IBM TotalStorage SAN Volume Controller

IBM

Installation Guide

Version 1.2.1

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Version 1.2.1

Fourth Edition (October 2004)

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

Contents

Figures

Tables

About this guide

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

Related concepts

Chapter 1, "SAN Volume Controller," on page 1
The SAN Volume Controller is a SAN appliance that attaches open-systems storage devices to supported open-systems hosts.

Related reference

Chapter 4, "Installing the uninterruptible power supply, the master console, and the SAN Volume Controller," on page 19
These are the steps you need to do to install the SAN Volume Controller and the uninterruptible power supply.

Chapter 5, "Using the front panel display on the SAN Volume Controller," on page 39
The front panel display contains status and menu indicators.

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, the uninterruptible power supply, and the master console at a customer site.

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 SC26-7541-03 SAN Volume Controller 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 version includes the following new information since the previous edition, SC26-7541-02.

* Clusters can contain from one to four pairs of nodes.
* A cluster must have two to four uninterruptible power supply units depending on the number of nodes.

Changed information

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

* Operational states of the Ethernet port clarified.

Emphasis

Different typefaces are used in this guide to show emphasis.

The following typefaces are used to show emphasis:

Table 1. Emphasis descriptions

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 TotalStorage SAN Volume Controller
- Other IBM publications that relate to the SAN Volume Controller

SAN Volume Controller library

Table 2 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) on a compact disc (CD) that comes with the SAN Volume Controller. If you need additional copies of this CD, the order number is SK2T-8811. These publications are also available as PDF files from the following Web site:

http://www-1.ibm.com/servers/storage/support/virtual/2145.html

Table 2. Publications in the SAN Volume Controller library

Title	Description	Order number
IBM TotalStorage SAN Volume Controller: CIM Agent Developer's Reference	This reference guide describes the objects and classes in a Common Information Model (CIM) environment.	SC26-7590
IBM TotalStorage 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).	SC26-7544

Table 2. Publications in the SAN Volume Controller library (continued)

Title	Description	Order number
IBM TotalStorage SAN Volume Controller: Configuration Guide	This guide provides guidelines for configuring your SAN Volume Controller.	SC26-7543
IBM TotalStorage SAN Volume Controller: Host Attachment Guide	This guide provides guidelines for attaching the SAN Volume Controller to your host system.	SC26-7575
IBM TotalStorage SAN Volume Controller: Installation Guide	This guide includes the instructions the service representative uses to install the SAN Volume Controller.	SC26-7541
IBM TotalStorage 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.	GA22-1052
IBM TotalStorage SAN Volume Controller: Service Guide	This guide includes the instructions the service representative uses to service the SAN Volume Controller.	SC26-7542
IBM TotalStorage SAN Volume Controller: Translated Safety Notices	This guide contains the danger and caution notices for the SAN Volume Controller. The notices are shown in English and in numerous other languages.	SC26-7577

Other IBM publications

Table 3 lists and describes other IBM publications that contain additional information related to the SAN Volume Controller.

Table 3. Other IBM publications

Title	Description	Order number
IBM TotalStorage Enterprise Storage Server, IBM TotalStorage SAN Volume Controller, IBM TotalStorage SAN Volume Controller for Cisco MDS 9000, Subsystem Device Driver: User's Guide	This guide describes the IBM Subsystem Device Driver Version 1.5 for TotalStorage Products and how to use it with the SAN Volume Controller. This publication is referred to as the *IBM TotalStorage Subsystem Device Driver: User's Guide*.	SC26-7608

Related reference

"How to order IBM publications" on page xii
The publications center is a worldwide central repository for IBM product publications and marketing material.

> **Related information**
> "How to send your comments"

Related Web sites

Table 4 lists Web sites that have information about SAN Volume Controller or related products or technologies.

Table 4. Web sites

Type of information	Web site
SAN Volume Controller support	http://www-1.ibm.com/servers/storage/support/virtual/2145.html
Technical support for IBM storage products	http://www.ibm.com/storage/support/

How to order IBM publications

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

The IBM publications center

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:

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

Publications notification system

The IBM publications center Web site offers you a notification system for IBM publications. Register and you can create your own profile of publications that interest you. The publications notification system sends you a daily e-mail that contains information about new or revised publications that are based on your profile.

If you want to subscribe, you can access the publications notification system from the IBM publications center at the following Web site:

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

> **Related reference**
> "SAN Volume Controller library and related publications" on page x
> A list of other publications that are related to this product are provided to you for your reference.

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.

Related reference

"SAN Volume Controller library and related publications" on page x
A list of other publications that are related to this product are provided to you for your reference.

Definitions of notices

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

The following notices are used throughout this library to convey the following 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 situation in which damage could 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.**

Danger notices for the uninterruptible power supply

Ensure that you understand the danger notices for the uninterruptible power supply.

Use the reference numbers in parentheses, for example (1), at the end of each notice to find the matching translated notice.

DANGER

> **An electrical outlet that is not correctly wired could place a hazardous voltage on the metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (1)**

DANGER

> **To prevent possible electrical shock during an electrical storm, do not connect or disconnect cables or station protectors for communications lines, display stations, printers, or telephones. (2)**

DANGER

> **Do not attempt to open the covers of the power supply. Power supplies are not serviceable and are replaced as a unit. (3)**

DANGER

> **To prevent a possible electrical shock when installing the device, ensure that the power cord for that device is unplugged before installing signal cables. (4)**

DANGER

> **The uninterruptible power supply contains lethal voltages. All repairs and service should be performed by an authorized service support representative only. There are no user serviceable parts inside the uninterruptible power supply. (5)**

Related reference

"Caution notices for the uninterruptible power supply"
Ensure that you understand the caution notices for the uninterruptible power supply.

