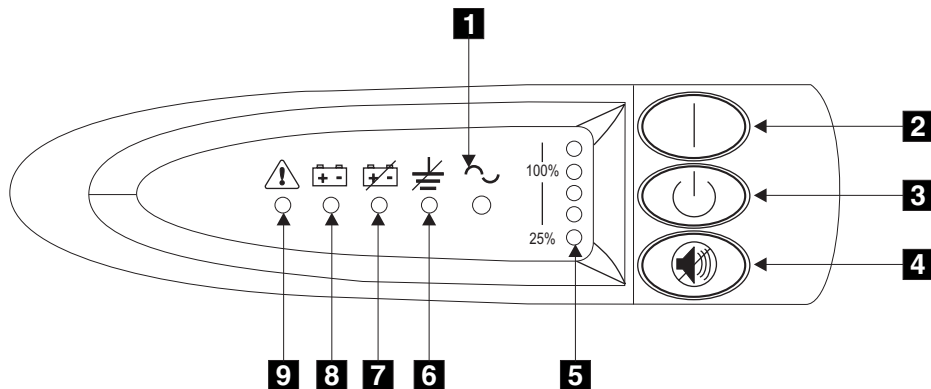
Figure 91. 2145 uninterruptible power supply front panel assembly

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 and is located on the front panel.

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

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

When the mode indicator is steady red, the 2145 uninterruptible power supply is in bypass mode because of one of the following conditions:
- The 2145 uninterruptible power supply has overheated
- The 2145 uninterruptible power supply has an overload condition of 103% through 110% for 30 seconds
- The 2145 uninterruptible power supply detects a fault in the battery or in the 2145 uninterruptible power supply 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 uninterruptible power supply, 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 uninterruptible power supply and powered on.

On button
The on button turns on the main power to the 2145 uninterruptible power supply.

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 uninterruptible power supply.

Off button
The off button turns off the main power to the 2145 uninterruptible power supply.

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 uninterruptible power supply 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 uninterruptible power supply remains in standby mode until you disconnect the 2145 uninterruptible power supply from the main power outlet.

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 and the 2145-1U uninterruptible power supply.

Load-level indicators
The load-level indicators show the percentage of the 2145 uninterruptible power supply 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 uninterruptible power
supply.

Site wiring fault indicator

The site wiring fault indicator on the 2145 uninterruptible power supply 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
uninterruptible power supply.

Battery service indicator

The battery service indicator is located on the front panel of the 2145
uninterruptible power supply and shows that the charge in the battery has become
low while the 2145 uninterruptible power supply 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
uninterruptible power supply shuts down, it automatically restarts when the main
power returns.

Battery mode indicator

The battery mode indicator shows that the 2145 uninterruptible power supply is
operating on batteries.

The battery mode indicator lights up when the main power source fails and the
2145 uninterruptible power supply is running on battery power. The alarm beeps
once every five seconds. When main power returns, the 2145 uninterruptible
power supply 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 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 uninterruptible power supply is too high or there has been
a momentary output overload.

Hardware for the 2145 uninterruptible power supply

The hardware for the 2145 uninterruptible power supply consists of connectors,
circuit breakers, and the power supply.

Locations for the 2145 uninterruptible power supply connectors and circuit breakers
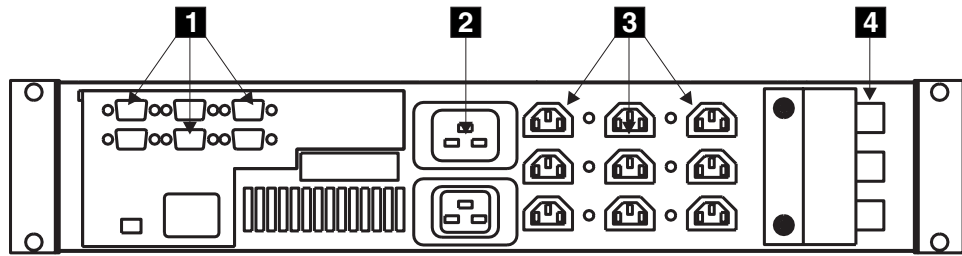
Figure 92. 2145 uninterruptible power supply connectors and circuit breakers

1 Signal cable connectors

2 Main power connector

3 Output connectors

4 Circuit breakers

2145 uninterruptible power supply part assembly

Figure 93 shows the different parts that make up the 2145 uninterruptible power supply.
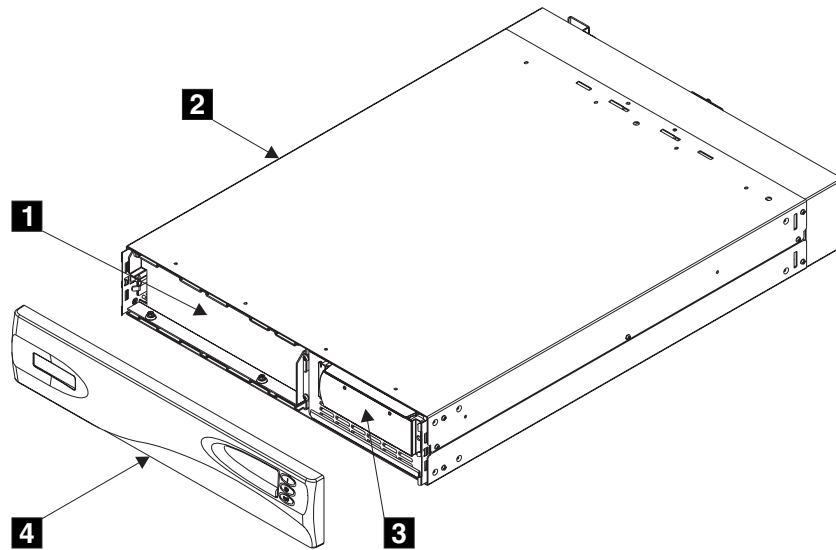

Figure 93. Exploded view of the 2145 uninterruptible power supply hardware

1 Battery assembly

2 Frame assembly

3 Electronics assembly

4 Front panel assembly

2145 uninterruptible power supply connector

Figure 94 on page 112 shows the power connector for the 2145 uninterruptible power supply.
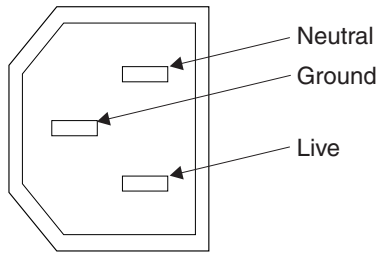
Figure 94. Power connector

Power cables for the 2145 uninterruptible power supply

You must follow the power requirements of your country or region to choose the appropriate power cable for the 2145 uninterruptible power supply.

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

Country or region	Length	Connection type (attached plug designed for 200 - 240 V ac input)	Part number
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
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 that 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. Optionally, 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 uninterruptible power supply.
4. Install the node.
5. Connect the fibre-channel and Ethernet cables to the node.
6. Connect the node to the uninterruptible power supply.
7. Verify the node.
8. Install and verify the master console, unless it is already installed. Optionally, this step can be performed first.

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

Installing the 2145-1U uninterruptible power supply

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

Complete the following steps to install the 2145-1U uninterruptible power supply:

1. Install the support rails for the 2145-1U uninterruptible power supply.
2. Install the 2145-1U uninterruptible power supply in the rack.
3. Install the 2145-1U uninterruptible power supply cable retention bracket.

Installing the support rails for the 2145-1U uninterruptible power supply

You must install the support rails in the rack before installing the 2145-1U uninterruptible power supply.

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 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply. Because of its weight, position the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply:

1. Open the top of the 2145-1U uninterruptible power supply shipping carton. Grip the flaps on either side of the 2145-1U uninterruptible power supply.
2. Lift the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply using four M3 × 6 screws **2** for each bracket, as shown in Figure 62 on page 79.

Figure 95. Installing the support rails for a 2145-1U uninterruptible power supply into the rack

4. Loosen the assembly wing nuts (**1** in Figure 63 on page 79) on both rail assemblies and adjust the rail size to the depth of your rack.
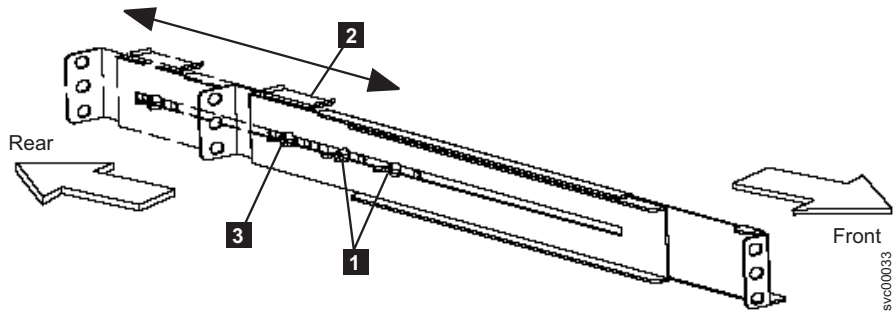
Figure 96. Adjusting the rail depth on the 2145-1U uninterruptible power supply

1 Assembly wing nuts

2 Hold-down bracket

3 Wing nut

5. Position the rear, hold-down bracket (**2** in Figure 63 on page 79) towards the end of the rail assemblies and tighten the wing nut (**3** in Figure 63 on page 79).

6. Select the holes in the rail where you want to position the 2145-1U uninterruptible power supply.

   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 64 on page 80) 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.
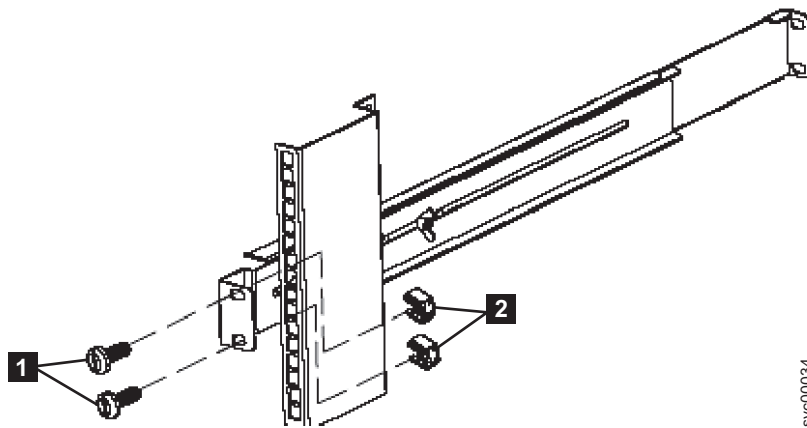
Figure 97. Securing the rear rail on the 2145-1U uninterruptible power supply

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 65 on page 80).
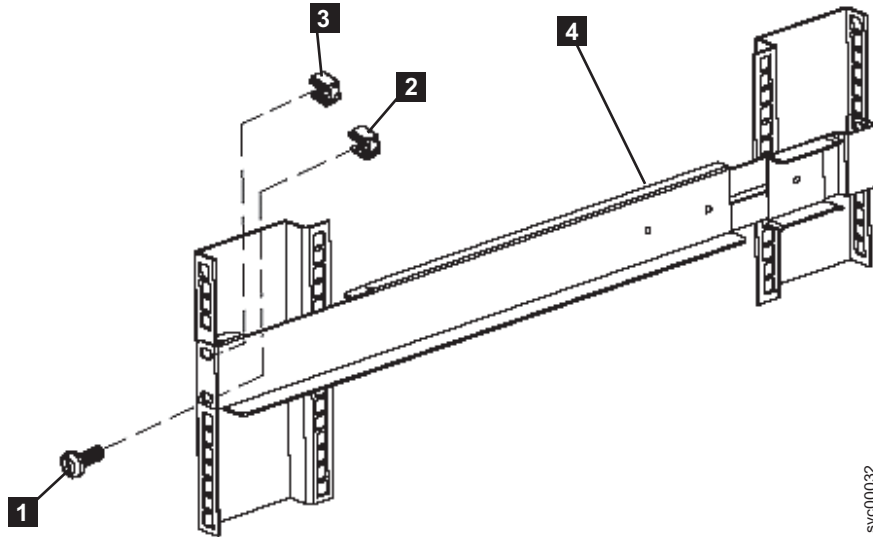
Figure 98. Securing the front rail on the 2145-1U uninterruptible power supply

9. Install a clip nut in the top hole of the rail **3** .
10. Repeat step 7 on page 79 through step 9 on page 80 for the other rail.
11. Tighten the assembly wing nuts on both rail assemblies.

Installing the 2145-1U uninterruptible power supply in the rack

After you have completed the preparation procedures, you are ready to install the 2145-1U uninterruptible power supply 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 uninterruptible power supply contains its own energy source (sealed, lead-acid batteries). The output receptacles might carry live voltage, even when the uninterruptible power supply is not connected to an ac supply. (11)

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

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

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

Perform the following steps to install the 2145-1U uninterruptible power supply in the rack:

Note: You might have already completed steps 3 on page 82 through 6 on page 83 if you used the *Read Me First* pamphlet, which is included with the 2145-1U uninterruptible power supply.

1. Stand at the front of the rack and place the back of the 2145-1U uninterruptible power supply onto the support rails, and then slide the 2145-1U uninterruptible power supply into the rack.

   Note: The 2145-1U uninterruptible power supply weighs 16 kg (35.3 lb). If you feel unsure about lifting the uninterruptible power supply to its location in the rack, seek assistance or remove the battery to reduce its weight.

2. At the front of the 2145-1U uninterruptible power supply, install the two mounting screws (**1** in Figure 66 on page 82).

Figure 99. Mounting screws for the 2145-1U uninterruptible power supply

3. If you have not already connected the internal battery connector, remove the 2145-1U uninterruptible power supply front panel, as shown in Figure 67 on page 82.
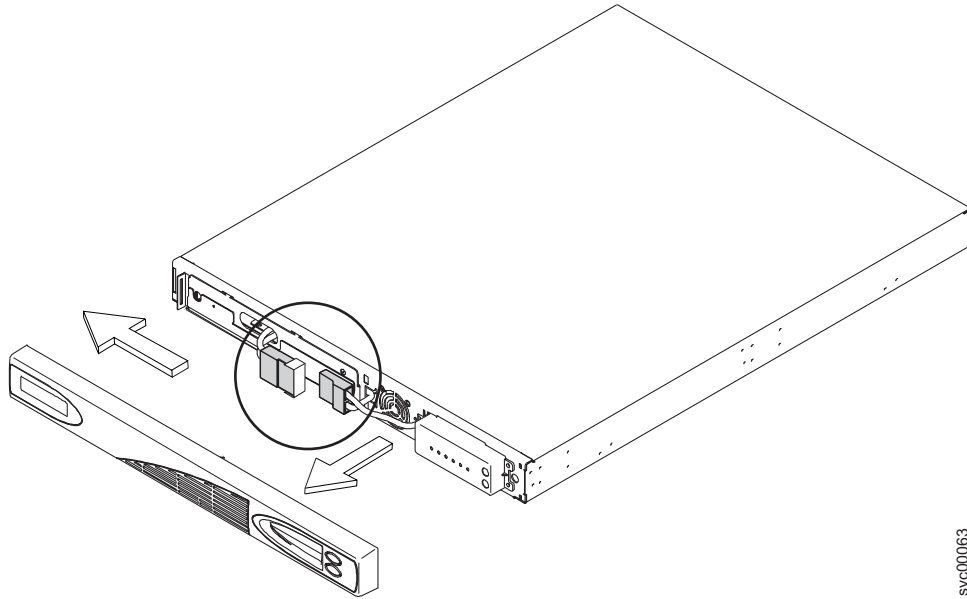
Figure 100. Removing the 2145-1U uninterruptible power supply front panel

4. Remove the protective label from the internal battery connector (shown in Figure 68 on page 83).
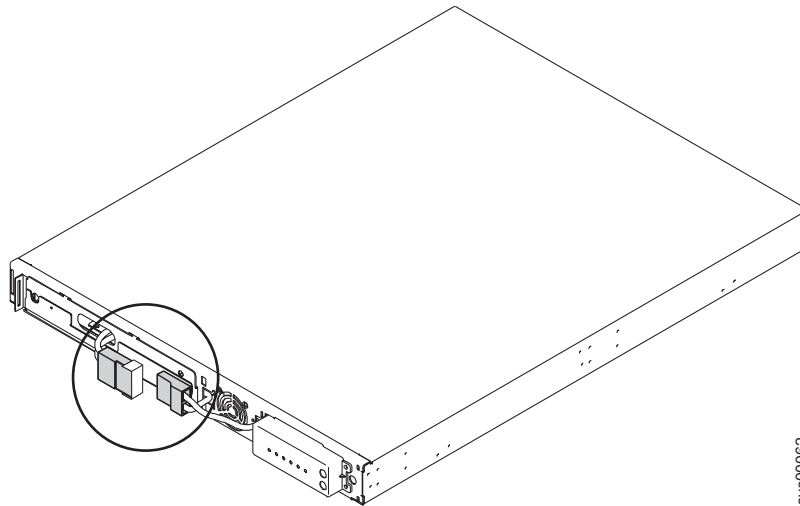
Figure 101. The 2145-1U uninterruptible power supply internal battery connector with protective tape

5. Connect the internal battery connector (shown in Figure 69 on page 83). 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.
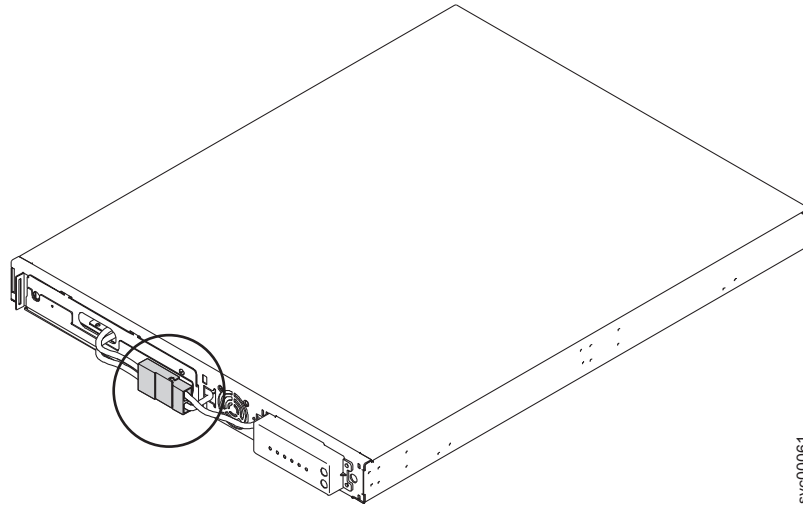
Figure 102. The 2145-1U uninterruptible power supply internal battery connector

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

7. At the back of the 2145-1U uninterruptible power supply, plug the 2145-1U uninterruptible power supply main power connector into the power socket (**1** in Figure 70 on page 84). The 2145-1U uninterruptible power supply is in standby mode, so all indicators are off.

It is recommended that each 2145-1U uninterruptible power supply for an I/O group is connected to a different power source.
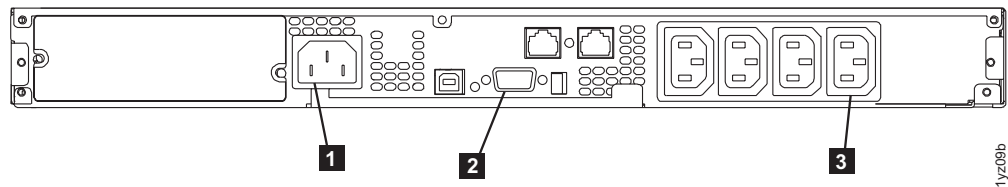
Figure 103. 2145-1U uninterruptible power supply (rear view)

1 Main power connector

2 Communication port

3 Load segment 2 receptacle

Attention: Ensure that you comply with the following requirements:

- The voltage supplied to the 2145-1U uninterruptible power supply must be 200 – 240 V single phase.
- The frequency supplied must be 50 or 60 Hz.

Notes:

a. The 2145-1U uninterruptible power supply has an integrated circuit breaker and does not require external protection.

b. The 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply or the SAN Volume Controller cluster malfunctions.

8. Press and hold the on/off button (**7** in Figure 71 on page 84) for approximately five seconds. You might need a pointed device, such as a screwdriver, to press the on/off button. The front panel indicators cycle through a startup sequence while the 2145-1U uninterruptible power supply conducts a self-test.
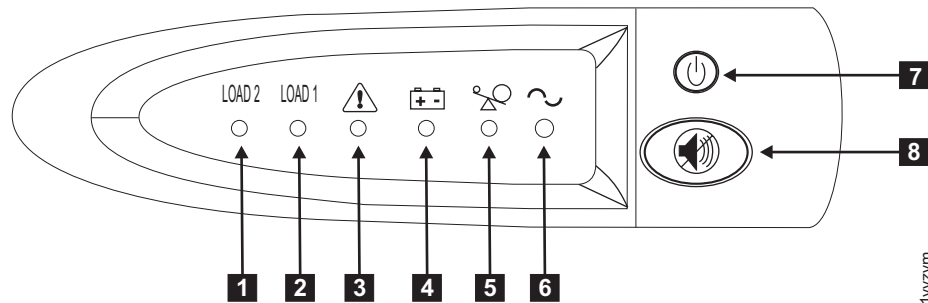
Figure 104. 2145-1U uninterruptible power supply front panel assembly

When the self-test is complete, the power-on indicator **6** and the load indicators (**1** and **2**) illuminate to indicate that power is being supplied by the 2145-1U uninterruptible power supply. The 2145-1U uninterruptible power supply is now in normal mode, and is charging its battery. If the power-on indicator **6** 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 2145-1U uninterruptible power supply, 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 2145-1U uninterruptible power supply and powered on.

9. Repeat all of these steps to install additional 2145-1U uninterruptible power supply units.

Installing the 2145 uninterruptible power supply

Before you can use the SAN Volume Controller 2145-4F2, you need to install the uninterruptible power supply.

The SAN Volume Controller 2145-4F2 node can operate with either the 2145 uninterruptible power supply or the 2145-1U uninterruptible power supply. For more information about installing the 2145-1U uninterruptible power supply, see "Installing the 2145-1U uninterruptible power supply" on page 78 and then "Connecting the SAN Volume Controller 2145-4F2 to the 2145-1U uninterruptible power supply" on page 133.

Complete the following steps to install the 2145 uninterruptible power supply:
1. Install the support rails for the 2145 uninterruptible power supply.
2. Install the 2145 uninterruptible power supply into the rack.
3. Connect the 2145 uninterruptible power supply battery.
4. Connect the power cables to the 2145 uninterruptible power supply.

Installing the support rails for a 2145 uninterruptible power supply

You must install the support rails in the rack before installing the 2145 uninterruptible power supply.

Before you install the support rails, determine where the 2145 uninterruptible power supply units 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 uninterruptible power supply.
- 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 uninterruptible power supply. Always install the 2145 uninterruptible power supply into the lowest available position in the rack. The only device that can be beneath a 2145 uninterruptible power supply is another uninterruptible power supply. 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 uninterruptible power supply with available spare capacity. Therefore, the SAN Volume Controller 2145-4F2 might be delivered without a 2145 uninterruptible power supply.