Danger notices for the SAN Volume Controller

Ensure that you are familiar with the danger notices on the SAN Volume Controller.

Use the reference numbers in parentheses, for example (1), at the end of each notice to find the matching translated notice.

DANGER

> **Do not try to open the covers of the power supply assembly (32).**

Related reference

"Caution notices for the SAN Volume Controller" on page xvi
Ensure that you understand the caution notices for the SAN Volume Controller.

Caution notices for the uninterruptible power supply

Ensure that you understand the caution notices for the uninterruptible power supply.

Use the reference numbers in parentheses, for example (1), at the end of each notice to find the matching translated notice.

CAUTION:
The uninterruptible power supply contains its own energy source (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. This 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 comply with international standards and wiring regulations, the total equipment connected to the output of the uninterruptible power supply must not have an earth leakage current greater than 2.5 milliamperes. (14)

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

The uninterruptible power supply weighs 39 kg (86 lb) with the electronics assembly and the battery assembly installed:

- **Do not attempt to lift the uninterruptible power supply by yourself. Ask another service representatives for assistance.**
- **Remove the battery assembly from the uninterruptible power supply before removing the uninterruptible power supply from the shipping carton.**
- **Do not attempt to install the uninterruptible power supply into the rack unless the electronics assembly and the battery assembly have been removed.**

CAUTION:
The electronics assembly weighs 6.4 kg (14 lb). Take care when you remove it from the uninterruptible power supply. (16)

CAUTION:
The uninterruptible power supply battery unit weighs 21 kg (45 lb). Do not attempt to lift the uninterruptible power supply battery unit by yourself. Ask another service representative for aid. (18)

CAUTION:
Do not dispose of the battery in a fire. The battery might explode. Correct disposal of the battery is required. Refer to your local regulations for disposal requirements. (20)
   Related reference

"Danger notices for the uninterruptible power supply" on page xiii
Ensure that you understand the danger notices for the uninterruptible power supply.

Caution notices for the SAN Volume Controller

Ensure that you understand the caution notices for the SAN Volume Controller.

Use the reference numbers in parentheses, for example (1), at the end of each notice to find the matching translated notice.

CAUTION:
This product contains a registered/certified class 1 laser that complies with the FDA radiation performance standards and is in compliance with the IEC/EN 60825-1 standards. (21)

CAUTION:
A lithium battery can cause fire, explosion, or a severe burn. Do not recharge, disassemble, heat above 100°C (212°F), solder directly to the cell, incinerate, or expose cell contents to water. Keep away from children. Replace only with the part number specified for your system. Use of another battery might present a risk of fire or explosion. The battery connector is polarized; do not attempt to reverse the polarity. Dispose of the battery according to local regulations. (22)

> **Related reference**
>
> "Danger notices for the SAN Volume Controller" on page xiv
> Ensure that you are familiar with the danger notices on the SAN Volume Controller.

Inspecting the SAN Volume Controller for unsafe conditions

Be cautious of potential safety hazards that are not covered in the safety checks. If unsafe conditions are present, determine how serious the hazards are and whether you should continue before correcting the problem.

Consider the following conditions and the safety hazards they present:

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.

Using the following inspection checklist as a guide, inspect the IBM® TotalStorage® SAN Volume Controller for unsafe conditions. If necessary, see any suitable safety publications.

1. Turn off the SAN Volume Controller.
2. Check the frame for damage (loose, broken, or sharp edges).
3. Check the power cables and ensure that:
   a. 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. The insulation is not worn or damaged.

4. Check for any obvious nonstandard changes. 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, 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 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.

   Related tasks

   "Checking the grounding of the SAN Volume Controller and the uninterruptible power supply" on page xviii
   Ensure that you understand how to check the grounding.

External machine checks

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

Perform the following external machine checks before you install the SAN Volume Controller:

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.

   Related tasks

   "Inspecting the SAN Volume Controller for unsafe conditions" on page xvi
   Be cautious of potential safety hazards that are not covered in the safety checks. If unsafe conditions are present, determine how serious the hazards are and whether you should continue before correcting the problem.

Internal machine checks

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

Perform the following internal machine checks before you install the SAN Volume Controller:

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.

Related tasks

"Inspecting the SAN Volume Controller for unsafe conditions" on page xvi
Be cautious of potential safety hazards that are not covered in the safety
checks. If unsafe conditions are present, determine how serious the hazards are
and whether you should continue before correcting the problem.

"External machine checks" on page xvii
Ensure that you perform an external machine check on the SAN Volume
Controller.

Checking the grounding of the SAN Volume Controller and the uninterruptible power supply

Ensure that you understand how to check the grounding.

Figure 1 shows the connectors for the SAN Volume Controller and the
uninterruptible power supply.

Perform the following steps to ensure that the SAN Volume Controller is properly
grounded:

1. Ensure that all power is removed.

2. Ensure that the power cable **1** is plugged into the uninterruptible power supply.
   Also ensure that the other ends of the power cable are connected to the power
   supply in the rack. See Figure 1.
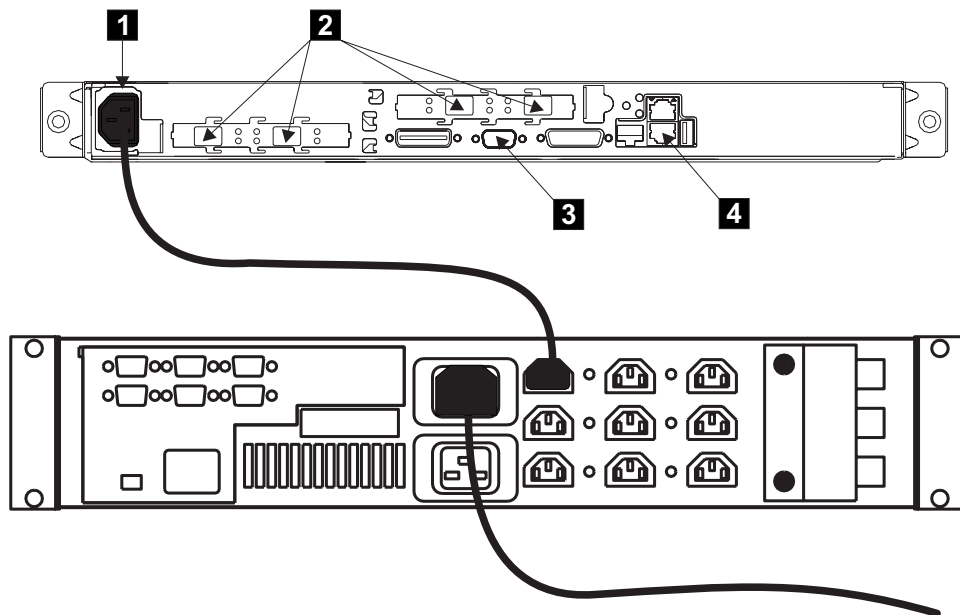
Figure 1. Power cable and signal sockets

3. **Attention:** Some electrical circuits could be damaged if the external signal
   cables are present at the SAN Volume Controller while the grounding check is
   being done.

   Ensure that no external cables are present at connectors **2** and **3** .

4. Disconnect and remove the Ethernet cable from connector **4** .

5. Follow your local procedures and check the grounding of the SAN Volume
   Controller. Any test equipment must be connected to the frame of the SAN
   Volume Controller.

If the grounding is correct, go no further with these instructions.

If the grounding is *not* correct, unplug the power cable **1** from the uninterruptible power supply in the SAN Volume Controller.

6. Check for continuity between the frame of the SAN Volume Controller and the ground pin (**1** in Figure 2) of each main power connector.
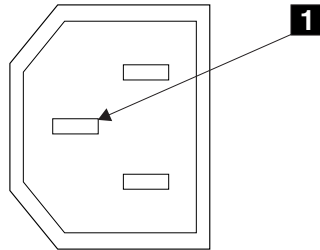
Figure 2. Ground pin

7. If the uninterruptible power supply has no continuity, exchange it for a new one. Then perform a complete grounding check again.

If the uninterruptible power supply has continuity, you might have a problem with the power cable or with the grounding of the host system.

8. Check the power cable for continuity.

If the power cable does not have continuity, exchange it for a new one, then perform step 1 on page xviii through step 5 on page xviii again.

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 the safety hazards they present:

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.

Be cautious of potential safety hazards that are not covered in the safety checks. If unsafe conditions are present, determine how serious the hazards are and whether you should continue before correcting 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. File a claim for shipping damage within fifteen days of receipt of the equipment.

Preparing your SAN Volume Controller environment

Before installing the SAN Volume Controller, prepare the physical environment.

Dimensions and weight

Height	Width	Depth	Maximum Weight
43 mm (1.7 in.)	440 mm (17.3 in.)	660 mm (26 in.)	12.7 kg (28 lb.)

Additional space requirements

Location	Additional Space Required	Reason
Left and right sides	50 mm (2 in.)	Cooling air flow
Back	minimum: 100 mm (4 in.)	Cable exit

AC input-voltage requirements

Table 5.

Power Supply Assembly Type	Voltage	Frequency
200 to 240V	88 to 264 V ac	50 to 60 Hz

Environment

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)	–	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)

Heat output (maximum)

350 watts (1195 Btu per hour)

Related reference

"Preparing your uninterruptible power supply environment" on page xxi
Ensure that your physical site meets the installation requirements for the
uninterruptible power supply.

Preparing your uninterruptible power supply environment

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

Your uninterruptible power supply should be configured with the following considerations:

- Each 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 uninterruptible power supply.
- The voltage supplied to the uninterruptible power supply must be 200–240 V single phase.
- The frequency supplied must be between 50 and 60 Hz.

Attention: Ensure that you comply with the following requirements for uninterruptible power supplies.

Note: 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% with any single harmonic being less than 1%. The uninterruptible power supply must also have input voltage capture that has a slew rate faster than 3 Hz per second and 1 msec glitch rejection.