Perform the following steps for each rail:

1. Attach nut clips **4** to the rack (see Figure 105 on page 122). These nut clips must align with the second and fourth holes of the support rail flange.
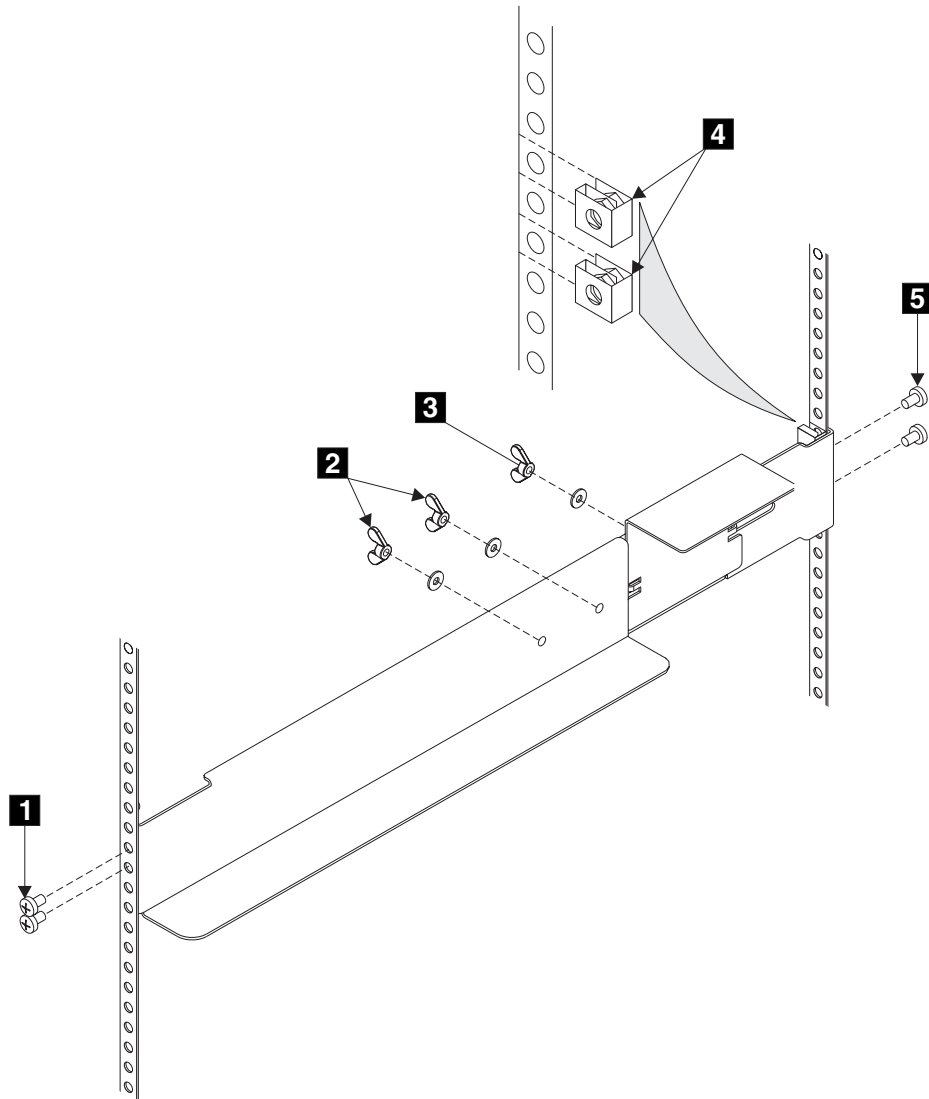
Figure 105. Installing support rails for a 2145 uninterruptible power supply into the rack

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 uninterruptible power supply in the rack

After you have completed the preparation procedures, you can install the 2145 uninterruptible power supply in the rack.

You must complete the following prerequisites before you install the 2145 uninterruptible power supply in the rack:

1. Complete the preinstallation procedures.
2. Install the support rails for the 2145 uninterruptible power supply.
3. Prepare your 2145 uninterruptible power supply 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 uninterruptible power supply contains its own energy source (sealed, lead-acid batteries). The output receptacles might carry live voltage, even when the uninterruptible power supply is not connected to an ac supply. (11)

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

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

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

The 2145 uninterruptible power supply weighs 39 kg (86 lb) with the electronics assembly and the battery assembly installed:
- **Do not attempt to lift the 2145 uninterruptible power supply by yourself. Ask another service representative for assistance.**
- **Remove the battery assembly from the 2145 uninterruptible power supply before removing the 2145 uninterruptible power supply from the shipping carton.**
- **Do not attempt to install the 2145 uninterruptible power supply into the rack unless the electronics assembly and the battery assembly have been removed.**

Perform the following steps to install the 2145 uninterruptible power supply in the rack:

1. Before you remove the 2145 uninterruptible power supply from the shipping carton, you must reduce its weight by removing the battery assembly. Perform the following steps to remove the 2145 uninterruptible power supply battery assembly:

    a. Open the top of the 2145 uninterruptible power supply shipping carton. With the assistance of another service representative, grip the flaps on either side of the 2145 uninterruptible power supply, as shown in Figure 106.

Figure 106. Opening the top of the 2145 uninterruptible power supply shipping carton

    b. Slide the 2145 uninterruptible power supply to the end of the carton and rest its front edge on the edge of the carton, as shown in Figure 107.

Figure 107. Sliding the 2145 uninterruptible power supply 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 108. Next, remove the battery retaining bracket **3** .
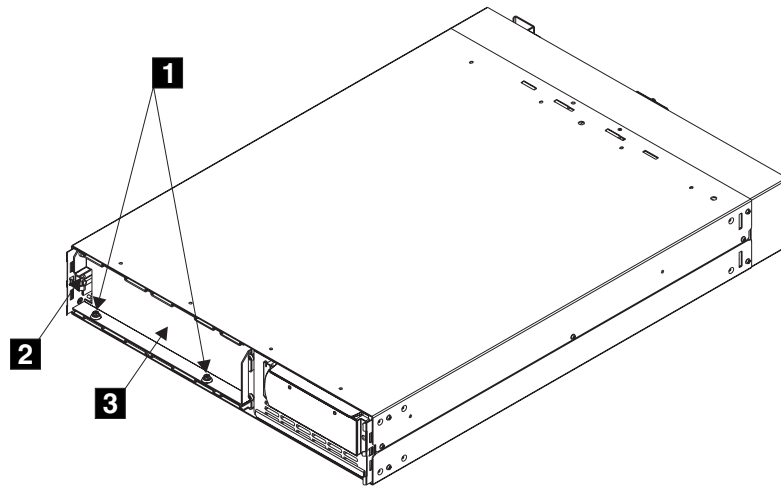
Figure 108. Fastening the battery retaining bracket

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 uninterruptible power supply and place to one side.

Note: The front cover for the 2145 uninterruptible power supply 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 uninterruptible power supply clear of the shipping carton and place it on a flat, stable surface.

3. Remove the two screws **1** (shown in Figure 109 on page 126).

4. Pull the electronics assembly **2** out of the 2145 uninterruptible power supply, and put it to one side.
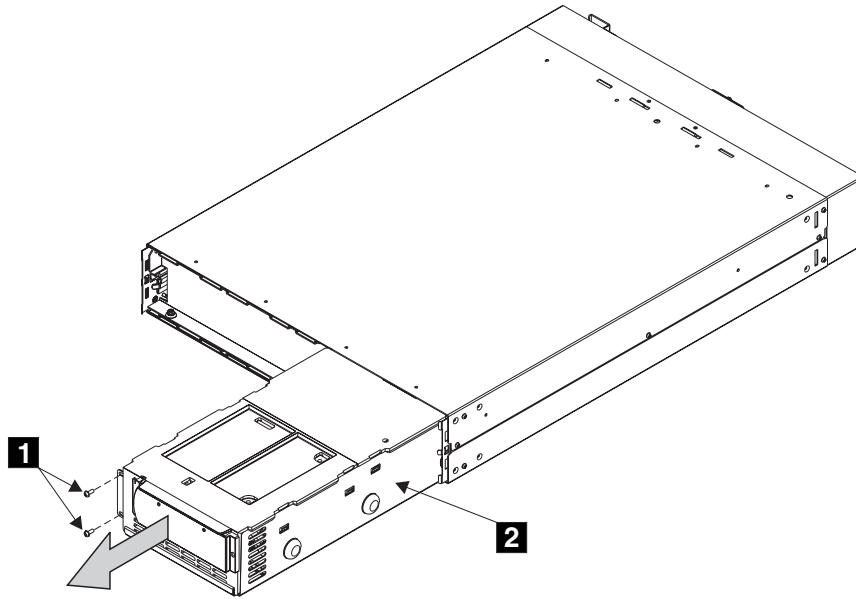
Figure 109. Removing the 2145 uninterruptible power supply electronics assembly

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 uninterruptible power supply onto the support rails and then slide it into the rack.

6. Install the front flathead screws (**1** in Figure 110 on page 127).
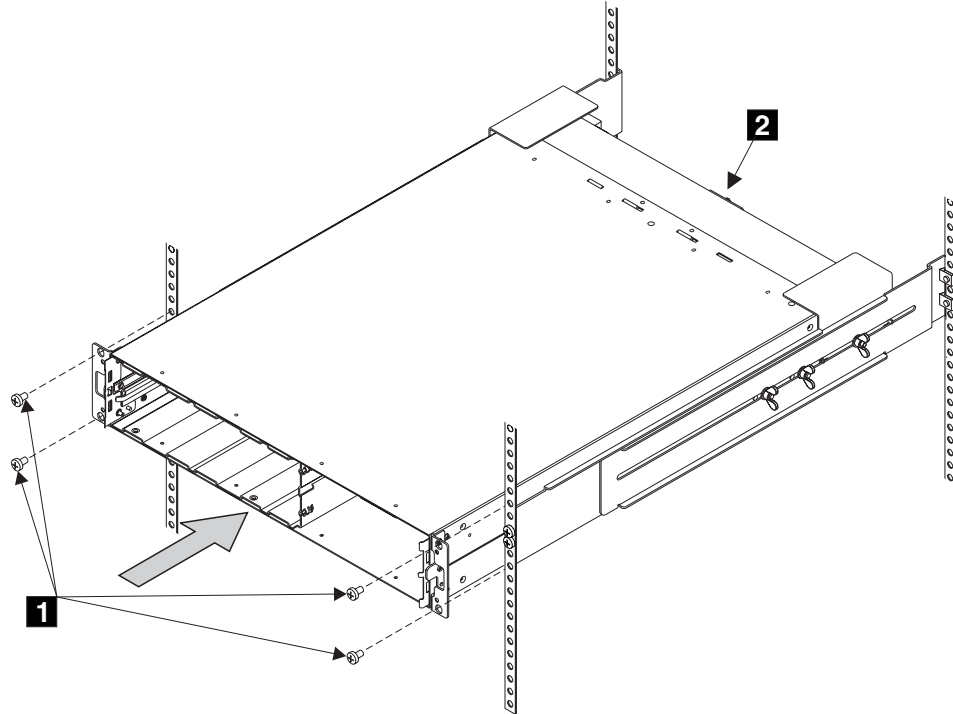
Figure 110. Installing the 2145 uninterruptible power supply into a rack

      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 uninterruptible power supply so that you can attach a ground bonding wire, if it is required by local wiring codes. Because safety grounding of the 2145 uninterruptible power supply 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 uninterruptible power supply, plug the 2145 uninterruptible power supply main power cable (**1** in Figure 111 on page 128) into the power socket.

    Note: The 2145 uninterruptible power supply 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 uninterruptible power supply, or the SAN Volume Controller 2145-4F2 cluster malfunctions.
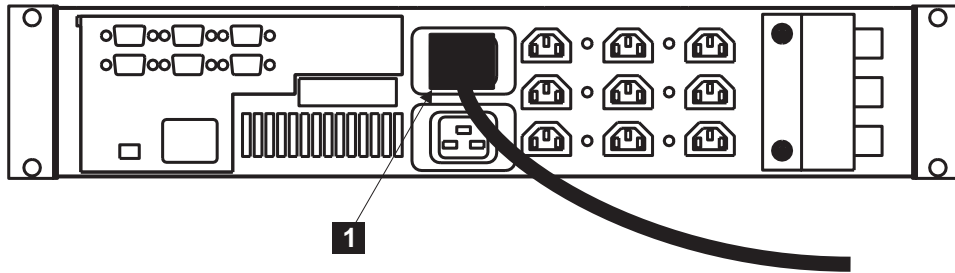
Figure 111. Installing the 2145 uninterruptible power supply power cable

1 Main power cable

If possible, ensure that the two uninterruptible power supply units are not both connected to the same power source. Ensure that you comply with the following requirements for the 2145 uninterruptible power supply:

- Each 2145 uninterruptible power supply 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 uninterruptible power supply.
- The voltage that is supplied to the 2145 uninterruptible power supply must be 200 – 240 V single phase.
- The frequency that is supplied must be 50 or 60 Hz.

Note: If the 2145 uninterruptible power supply is cascaded from another uninterruptible power supply, the source uninterruptible power supply must have at least 3 times the capacity per phase and the total harmonic distortion must be less than 5%. The uninterruptible power supply 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 uninterruptible power supply flash for a short time while the 2145 uninterruptible power supply runs a self-test. When the test is complete, the mode indicator **1** flashes to show that the 2145 uninterruptible power supply is in standby mode; see Figure 112.

    Press and hold the 2145 uninterruptible power supply On button, **2** in Figure 112, until you hear the 2145 uninterruptible power supply 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 uninterruptible power supply. The 2145 uninterruptible power supply is now in normal mode and is charging its battery.
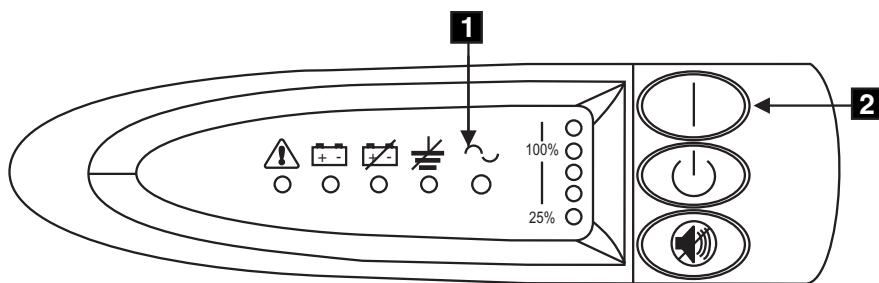
Figure 112. Power switch and indicators on the 2145 uninterruptible power supply

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 uninterruptible power supply, 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 uninterruptible power supply and powered on.

11. Repeat all of these steps to install additional 2145 uninterruptible power supply units.

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 2145-1U uninterruptible power supply or the 2145 uninterruptible power supply.

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 113 on page 130, and put your thumb against the front of the latch-lock **2** .
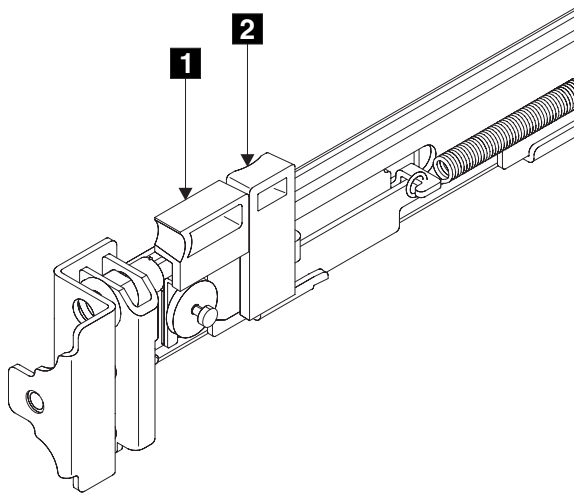
Figure 113. Retracting the latch lock carrier

      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 114). The latch-lock carrier assembly slides against the spring tension.
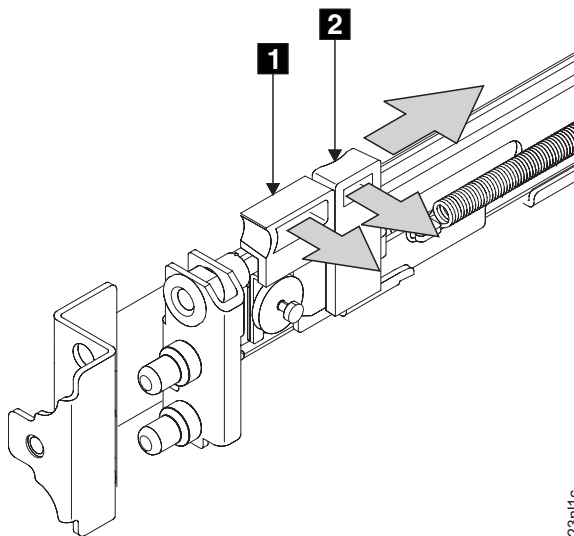
Figure 114. Opening the front latch-lock carrier assembly

      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 115 on page 131) toward the front of the rail until it stops. The rail is now at its shortest adjustment.
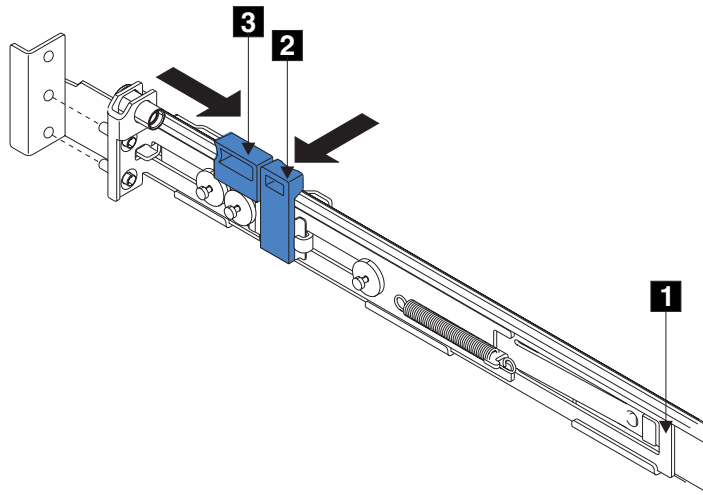
Figure 115. Opening the back latch-lock carrier assembly

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 116) with the required EIA marking that is on the rack.
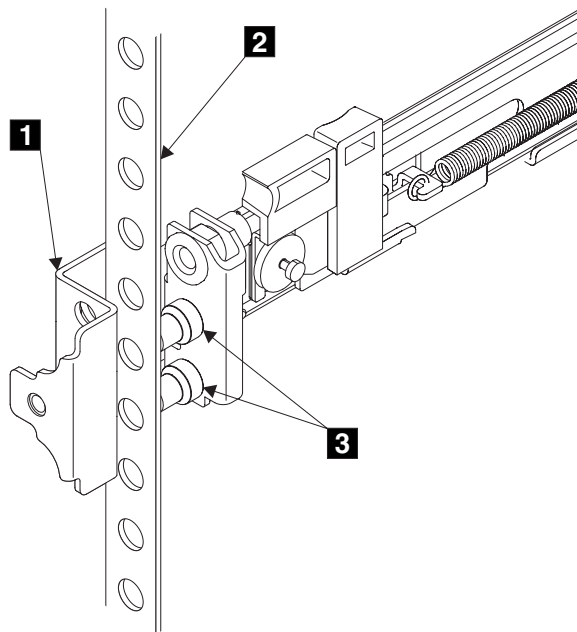
Figure 116. Installing the front end of the rail

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 117) 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.
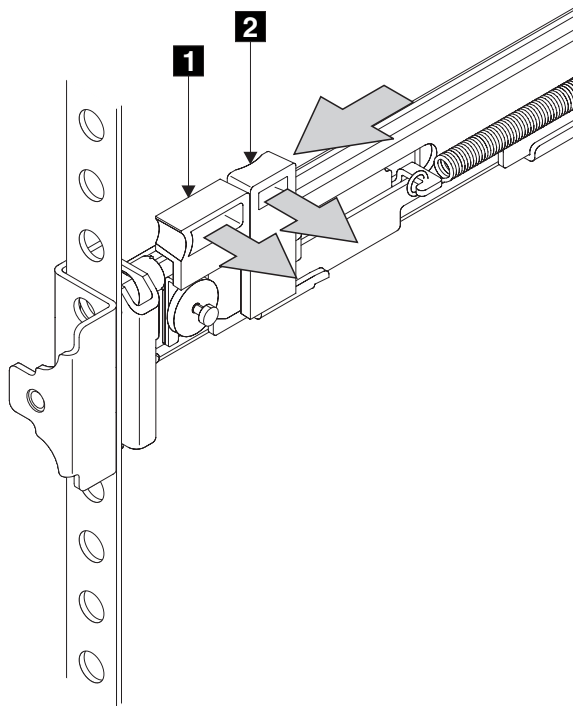
Figure 117. Closing the latch-lock carrier assembly

   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 118).
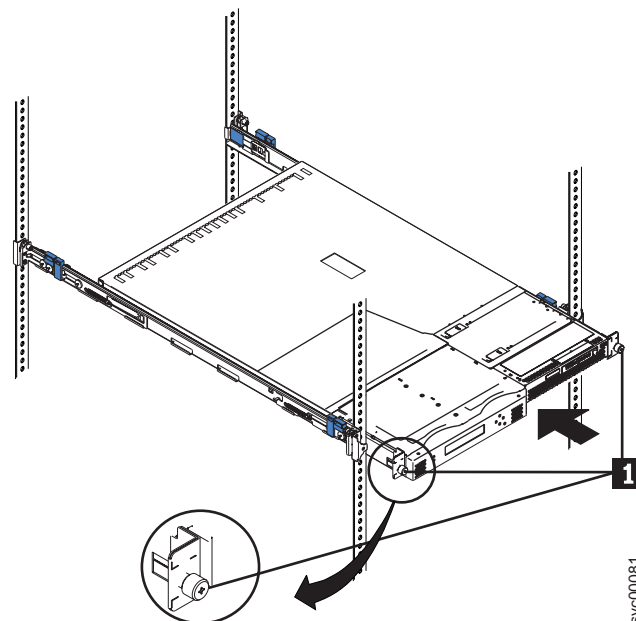
Figure 118. Installing the SAN Volume Controller 2145-4F2 into a rack

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 1∪ space between each node to improve the air circulation in the rack.

Connecting the SAN Volume Controller 2145-4F2 to the 2145-1U uninterruptible power supply

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

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

Before you begin this task, see the completed user's cable connection table, which is described in the *IBM System Storage SAN Volume Controller: Planning Guide* and was downloaded from http://www.ibm.com/storage/support/2145.

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

Perform the following steps to connect the SAN Volume Controller 2145-4F2 to the 2145-1U uninterruptible power supply:

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 119).
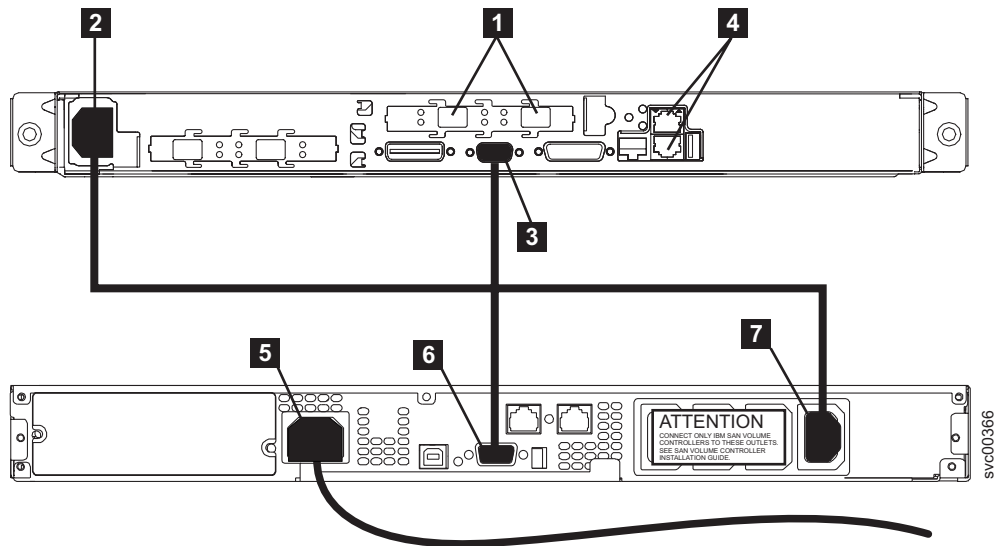
Figure 119. Connecting the SAN Volume Controller 2145-4F2 power cable to the 2145-1U uninterruptible power supply

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 2145-1U uninterruptible power supply.