Dimensions and weight

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

AC input-voltage requirements

Power Supply Assembly Type	Voltage	Frequency
200 to 240 V	160 to 288 V ac	50 to 60 Hz

Environment

	Operating Environment	Non-operating Environment	Storing Environment	Shipping Environment
Air Temperature	0°C to 40°C (32°F to 104°F)	0°C to 40°C (32°F to 104°F)	0°C to 25°C (32°F to 77°F)	−25°C to 55°C (−13°F to 131°F)
Relative Humidity	5% to 95% non-condensing	5% to 95% non-condensing	5% to 95% non-condensing	5% to 95% non-condensing

Altitude

	Operating Environment	Non-operating Environment	Storing Environment	Shipping Environment
Altitude (from sea level)	0 to 2000 m (0 to 6560 ft.)	0 to 2000 m (0 to 6560 ft.)	0 to 2000 m (0 to 6560 ft.)	0 to 15 000 m (0 to 49212 ft.)

Heat output (maximum)

142 watts (485 Btu per hour) during normal operation.

553 watts (1887 Btu per hour) when power has failed and the uninterruptible power supply is supplying power to the nodes of the SAN Volume Controller.

> **Related reference**
>
> "Preparing your SAN Volume Controller environment" on page xix
> Before installing the SAN Volume Controller, prepare the physical environment.

Preparing your master console environment

Ensure that your physical site meets the installation requirements for the master console server and console monitor kit.

Server dimensions and weight

Height	Width	Depth	Maximum Weight
43 mm (1.7 in.)	430 mm (16.69 in.)	424 mm (16.69 in.)	12.7 kg (28 lb.)

Note: The above dimensions are for a 1U monitor and keyboard assembly.

Server AC and input-voltage requirements

Power Supply	Electrical Input

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

Server environment

Environment	Temperature	Altitude	Relative Humidity
Server On	10° to 35°C (50°F to 95°F)	0 to 914 m (2998.0 ft.)	8% to 80%

Environment	Temperature	Altitude	Relative Humidity
Server Off	-40°C to 60°C (-104°F to 140°F)	Maximum: 2133 m (6998.0 ft.)	8% to 80%

Server heat output

Approximate heat output in British thermal units (BTU) per hour:
- Minimum configuration: 87 watts (297 BTU)
- Maximum configuration: 150 watts (512 BTU)

Monitor console kit dimensions and weight

Height	Width	Depth	Maximum Weight
43 mm (1.7 in.)	483 mm (19.0 in.)	483 mm (19.0 in.)	17.0 kg (37.0 lb.)

Related reference

"Preparing your uninterruptible power supply environment" on page xxi
Ensure that your physical site meets the installation requirements for the uninterruptible power supply.

Emergency power-off (EPO) event

In the event of a room emergency power-off (EPO) shutdown, the SAN Volume Controller completes the process of shutting down the output from the uninterruptible power supplies within 5 minutes.

Attention: If an EPO event occurs and the uninterruptible power supply is not connected to at least one operational SAN Volume Controller the output cables of the uninterruptible power supply must be unplugged to remove output power from the uninterruptible power supply.

Checking the safety labels on the SAN Volume Controller

Ensure that you check and understand the safety labels on the SAN Volume Controller.

The following topics describe how to check the labels on the SAN Volume Controller.

Perform the following label checks:
1. Agency/ratings label. See Figure 3 on page xxiv.

A E   E 14

DE

■   4

A

■ 100- 40   ∿ 0 0

3 - 1 A

4 3

IBM®

Marca Registrada

A E
A
A

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

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

1
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MIC

E-D019-00-3904(A)

РСТ

ME01

340 4

SP
E 09 0

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

CE

NOM-018

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

1 4

Figure 3. Agency/ratings label for the SAN Volume Controller

2. No user access label. See Figure 4.

Figure 4. No user access label for the SAN Volume Controller

3. Class 1 laser label. See Figure 5.

	This product contains a registered/certified Class I laser device that complies with the FDA radiation performance standards and is in compliance with the ICE/EN60825-1 standards.
Class 1 Laser	
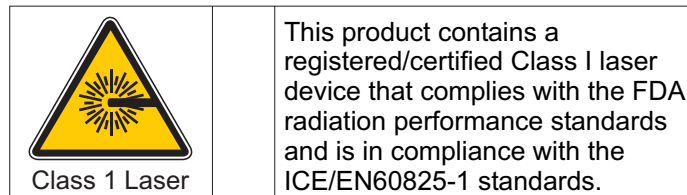
Figure 5. Class 1 laser label

Checking the labels on the outside of the uninterruptible power supply

You need to understand and check the labels on the outside of the uninterruptible power supply.

Perform the following safety label checks for the uninterruptible power supply:

1. Agency label. See Figure 6 on page xxv.

EC: H63317
IBM Model: 2145UPS
P18P5864
SNYM1000YMDXXX [4.4]

```
c(UL)us
LISTED
UPS
33C0
E82662
```

Input ~ :
   200-240V, 50/60Hz
   16A MAX
Input ⎓ : DC 120V, 30A
Output ~ :
   200-240V, 50/60Hz
   15A MAX
   3000VA/2700W

CE

   Assembled in Mexico - TWWYY [4.7]

Figure 6. Agency label for the uninterruptible power supply

2. Rear panel configuration. See Figure 7 is installed on the cover of the power supply of the SAN Volume Controller.

COM
INPUT INLET
LOAD GROUP 1 16A MAX
LOAD GROUP 1 10A MAX
LOAD GROUP 2 10A MAX
LOAD GROUP 3 10A MAX
BREAKER 1
BREAKER 2
BREAKER 3

1 2 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.