DANGER

> **You have already switched on the 2145-1U uninterruptible power supply. The output sockets of the 2145-1U uninterruptible power supply 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 2145-1U uninterruptible power supply.

The SAN Volume Controller 2145-4F2 power is now connected to the 2145-1U uninterruptible power supply.

Connecting the SAN Volume Controller 2145-4F2 to the 2145 uninterruptible power supply

Connect the SAN Volume Controller to the 2145 uninterruptible power supply to protect your data in the event of an unexpected loss of external power.

Each SAN Volume Controller 2145-4F2 of a pair must be connected to a different 2145 uninterruptible power supply. Each 2145 uninterruptible power supply can support up to two SAN Volume Controller 2145-4F2 nodes.

Attention: Do not connect two nodes to the same pair of 2145 uninterruptible power supply units. Both nodes are lost in the event that a power failure occurs on both of those 2145 uninterruptible power supply units.

Note: You must install 2145 uninterruptible power supply units in pairs. There must be at least two 2145 uninterruptible power supply units per cluster. A cluster can contain no more than eight SAN Volume Controller 2145-4F2 nodes. Also, ensure that each 2145 uninterruptible power supply 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 uninterruptible power supply units.

Before you begin this task, see the completed user's cable connection table, which is described in the *IBM System Storage SAN Volume Controller: Planning Guide* and was downloaded from http://www.ibm.com/storage/support/2145, to identify the 2145 uninterruptible power supply to which this node is to be connected.

Click the **Plan/upgrade** tab. Under **Sizing/Capacity**, click **SAN Volume Controller planning**. Click your language to view the Planning Guide abstract. The charts and tables are located under the **Related information** heading.

Perform the following steps to connect the SAN Volume Controller 2145-4F2 node to the 2145 uninterruptible power supply:
1. At the back of the SAN Volume Controller 2145-4F2 node, as shown in Figure 120 on page 136, plug a power cable into the power connector **1** .
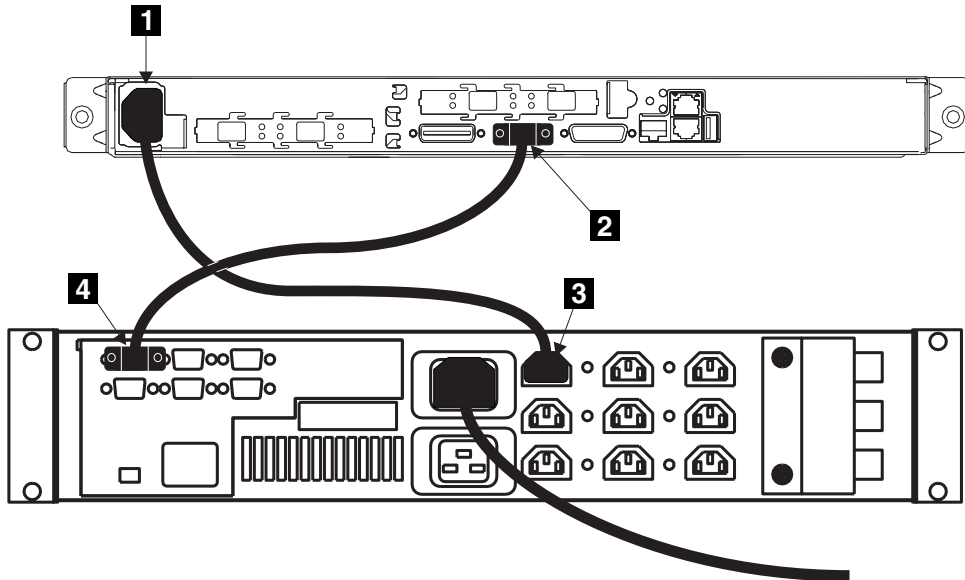
Figure 120. Connecting the SAN Volume Controller 2145-4F2 power cable to the 2145 uninterruptible power supply

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 uninterruptible power supply. The output sockets of the 2145 uninterruptible power supply 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 uninterruptible power supply.

4. Place the other end of the signal cable into any vacant position on the top row of serial connectors 4 on the 2145 uninterruptible power supply.

   Attention: Do not plug any signal cables into the bottom row of signal cable connectors or the 2145 uninterruptible power supply malfunctions.

The SAN Volume Controller 2145-4F2 power is now connected to the 2145 uninterruptible power supply.

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 121 on page 137.

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.
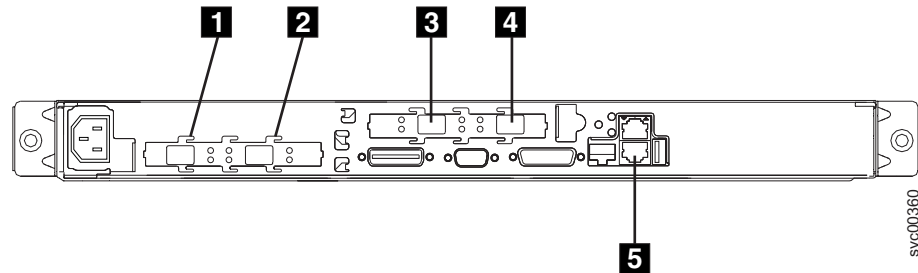
Figure 121. Connectors at the back of the SAN Volume Controller 2145-4F2

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.

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`, `Recovering`, or `Cluster:` message 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` or `Recovering` message. If the `Charging` or `Recovering` message is displayed, you will also see a progress bar on the second line. Battery charging can take up to two 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, the `Cluster:` message 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 122 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.

No button pressed (border only)

Up button pressed

Left and Right button pressed

Select button pressed
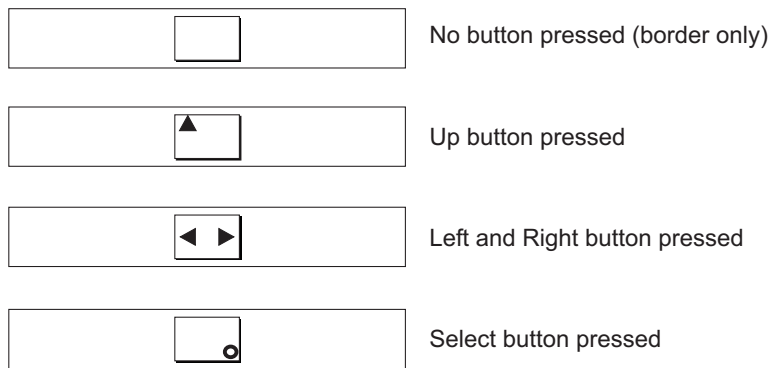
Figure 122. Front panel display when push buttons are pressed

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

5. Press and release the up 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 123 on page 139 shows how the node number is displayed on the front panel. If the node number is not the same, contact the IBM Support Center.

```
Node:
xxxxxx
```

Figure 123. 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 124 shows the message `Inactive`. This message indicates that, although an Ethernet connection is available, it cannot yet be used.

```
Ethernet:
Inactive
```

Figure 124. 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.

If the battery needed to be charged, the `Charging` or `Recovering` message is replaced by the `Cluster:` message when the battery is fully charged. The progress bar no longer displays. The installation of the SAN Volume Controller hardware is now complete. No software installation is required. Continue with the instructions in the *IBM System Storage SAN Volume Controller: Software Installation and Configuration Guide* to create, if necessary, a new SAN Volume Controller cluster and to add the nodes into a SAN Volume Controller cluster.

Appendix C. Master console

For SAN Volume Controller version 4.2.1 and earlier, the master console provides a single point from which to manage the SAN Volume Controller nodes. The customer could purchase the master console as a hardware product option (which includes the master console preinstalled software) or as a software-only option. Although it can no longer be purchased, the master console can be upgraded to support clusters running the latest SAN Volume Controller software.

Beginning with SAN Volume Controller version 4.3.0, the IBM System Storage Productivity Center (SSPC) is an integrated hardware and software solution that provides a single point of entry for managing SAN Volume Controller clusters, IBM System Storage DS8000 systems, and other components of your data storage infrastructure. For more information on SSPC, see the *IBM System Storage Productivity Center Introduction and Planning Guide*.

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 two SAN Volume Controller clusters. Although multiple master console servers can access a single cluster, you cannot concurrently perform configuration and services tasks if multiple servers are accessing one cluster.

Master console hardware option components

Your master console software was preinstalled when you ordered 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.

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

Server dimensions and weight

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

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)

Master console kit dimensions and weight

Ensure that space is also available in the rack for the master console kit.

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)

Server ac and input-voltage requirements

Ensure that your environment meets the following ac power and 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 environmental requirements

Ensure that your environment falls within the following ranges:

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)

Installing the hardware master console

If your system includes the master console hardware product option, 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, 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 available slot, connect the keyboard, mouse, monitor, and Ethernet cables at the back of the master console before you install 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. Connect the master console to the Ethernet port that is designated in the Cable connection table.

Appendix D. Using the front panel of the SAN Volume Controller

The front panel of the SAN Volume Controller has a display, various LEDs, navigation buttons, and a select button that are used when servicing your SAN Volume Controller node.

Figure 125 shows where the front panel display is located on the SAN Volume Controller 2145-8G4 node.
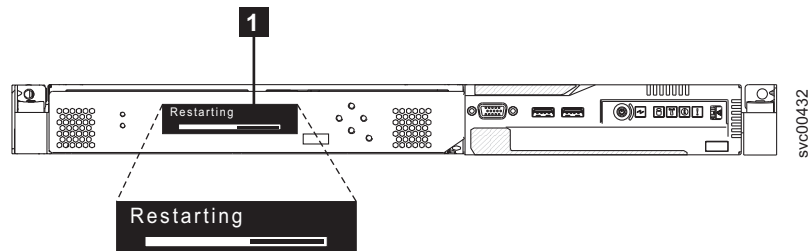
Figure 125. SAN Volume Controller 2145-8G4 front panel display

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.

```
Booting          130
```

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.

```
Failed           180
```

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 battery is charging.

A node will not start and join a cluster if there is insufficient power in the uninterruptible power supply battery to manage with a power failure. `Charging` is displayed until it is safe to start the node. This might take up to two hours.

Error codes

Error codes are displayed on the front panel display.

Figure 126 and Figure 127 show how error codes are displayed on the front panel.
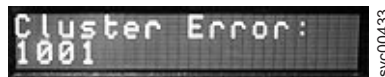
Figure 126. Cluster error display

Figure 127. Node error 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.
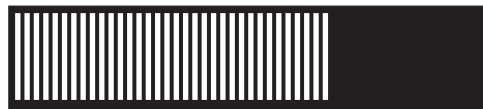
If this display remains active for longer than 3 minutes, there might be a problem. The cause might be a hardware failure or the software on the hard disk drive might be missing or damaged.

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, which is shown in Figure 128, indicates that a request has been made to replace 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 (for example, the hard disk drive in the node fails), it is possible to copy all the software from another node that is connected to the same fibre-channel fabric. This process is known as *node rescue*.

Figure 128. Node rescue display

Power failure

The SAN Volume Controller node uses battery power from the uninterruptible power supply to shut itself down.

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.

`Powering Off` is displayed after the power button has been pressed and while 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 battery is not fully charged.

Recovering

When a node is active in a cluster but the uninterruptible power supply battery is not fully charged, Recovering is displayed. If the power fails while this message is displayed, the node does not restart until the uninterruptible power supply 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.