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

Assembled in Mexico

Figure 7. Rear panel configuration label

3. Three-man lift. See Figure 8.

32 – 55 kg (70.5 – 121.2 lbs.)
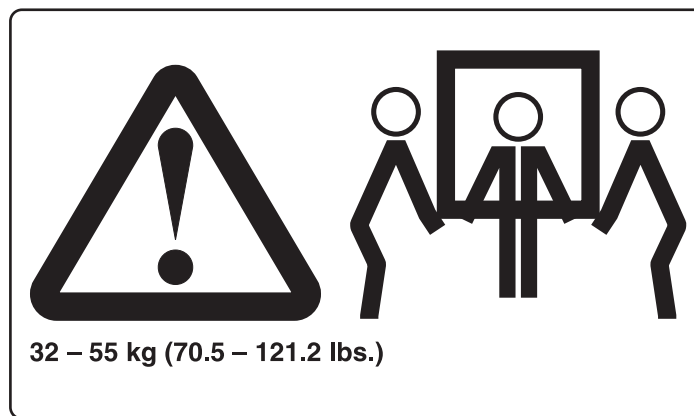
Figure 8. Three-man lift label

4. Weight label. See Figure 9 on page xxvi.

Figure 9. Weight label for the uninterruptible power supply

5. IT compatible label. See Figure 10.

THIS UNIT IS SUITABLE
FOR AN "IT-POWER
SYSTEM" CONNECTION
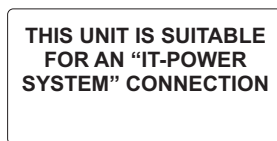
Figure 10. IT compatible label for the uninterruptible power supply

6. No user access label. See Figure 11.

Figure 11. No user access label for the uninterruptible power supply

Environmental notices and statements

Ensure that you are familiar with the environmental notices and statements.

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

Product recycling

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

This unit contains recyclable materials. These materials should be recycled where processing sites are available and according to local regulations. In some areas, IBM provides a product take-back program that ensures proper handling of the product. Contact your IBM representative for more information.

Product disposal

Ensure that you are aware of the proper disposal for certain parts on the SAN Volume Controller.

This unit might contain batteries. Remove and discard these batteries, or recycle them, according to local regulations.

Battery disposal

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

CAUTION:
A lithium battery can cause fire, explosion, or a severe burn. Do not recharge, disassemble, heat above 100°C (212°F), solder directly to the cell, incinerate, or expose cell contents to water. Keep away from children. Replace only with the part number specified for your system. Use of another battery might present a risk of fire or explosion. The battery connector is polarized; do not attempt to reverse the polarity. Dispose of the battery according to local regulations. (51)

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 its 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 handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

Chapter 1. SAN Volume Controller

The SAN Volume Controller is a SAN appliance that attaches open-systems storage devices to supported open-systems hosts.

The IBM TotalStorage SAN Volume Controller provides symmetric virtualization by creating a pool of managed disks from the attached storage subsystems, which are then mapped to a set of virtual disks for use by attached host computer systems. System administrators can view and access a common pool of storage on the SAN, which enables them to use storage resources more efficiently and provides a common base for advanced functions.

The SAN Volume Controller is analogous to a logical volume manager (LVM) on a SAN. It performs the following functions for the SAN storage that it is controlling:

- Creates a single pool of storage
- Manages logical volumes
- Provides advanced functions for the SAN, such as:
  - Large scalable cache
  - Copy services
    - Point-in-time Copy
    - FlashCopy® (point-in-time copy)
    - Remote Copy (synchronous copy)
    - Data migration
  - Space management
    - Mapping that is based on desired performance characteristics
    - Quality of service metering

A *node* is a single storage engine. See Figure 12 on page 2 for a visual of a node. The storage engines are always installed in pairs with one to four pairs of nodes constituting a *cluster*. Each node in a pair is configured to back up the other. 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 for resilience. Each virtual volume is defined to an I/O group. To avoid any single point of failure, the nodes of an I/O group are protected by independent uninterruptible power supply units.
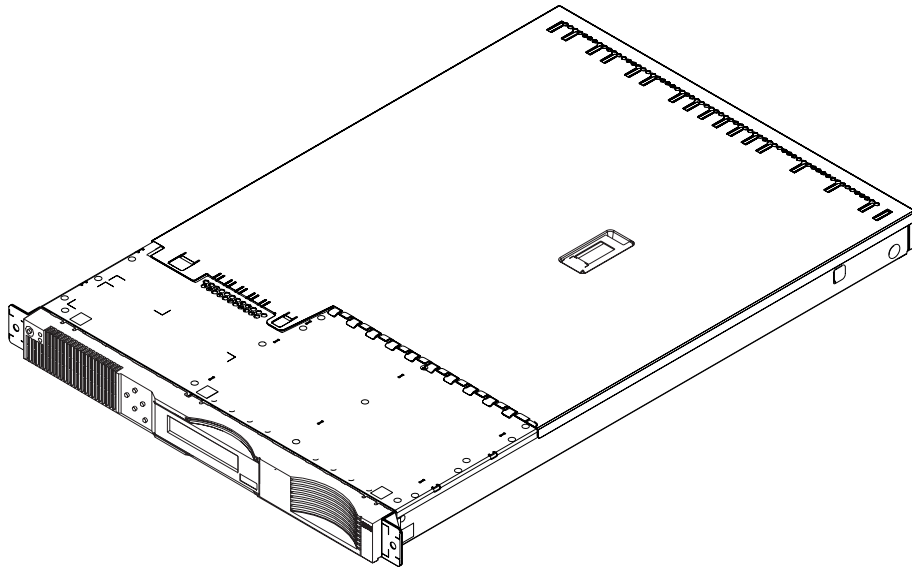
Figure 12. A SAN Volume Controller node

The SAN Volume Controller I/O groups see the storage presented to the SAN by the backend controllers as a number of disks known as *managed disks*. The application services do not see these managed disks. Instead they see a number of logical disks, known as *virtual disks*, that are presented to the SAN by the SAN Volume Controller. Each node must only be in one I/O group and provide access to the virtual disks in the I/O group.

The SAN Volume Controller helps to provide continuous operations and can also optimize the data path to ensure performance levels are maintained. Ensure that you use IBM TotalStorage Multiple Device Manager performance manager to analyze the performance statistics. See *IBM TotalStorage Multiple Device Manager Configuration and Installation Guide* and *IBM TotalStorage Multiple Device Manager CLI Guide* for more information.

The fabric contains two distinct zones: a host zone and a disk zone. In the host zone, the host systems can identify and address the nodes. You can have more than one host zone. Generally, you will create one host zone per operating system type. In the disk zone, the nodes can identify the disk drives. Host systems cannot operate on the disk drives directly; all data transfer occurs through the nodes. As shown in Figure 13 on page 3, several host systems can be connected to a SAN fabric. A cluster of SAN Volume Controllers is connected to the same fabric and presents virtual disks to the host systems. You configure these virtual disks using the disks located on the RAID controllers.

Note: You can have more than one host zone. Generally you create one host zone per operating system type because some operating systems will not tolerate other operating systems in the same zone.
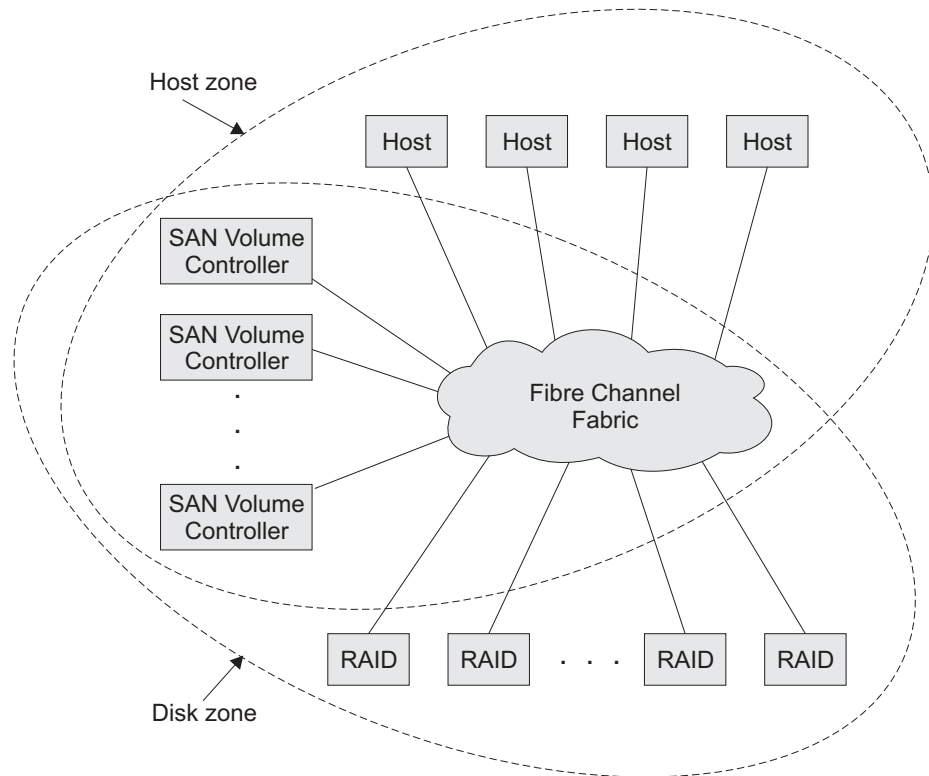
Figure 13. Example of a SAN Volume Controller in a fabric

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

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

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

SAN Volume Controller operating environment
- Minimum of one pair of SAN Volume Controller nodes
- Minimum two uninterruptible power supplies
- One master console is required per SAN installation for configuration

Features of a SAN Volume Controller node
- 19-inch rack mounted enclosure
- 4 fibre channel ports
- 2 fibre channel adapters

- 4 GB cache memory

Supported hosts

For a list of supported operating systems, see the IBM TotalStorage SAN Volume Controller Web site at:

http://www-1.ibm.com/servers/storage/support/virtual/2145.html

Multipathing software
- IBM Subsystem Device Driver (SDD)
- Redundant Dual Active Controller (RDAC)

Note: Direct attach hosts sharing a back end storage controller with a SAN Volume Controller can run multipath drivers SDD and RDAC. There is no support for the co-existence of native multipath drivers with SDD on the same host.