Restarting

The software is restarting for one of the following reasons:
- An internal error was detected.
- The power button was pressed again while the node was powering off.

If you press the power button while powering off, the panel display changes to indicate that the button press was detected; however, the power off continues until the node finishes saving its data. After the data is saved, the node powers off and then automatically restarts. The progress bar moves to the right while the node is restarting.

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, the 2145 uninterruptible power supply also shuts down. When a node that is connected to a 2145-1U uninterruptible power supply is shut down, the 2145-1U uninterruptible power supply remains in the normal mode.

Shutting Down

Validate WWNN?

The front panel prompts you to validate the WWNN when the worldwide node name (WWNN) that is stored in the service controller (the panel WWNN) does not match the WWNN that is backed up on the SAN Volume Controller disk (the disk WWNN).

Typically, this panel is displayed when the service controller has been replaced. The SAN Volume Controller uses the WWNN that is stored on the service controller. Usually, when the service controller is replaced, you modify the WWNN that is stored on it to match the WWNN on the service controller that it replaced. By doing this, the node maintains its WWNN address, and you do not need to modify the SAN zoning or host configurations. The WWNN that is stored on disk is the same that was stored on the old service controller.

After it is in this mode, the front panel display will not revert to its normal displays, such as node or cluster options or operational status, until the WWNN is validated. Navigate the Validate WWNN option (shown in Figure 129) to choose which WWNN that you want to use.
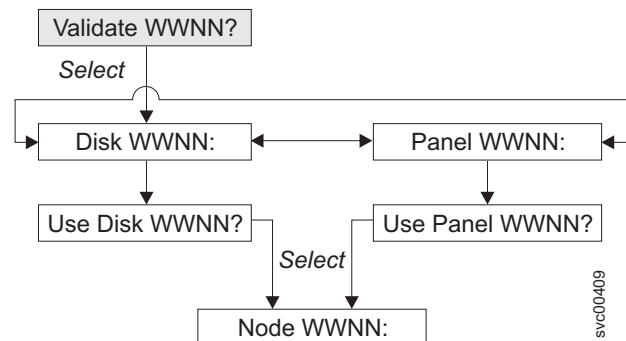
Figure 129. Validate WWNN? navigation

To choose which stored WWNN that you want this node to use, perform the following steps:

1. From the Validate WWNN? panel, press and release the select button. The Disk WWNN: panel is displayed and shows the last five digits of the WWNN that is stored on the disk.
2. To view the WWNN that is stored on the service controller, press and release the right button. The Panel WWNN: panel is displayed and shows the last five numbers of the WWNN that is stored on the service controller.
3. Determine which WWNN that you want to use.
   a. To use the WWNN that is stored on the disk, perform the following steps:
      1) From the Disk WWNN: panel, press and release the down button. The Use Disk WWNN? panel is displayed.
      2) Press and release the select button.

b. To use the WWNN that is stored on the service controller, perform the
following steps:

1) From the Panel WWNN: panel, press and release the down button. The
Use Panel WWNN? panel is displayed.

2) Press and release the select button.

The node is now using the selected WWNN. The Node WWNN: panel is displayed
and shows the last five numbers of the WWNN that you selected.

If neither WWNN that is stored on the service controller panel or on the disk is
suitable, select either WWNN choice and then use the edit WWNN option that is
available from the Node WWNN: panel to change the WWNN to the correct value.

SAN Volume Controller menu options

During normal operations, menu options are available on the front panel display of
the SAN Volume Controller node.

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 to service the node.

Figure 130 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 that is displayed is the cluster option.

Main Options   Secondary Options

Recover Cluster? ←→ IPv6 Gateway ←→ IPv6 Prefix ←→ IPv6 Address

Cluster ←→ Status ←→ IPv4 Address ←→ IPv4 Subnet Mask ←→ IPv4 Gateway

Node ←→ Status ←→ Node WWNN ←→ Create Cluster?

Version ←→ Build ←→ Cluster Build

Ethernet ←→ MAC

FC Port-1 ←→ FC Port-2 ←→ FC Port-3 ←→ FC Port-4

Select Language?

1nfit9
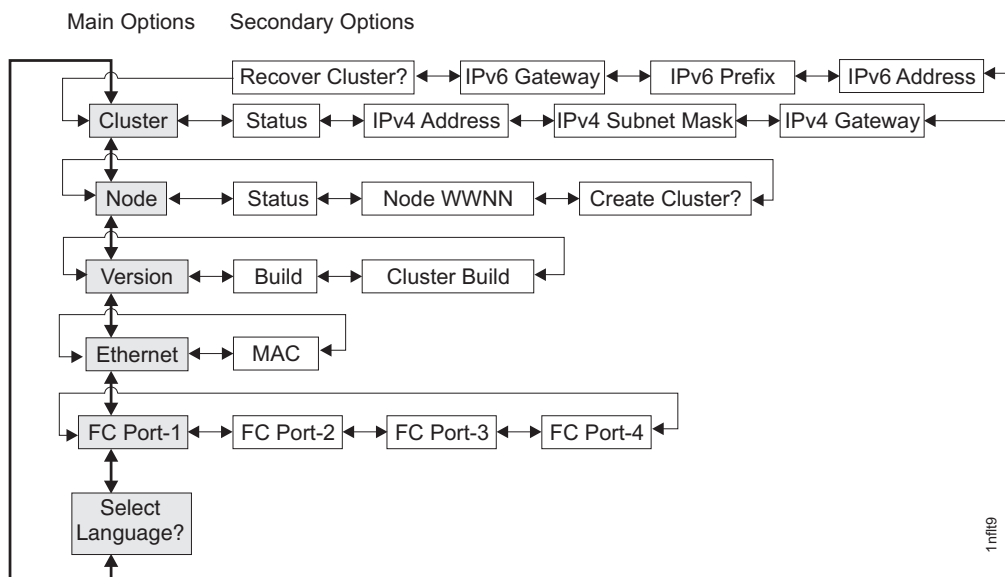
Figure 130. SAN Volume Controller options on the front panel display

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 button to scroll through the display. When there is no more text to display, you can move to the next item in the menu by pressing the right button.

Similarly, you might see a left angle bracket (<) on the left-hand side of the display screen. If you see a left angle bracket, press the left button to scroll through the display. When there is no more text to display, you can move to the previous item in the menu by pressing the left button.

The following main options are available:
- Cluster
- Node
- Version
- Ethernet
- FC port: 1 - 4
- Select language?

Cluster options

The main cluster option from the menu can display the cluster name or can be blank.

The main cluster option displays the cluster name that the user has assigned. If a cluster is in the process of being created on the node, and no cluster name has been assigned, a temporary name that is based on the IP address of the cluster is displayed. If this SAN Volume Controller node 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.

IPv4 Address

A cluster must have either an IPv4 or an IPv6 address that is assigned, or it can have both. If it is assigned, you can use the IPv4 address to access the cluster from the command-line tools or the SAN Volume Controller Console.

This field contains the existing IPv4 address of the cluster. If this SAN Volume Controller node is not a member of a cluster or an IPv4 address has not been assigned, this field is blank.

IPv4 Subnet
The IPv4 subnet mask address is set when an IPv4 address is assigned to the cluster.

The IPv4 subnet option displays the subnet mask address when the cluster has an IPv4 address. If this SAN Volume Controller node is not a member of a cluster or if an IPv4 addresss has not been assigned, this field is blank.

IPv4 Gateway
The IPv4 gateway address is set when the cluster is created.

The IPv4 gateway option displays the gateway address for the cluster. If this SAN Volume Controller node is not a member of a cluster, or if an IPv4 address has not been assigned, this field is blank.

IPv6 Address
You can use the IPv6 address to access the cluster from the command line tools or the SAN Volume Controller Console.

This option displays the existing IPv6 address of the cluster. If this SAN Volume Controller node is not a member of a cluster, or if an IPv6 address has not been assigned, this field is blank.

IPv6 Prefix
The IPv6 prefix is set when a cluster is created.

The IPv6 prefix option displays the network prefix of the cluster and the service IPv6 addresses. The prefix has a value of 0 - 127. If this SAN Volume Controller node is not a member of a cluster, or if an IPv6 address has not been assigned, a blank line displays.

IPv6 Gateway
The IPv6 gateway address is set when the cluster is created.

This option displays the IPv6 gateway address for the cluster. If this SAN Volume Controller node is not a member of a cluster, or if an IPv6 address has not been assigned, a blank line displays.

Displaying and editing an IPv6 address
After you have set the IPv6 address, you can display the IPv6 address and the IPv6 gateway address. You can also set the IPv6 address for a cluster that you are going to create.

The IPv6 address and the IPv6 gateway address each consist of eight (4-digit) hexadecimal values that are shown across four panels, as shown in Figure 131. Each panel displays two 4-digit values that are separated by a colon, the address field position (such as 2/4) within the total address, and scroll indicators. Move between the address panels by using the left or right button.

```
I P v 6   A d d r e s s :         I P v 6   A d d r e s s :         I P v 6   A d d r e s s :         I P v 6   A d d r e s s :
  F E D C : 1 2 3 4    1 / 4 >    < F E D C : 1 2 3 4    2 / 4 >    < F E D C : 1 2 3 4    3 / 4 >    < F E D C : 1 2 3 4    4 / 4
```
svc00417
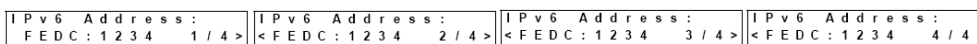
Figure 131. Viewing the IPv6 Address on the front panel display

You can display or edit the IPv6 Address or IPv6 Gateway address when you are creating a cluster from the Create Cluster? menu. You can also edit an IPv6 address within service mode.

Perform the following steps to edit an IPv6 address:

1. When the panel is in edit mode, the full address is still shown across four panels as eight (4-digit) hexadecimal values. You edit each digit of the hexadecimal values independently. The current digit is highlighted.
2. Press the up button if you want to increase the value that is highlighted; press the down button if you want to decrease that value.
3. Press the right or left buttons to move to the number field that you want to set.
4. Repeat steps 3 and 4 for each number field that you want to set.
5. Press the select button to complete the change or press the right button to display the next secondary option or press the left button to display the previous options.

Recover cluster navigation

The Recover cluster? option is useful if the administrator password has been lost or forgotten.

Use the recover cluster option (shown in Figure 132) if the user has lost the administrator password or if the user is unable to access the cluster. If it is permitted by the user's password security policy, use this selection to reset the administrator password. Alternatively, use this selection to enter the node into service mode. This makes the node available through the service IP address.

Select **SERVICE MODE** by pressing the select button after you access the Recover Cluster? menu.
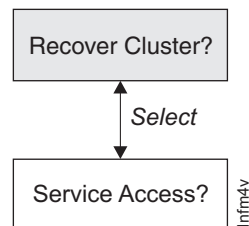
Figure 132. Recover Cluster? navigation

Resetting the password

To reset the administrator password on the cluster, complete the following steps from the Service Access? menu:

1. Press and hold the up button.
2. Press and release the select button.
3. Release the up button.

If your password security policy permits password recovery and if the node is currently a member of a cluster, the administrator password is reset and a new password is displayed for 60 seconds. If your password security policy does not permit password recovery or the node is not a member of a cluster, completing these steps has no effect.

Entering service mode

Enter service mode only if directed to do so by the IBM Support Center.

This function is capable of degrading the operation of a working cluster. Use it only to recover from a problem that is making the cluster inaccessible.

All SAN Volume Controller nodes in the cluster share the same Service IP address. Set only one SAN Volume Controller at a time on the LAN in service mode. Setting more than one SAN Volume Controller in service mode might result in a LAN failure.

Important: Your cluster can use a fixed address for its service mode IP address. If you do use a fixed address for your service mode IP address, only one node at a time can be in service mode.

To enter service mode, complete the following steps from the Service Access? menu:
1. Press and hold the down button.
2. Press and release the select button.
3. Release the down button.

The node restarts and service mode is enabled. `SERVICE MODE` is displayed on screen. The left or right buttons can be used to display the current service IP address. The node can be accessed using this address. The SERVICE MODE menu continues to be displayed on the front panel until service mode is reset by a command sent to the service IP address, or until the power to the node is turned off and on.

Note: If you are using the service mode, you need only do this on one node at a time. Be sure to disable service mode before continuing on to other nodes.

Node options

The node option displays the identification number or name of the SAN Volume Controller node.

The main node option displays the identification number of the SAN Volume Controller or the name of the SAN Volume Controller node if the user has assigned a name.

Status

The node status is indicated on the front panel. The status can be one of the following states:

Active The SAN Volume Controller node is operational and assigned to a cluster. It has access to the fibre-channel fabric.

Inactive
> The SAN Volume Controller node is operational and assigned to a cluster. It has no access to the fibre-channel fabric.

Free The SAN Volume Controller node is operational, but has not been assigned to any cluster. It has access to the fibre-channel fabric.

Disconnected
> The SAN Volume Controller node is operational, but has not been assigned to any cluster. It has no access to the fibre-channel fabric.

Failed The SAN Volume Controller node is not operational. A hardware fault is preventing the SAN Volume Controller from being part of a cluster.

Node WWNN

The node WWNN (worldwide node name) option displays the last five hexadecimal digits of the WWNN that is being used by the SAN Volume Controller node. Only the last five digits of a WWNN vary on a SAN Volume Controller node. The first 11 digits are always 50050768010.

To edit the WWNN, complete the following steps:

Important: Only change the WWNN when you are instructed to do so by a service procedure. Nodes must always have a unique WWNN. If you change the WWNN, you might have to reconfigure hosts and the SAN zoning.

1. Press and hold the down button, press and release the select button, and then release the down button. The display switches into edit mode. `Edit WWNN` is displayed on line 1. Line 2 of the display shows the last five numbers of the WWNN that is currently set. The first number is highlighted.
2. Edit the highlighted number to match the number that is required. Use the up and down buttons to increase or decrease the numbers. The numbers wrap F to 0 or 0 to F. Use the left and right buttons to move between the numbers.
3. When the highlighted value matches the required number, press and release the select button to activate the change. The Node WWNN: panel displays and the second line shows the last five characters of the changed WWNN.

Create Cluster?

You can create a cluster from the Create Cluster? menu. You also have the option to delete the node from the cluster if the node that is selected is in a cluster.

The Create Cluster? option allows you to create a new SAN Volume Controller cluster. Press the select button on the Create cluster? menu to start creating a cluster. Figure 133 on page 156 shows the sequence of the create cluster menu options.

You can set either the IPv4 or the IPv6 address from the front panel when you create the cluster, but you can only set one. If required, you can set the other address from the SAN Volume Controller Console or the CLI.
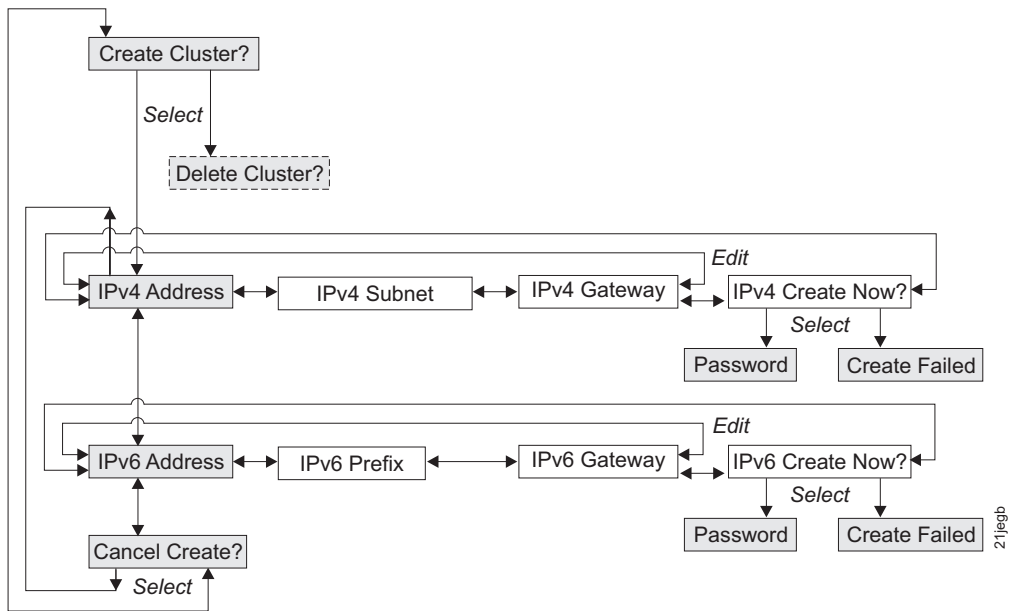
Figure 133. Create Cluster? navigation

Press the up and down 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 that are available include:
- IPv4 Address
- IPv6 Address
- Cancel Create?

If you are creating the cluster with an IPv4 address, complete the following steps:
1. Press and release the up or down button until `Node:` is displayed
2. Press and release the left or right button until `Create Cluster?` is displayed.
3. Press and release the select button. The IPv4 Address panel is displayed.
4. Put the panel into edit mode by pressing and releasing the select button.
5. Edit the IPv4 address, the IPv4 subnet, and the IPv4 gateway.
6. Press and release the select button to put the data in view rather than edit mode.
7. Use the right button to navigate to the IPv4 Create Now? panel.
8. Press and release the select button to confirm.

If you are creating the cluster with an IPv6 address, complete the following steps:
1. Press and release the up or down button until `Node:` is displayed
2. Press and release the left or right button until `Create Cluster?` is displayed.
3. Press and release the select button and then press the down button. The IPv6 Address panel is displayed.
4. Put the panel into edit mode by pressing and releasing the select button.
5. Edit the IPv6 address, the IPv6 prefix, and the IPv6 gateway.
6. Press and release the select button to put the data in view rather than edit mode.

7. Use the right button to navigate to the IPv6 Create Now? panel.
8. Press and release the select button to confirm.

IPv4 Address

The IPv4 address lets you set the IP address for the cluster that you are going to create. The cluster can have either an IPv4 or an IPv6 address, or both at the same time. You can set either the IPv4 or IPv6 address from the front panel when you are creating the cluster. If required, you can set the other IP address (IPv4 or IPv6) from the command line interface. Be sure to verify the correct IP address with the customer before you create a cluster.

Attention: If you set the IPv4 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 set the IPv4 address:
1. Navigate to the IPv4 Address panel.
2. Press the select button. The first IP address number is highlighted.
3. Press the up button if you want to increase the value that is highlighted; 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 set.
5. Repeat steps 3 and 4 for each number field that you want to set.
6. Press the select button to confirm the settings. Otherwise, press the right button to display the next secondary option or press the left button to display the previous options.

Press the right button to display the next secondary option or press the left button to display the previous options.

IPv4 Subnet

This option lets you set the IPv4 subnet mask.

Attention: If you set the IPv4 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 set the subnet mask:
1. Navigate to the IPv4 Subnet panel.
2. Press the select button. The first subnet mask number is highlighted.

3. Press the up button if you want to increase the value that is highlighted; 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 set.
5. Repeat steps 3 and 4 for each number field that you want to set.
6. Press the select button to confirm the settings. Otherwise, press the right button to display the next secondary option or press the left button to display the previous options.

IPv4 Gateway

This option lets you set the IPv4 gateway address.

Attention: If you set the IPv4 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 set the IPv4 gateway address:

1. Navigate to the IPv4 Gateway panel.
2. Press the select button. The first gateway address number field is highlighted.
3. Press the up button if you want to increase the value that is highlighted; 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 set.
5. Repeat steps 3 and 4 for each number field that you want to set.
6. Press the select button to confirm the settings. Otherwise, press the right button to display the next secondary option or press the left button to display the previous options.

IPv4 Create Now?

This option lets you start an operation to create a cluster with an IPv4 address.

1. Navigate to the IPv4Create Now? panel.
2. 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 manage the cluster from the SAN Volume Controller Console.

   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.

IPv6 Address

This option lets you set the IPv6 address for the cluster that you are going to create. The cluster can have either an IPv4 or an IPv6 address, or both at the same time. You can set either the IPv4 or IPv6 address from the front panel when you are creating the cluster. If required, you can set the other IP address (IPv4 or IPv6) from the command line interface. Be sure to verify the correct IPv6 address with the customer before you create a cluster.

Attention: If you set the IPv6 address, ensure that you type the correct address. Otherwise, you cannot access the cluster using the command-line tools or the SAN Volume Controller Console.

Perform the following steps to set the IPv6 address:

1. From the Create Cluster? option, press the select button, and then press the down button. The IPv6 Address option is displayed.
2. Press the select button again. The first IPv6 address number is highlighted. .
3. Move between the address panels by using the left or right button. The IPv6 address and the IPv6 gateway address each consist of eight (4-digit) hexadecimal values that are shown across four panels
4. You can change each number in the address independently. Press the up button if you want to increase the value that is highlighted; press the down button if you want to decrease that value.
5. Press the right or left buttons to move to the number field that you want to set.
6. Repeat steps 3 and 4 for each number field that you want to set.
7. Press the select button to confirm the settings. Otherwise, press the right button to display the next secondary option or press the left button to display the previous options.

IPv6 Prefix

This option lets you set the IPv6 prefix.

Attention: If you set the IPv6 prefix, ensure that you type the correct network prefix. Otherwise, you cannot access the cluster from the Web interface or from a command line.

Perform the following steps to set the IPv6 prefix:

Note: This option is restricted to a value between 0 and 127.

1. Navigate to the IPv6 Prefix panel.
2. Press the select button. The first prefix number field is highlighted.
3. Press the up button if you want to increase the value that is highlighted; 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 select button to confirm the settings. Otherwise, press the right button to display the next secondary option or press the left button to display the previous options.

IPv6 Gateway

This option lets you set the IPv6 gateway.

Attention: If you set the IPv6 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 set the IPv6 gateway address:

1. Navigate to the IPv6 Gateway panel.
2. Press the select button. The first gateway address number is highlighted. The IPv6 address and the IPv6 gateway address each consist of eight (4-digit) hexadecimal values that are shown across four panels.
3. You can change each number in the address independently. Press the up button if you want to increase the value that is highlighted; press the down button if you want to decrease that value.
4. Press the right or left buttons to move to the number field that you want to set.
5. Repeat steps 3 and 4 for each number field that you want to set.
6. Press the select button to confirm the settings. Otherwise, press the right button to display the next secondary option or press the left button to display the previous options.

IPv6 Create Now?

This option lets you start an operation to create a cluster with an IPv6 address.

1. Navigate to the IPv6 Create Now? panel.
2. 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 manage the cluster from the SAN Volume Controller Console.

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.

Delete Cluster?

The Delete Cluster? option lets you delete the node from the cluster. This option is displayed only if you select the Create Cluster? option on a SAN Volume Controller node that is already a member of a cluster.

Usually, you can use the command-line interface (CLI) or the graphical user interface (GUI) to remove a node from a cluster. However, if you cannot use the CLI or GUI, you can use the Delete Cluster? option to force the deletion of a node from a cluster.

From the Delete Cluster? panel, 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 node is deleted from the cluster and the node is restarted. The display then returns to the default menu.

Use the up button to return to the Create Cluster? option.

Version option

The version option displays the version of the SAN Volume Controller software that is active on the node. The version consists of four fields that are separated by full stops. The fields are the version, release, modification, and fix level; for example, 4.3.2.1.

Build

The Build: panel displays the build level of the SAN Volume Controller software that is currently active on the node.

Cluster Build

The Cluster Build: panel displays the build level of the SAN Volume Controller cluster software that is currently active on this node.