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

http://www-1.ibm.com/servers/storage/support/virtual/2145.html

User interfaces

The SAN Volume Controller provides the following user interfaces:
- IBM TotalStorage 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) using Secure Shell (SSH)

Application programming interfaces

The SAN Volume Controller provides the following application programming interface:
- IBM TotalStorage Common Information Model (CIM) Agent for the SAN Volume Controller, which supports the Storage Management Initiative Specification of the Storage Network Industry Association.

Controls and indicators for the SAN Volume Controller

Controls and indicators are located on the front panel of the SAN Volume Controller.

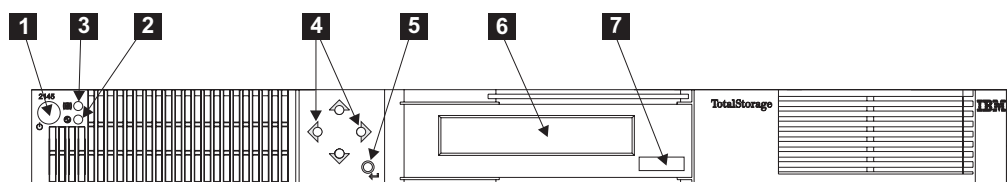All the controls for the SAN Volume Controller are located on the front panel (see Figure 14).

Figure 14. SAN Volume Controller front panel assembly

1 Power button

2 Power LED

3 Check LED

4 Navigation buttons

5 Select button

6 Front panel display

7 Label

Related reference

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

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

"Check LED" on page 6
The amber check LED is lit continuously if a critical failure occurs in the service controller.

"Navigation buttons" on page 6
Use the navigation buttons to move through the menu.

"Select button" on page 6
Use the select button to select an item from a menu.

"Front panel display" on page 7
The front panel display shows service, configuration, and navigation information.

"Node identification label" on page 7
The node identification label on the front panel displays a six-digit node identification number.

Power button

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

To turn on the power, press and release the power button **1** .

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

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

Related reference

"Controls and indicators for the SAN Volume Controller" on page 4
Controls and indicators are located on the front panel of the SAN Volume Controller.

Power LED

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

The properties of the green power LED **2** are as follows:

Off

- One or more output voltages from the power supply are not present.

On

- All the output voltages from the power supply are present.

Blinking

- The service controller, which provides the graphics and text for the front panel display, is in standby mode. (The rate of blinking is 0.5 seconds on, 0.5 seconds off.)

  Related reference

  "Controls and indicators for the SAN Volume Controller" on page 4
  Controls and indicators are located on the front panel of the SAN Volume Controller.

Check LED

The amber check LED is lit continuously if a critical failure occurs in the service controller.

If the check LED **3** is off and the power LED **2** is on, the service controller is working correctly.

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

  Related reference

  "Controls and indicators for the SAN Volume Controller" on page 4
  Controls and indicators are located on the front panel of the SAN Volume Controller.

Navigation buttons

Use the navigation buttons to move through the menu.

Four navigational buttons **4** are provided, arranged in a circle.

To move up, press the top button in the circle; to move right, press the right button in the circle. The fifth button, which is outside the circle, is the select button.

  Related reference

  "Controls and indicators for the SAN Volume Controller" on page 4
  Controls and indicators are located on the front panel of the SAN Volume Controller.

Select button

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

The select button **5** is located on the front panel of the SAN Volume Controller.

  Related reference

  "Controls and indicators for the SAN Volume Controller" on page 4
  Controls and indicators are located on the front panel of the SAN Volume Controller.

Front panel display

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

Information on the front panel display **6** is available in several national languages. The display can show both alphanumeric information and graphical information (progress bars).

The front panel displays configuration and service information about the SAN Volume Controller and the SAN Volume Controller cluster including the following items:

- Hardware boot
- Node rescue request
- Boot progress
- Boot failed
- Powering off
- Restarting
- Shutting down
- Power failure
- Error codes

    Related reference

    "Controls and indicators for the SAN Volume Controller" on page 4
    Controls and indicators are located on the front panel of the SAN Volume Controller.

Node identification label

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

The node identification label **7** is the same as the six-digit number used in the `addnode` command, 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 front panel is replaced the configuration and service software will display the number that is printed on the front of the replacement panel. Future error reports will also contain the new number. No cluster reconfiguration is necessary when the front panel is replaced.

The node also contains a SAN Volume Controller product serial number that is imbedded on the system board hardware. This number is used for warranty and service entitlement checking and is included in the data sent with error reports. It is essential that this number is not changed during the life of the product. If the system board is replaced you must follow the system board replacement instructions carefully and rewrite the serial number on the system board.

    Related reference

    "Controls and indicators for the SAN Volume Controller" on page 4
    Controls and indicators are located on the front panel of the SAN Volume Controller.

Chapter 2. Uninterruptible power supply overview

The uninterruptible power supply provides the SAN Volume Controller with a secondary power source to be used if you lose power from your primary power source due to power failures, power sags, power surges, or line noise.