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 the Ethernet port of one node becomes active for cluster configuration. If the node that has the active port fails, 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 be used to 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 2145-8F2 or the SAN Volume Controller 2145-4F2, 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

You can change the language that displays on the front panel.

The Select language? option allows you to change the language that is displayed on the menu. Figure 134 shows the Select language? option sequence.
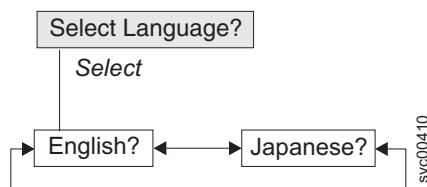
Figure 134. Select Language? navigation

The following languages are available:
• English
• Japanese

To select the language that you want to be used on the front panel, perform the following steps:

1. Navigate to the Select language? panel.

2. Press and release the select button.

3. Use the left and right buttons to move to the desired language. The translated language names are displayed in their own character set. If you do not understand the language that is displayed, wait for at least 60 seconds for the menu to reset to the default option.

4. Press and release the select button to select the language that is displayed.

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

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

Additional data is not available when the front panel displays a menu option, which ends with a question mark (?). In this case, press and release the select button to choose the menu option.

Note: You cannot select another language when the node is displaying a boot error.

Service mode

While in service mode, you can use the front panel to view or change a service IPv4 or an IPv6 address. You can also view the version and build level of the SAN Volume Controller software that is installed and active on the node.

Enter service mode only if directed to do so by the IBM Support Center.

By default, all nodes in a cluster are configured to use the same service address. This means that you can place only one node in service mode at a time. However, you can either change the fixed IP address of a node or configure the nodes for DHCP; thus, making it possible to have more than one node in service mode at any one time.

To access a node that is in service mode, point your Web browser to the following Web address, where *serviceipaddress* is the IPv4 or IPv6 address that is shown on the front panel display:

```
https://serviceipaddress
```

The service mode panel is displayed when you enter service mode. You can navigate to the IPv4 Address, IPv6 Address, or the Version panels, as shown in
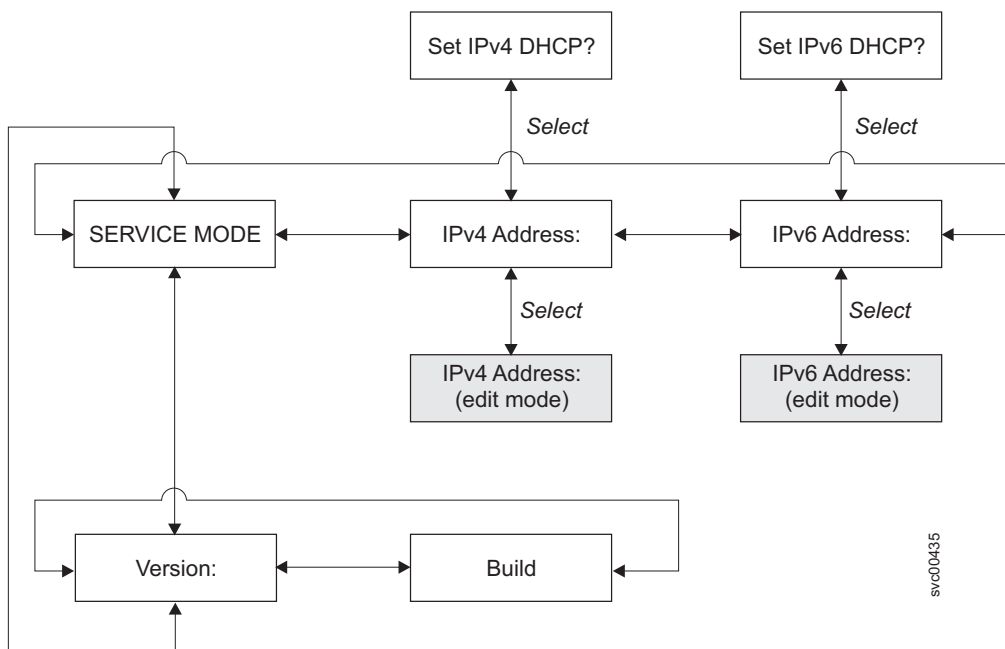
Figure 135. Service mode navigation

You can exit service mode through the Web browser or by turning the node off and then on.

IPv4 Address

The IPv4 Address panel shows one of the following:

- The active service mode address if the cluster has an IPv4 address. This can be either a configured or fixed address, or it can be an address obtained through DHCP.
- `DHCP Failed` if the IPv4 service address is configured for DHCP but the node was unable to obtain an IP address.
- `DHCP Configuring` if the IPv4 service address is configured for DHCP while the node attempts to obtain an IP address. This will change to the IPv4 address automatically if a DHCP address is allocated and activated.
- A blank line if the cluster does not have an IPv4 address.

If the service IPv4 address was not set correctly or a DHCP address was not allocated, you have the option of correcting the IPv4 address from this panel. Note that the service IP address must be in the same subnet as the cluster IP address.

To set a fixed service IPv4 address from the IPv4 Address: panel, perform the following steps:

1. Press and release the select button to put the panel in edit mode.
2. Press the right or left buttons to move to the number field that you want to set.
3. Press the up button if you want to increase the value that is highlighted; 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. When all the fields are set as required, press and release the select button to activate the new IPv4 address.

The IPv4 Address: panel is displayed. The new service IPv4 address is not displayed until it has become active. If the new address has not been displayed after two minutes, check that the selected address is valid on the subnetwork and that the Ethernet switch is working correctly.

To set the service IPv4 address to use DHCP, perform the following steps:

1. Navigate to the IPv4 Address: panel.
2. Press and release the down button. Set IPv4 DHCP? is displayed on the front panel.
3. Press and release the select button to activate DHCP, or you can press and release the up button to keep the existing address.
4. If you activate DHCP, DHCP Configuring is displayed while the node attempts to obtain a DHCP address. It changes automatically to show the allocated address if a DHCP address is allocated and activated, or it changes to DHCP Failed if a DHCP address is not allocated.

You can exit service mode through the CLI, or by turning the node off and then on.

IPv6 Address

The IPv6 Address panel shows one of the following:

- The active service mode address if the cluster has an IPv6 address. This can be either a configured or fixed address, or it can be an address obtained through DHCP.
- DHCP Failed if the IPv6 service address is configured for DHCP but the node was unable to obtain an IP address.
- DHCP Configuring if the IPv6 service address is configured for DHCP while the node attempts to obtain an IP address. This changes to the IPv6 address automatically if a DHCP address is allocated and activated.
- A blank line if the cluster does not have an IPv6 address.

If the service IPv6 address was not set correctly or a DHCP address was not allocated, you have the option of correcting the IPv6 address from this panel. Note that the service IP address must be in the same subnet as the cluster IP address.

To set a fixed service IPv6 address from the IPv6 Address: panel, perform the following steps:

1. Press and release the select button to put the panel in edit mode. When the panel is in edit mode, the full address is still shown across four panels as eight (4-digit) hexadecimal values. You edit each digit of the hexadecimal values independently. The current digit is highlighted.
2. Press the right or left buttons to move to the number field that you want to set.

3. Press the up button if you want to increase the value that is highlighted; press the down button if you want to decrease that value.
4. When all the fields are set as required, press and release the select button to activate the new IPv6 address.

   The `IPv6 Address:` panel is displayed. The new service IPv6 address is not displayed until it has become active. If the new address has not been displayed after two minutes, check that the selected address is valid on the subnetwork and that the Ethernet switch is working correctly.

To set the service IPv6 address to use DHCP, perform the following steps:
1. Navigate to the IPv6 Address: panel.
2. Press and release the down button. `Set IPv6 DHCP?` is displayed on the front panel.
3. Press and release the select button to activate DHCP, or you can press and release the up button to keep the existing address.
4. If you activate DHCP, `DHCP Configuring` is displayed while the node attempts to obtain a DHCP address. It changes automatically to show the allocated address if a DHCP address is allocated and activated, or it changes to `DHCP Failed` if a DHCP address is not allocated.

   Note: If an IPv6 router is present on the local network, SAN Volume Controller does not differentiate between an autoconfigured address and a DHCP address. Therefore, SAN Volume Controller uses the first address that is detected.

Version

The version option displays the version of the SAN Volume Controller software that is active on the node. The version consists of four fields that are separated by full stops. The fields are the version, release, modification, and fix level; for example, 4.3.2.1.

Build

The Build: panel displays the build level of the SAN Volume Controller software that is currently active on the node.

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 IPv4 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 xiii
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 171

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Verantwortlich für die Konformitätserklärung des EMVG ist die IBM Deutschland GmbH, 70548 Stuttgart.

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Glossary

This glossary includes terms for the IBM System Storage SAN Volume Controller.

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The following cross-references are used in this glossary:

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
>In SAN Volume Controller, a communication service that sends data and

event notifications 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.

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.

contingency capacity

Initially, a fixed amount of unused real capacity that is maintained on a space-efficient virtual disk that is configured to automatically expand its real capacity. It is also the difference between the used capacity and the new real capacity when the real capacity is changed manually.

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)
An F_port on 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.

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.

GUI See *graphical user interface*.

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*.

hop One segment of a transmission path between adjacent nodes in a routed network.

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

IBM System Storage Productivity Center (SSPC)
An integrated hardware and software solution that provides a single point of entry for managing SAN Volume Controller clusters, IBM System Storage DS8000 systems, and other components of a data storage infrastructure.

IBM TotalStorage Enterprise Storage Server (ESS)
An IBM product that provides an intelligent disk-storage subsystem across an enterprise.

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. IPv4 is the dominant network layer protocol on the Internet, and IPv6 is designated as its successor. IPv6 provides a much larger address space, which enables greater flexibility in assigning addresses and simplifies routing and renumbering.

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
> A hop on an interswitch link (ISL). 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. For SAN Volume Controller version 4.2.1 and earlier, the master console was purchased either as software that was installed and configured on a server or as a hardware platform with preinstalled operating system and master console software. See *IBM System Storage Productivity Center*.

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*.

mirrored virtual disk
A virtual disk (VDisk) with two VDisk copies.

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.

overallocated volume
> See *space-efficient virtual disk*.

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
A number that can be either: 0, 1 or 2

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.

real capacity
> The amount of storage that is allocated to a virtual disk copy from a managed disk group.

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 run commands in a remote machine, and to move files from one machine to another.

Secure Sockets Layer (SSL)
A security protocol that provides communication privacy. With SSL, client/server applications can communicate in a way that is designed to prevent eavesdropping, tampering, and message forgery.

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.

fibre-channel SFP connector
See *small form-factor pluggable connector*.

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.

small form-factor pluggable (SFP) connector
A compact optical transceiver that provides the optical interface to a fibre-channel cable.

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*.

space-efficient VDisk
See *space-efficient virtual disk*.

space-efficient virtual disk
A virtual disk that has different virtual capacities and real capacities.

SSH See *Secure Shell*.

SSPC See *IBM System Storage Productivity Center (SSPC)*.

SSL See *Secure Sockets Layer*.

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
Can issue any command-line interface (CLI) command. A superuser can view and work with the following panels: View users, Add cluster, Remove cluster, Add users, and Modify users. Only one Superuser role is available.

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.

thinly provisioned volume
> See *space-efficient virtual disk*.

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)

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
> 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.

V

valid configuration
> A configuration that is supported.

VDisk   See *virtual disk (VDisk)*.

VDisk copy
> See *virtual disk copy*.

virtual capacity
> The amount of storage that is available to a server on a virtual disk (VDisk) copy. In a space-efficient virtual disk, the virtual capacity can be different from the real capacity. In a standard virtual disk, the virtual capacity and real capacity are the same.

virtual disk copy
> A physical copy of the data that is stored on a virtual disk (VDisk). Mirrored VDisks have two such copies. Nonmirrored VDisks have one copy.

virtual disk (VDisk)
> A device that host systems in a 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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Numerics

Readers' Comments — We'd Like to Hear from You

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Hardware Installation Guide
Version 4.3.0

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