If a power outage occurs, the uninterruptible power supply will maintain power long enough to save any configuration and cache data contained in the dynamic random access memory (DRAM). The data will be saved to the SAN Volume Controller internal disk. Figure 15 provides a visual of the uninterruptible power supply.
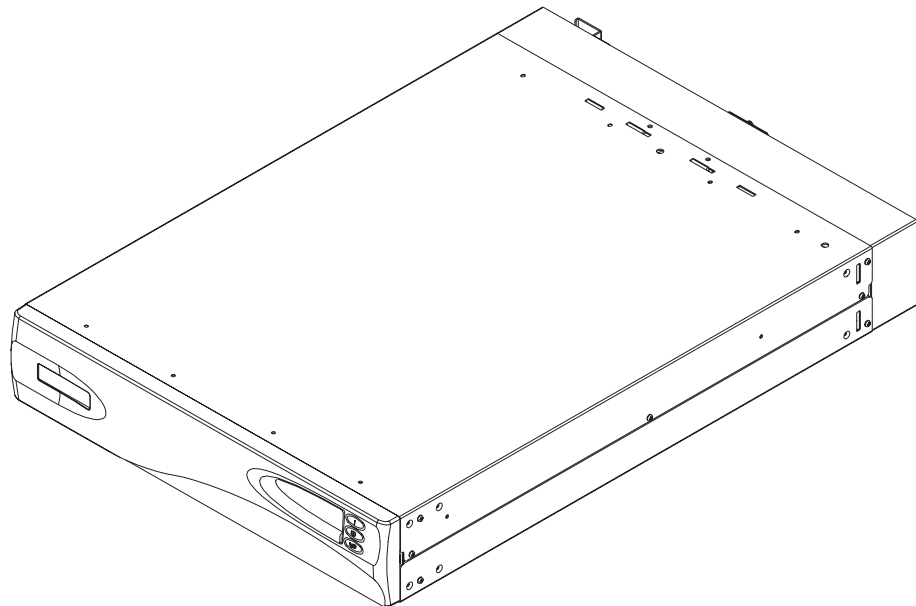

Figure 15. Uninterruptible power supply

Note: The SAN Volume Controller uninterruptible power supply is an integral part of the SAN Volume Controller solution, and maintains continuous SAN Volume Controller specific communications with its attached SAN Volume Controller nodes. The SAN Volume Controller will not operate without the uninterruptible power supply. The SAN Volume Controller uninterruptible power supply must be used in accordance with documented guidelines and procedures and must not power any equipment other than SAN Volume Controller nodes.

To provide full redundancy and concurrent maintenance, the SAN Volume Controller must be installed in pairs. Each SAN Volume Controller of a pair must be connected to a different uninterruptible power supply. Each uninterruptible power supply can support up to two SAN Volume Controller nodes. It is also recommended that you connect the two uninterruptible power supply units for the pair to different independent electrical power sources. This reduces the chance of an input power failure at both uninterruptible power supply units.

The uninterruptible power supply must be in the same rack as the nodes. When using 6 or 8 node support, ensure that 4 uninterruptible power supplies are used. Ensure that you are following the uninterruptible power supply support guidelines as

9

described below:

Number of nodes	Number of uninterruptible power supplies
2	2
4	2
6	4
8	4

Attention:

1. Do not connect the uninterruptible power supplies to an input power source that does not conform to standards. Review the requirements for uninterruptible power supplies listed under ″Related reference″ at the end of this topic.
2. Each uninterruptible power supply pair must power only one SAN Volume Controller cluster.

Each uninterruptible power supply includes power (line) cords that will connect the uninterruptible power supply to either a rack power distribution unit (PDU), if one exists, or to an external power source. Each uninterruptible power supply power input requires the protection of a UL approved (or equivalent) 250 volt, 15 amp circuit breaker.

The uninterruptible power supply is connected to the SAN Volume Controllers 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 cables enable the SAN Volume Controllers to read status and identification information from the uninterruptible power supply.

Each SAN Volume Controller monitors the operational state of the uninterruptible power supply to which it is attached. If the uninterruptible power supply reports a loss of input power, the SAN Volume Controller stops all I/O operations and dumps the contents of its DRAM to the internal disk drive. When input power to the uninterruptible power supply is restored, the SAN Volume Controllers restart and restore the original contents of the DRAM from the data saved on the disk drive.

A SAN Volume Controller is not fully operational until the uninterruptible power supply battery charge state indicates that it has sufficient capacity to power the SAN Volume Controller for long enough to permit it to save all its memory to the disk drive in the event of a power loss. The uninterruptible power supply has sufficient capacity to save all the data on the SAN Volume Controller at least twice. For a fully-charged uninterruptible power supply, even after battery capacity has been used to power the SAN Volume Controllers while they save DRAM data, sufficient battery capacity will remain to let the SAN Volume Controllers become fully operational as soon as input power is restored.

Note: Under normal circumstances, if input power is disconnected from the uninterruptible power supply, the SAN Volume Controller(s) connected to that uninterruptible power supply will perform a power down sequence. This operation, which saves the configuration and cache data to an internal disk in the SAN Volume Controller, typically takes about three minutes, at which time power is removed from the output of the uninterruptible power supply. In the event of a delay in the completion of the power down sequence, the

uninterruptible power supply output power will be removed five minutes after the time that power was disconnected to the uninterruptible power supply. Since this operation is controlled by the SAN Volume Controller, an uninterruptible power supply that is not connected to an active SAN Volume Controller will not shut off within the five-minute required period. In the case of an emergency, you will need to manually shut down the uninterruptible power supply by pushing the uninterruptible power supply power off button.

Attention: Data integrity could be compromised by pushing the uninterruptible power supply power off button. Never shut down an uninterruptible power supply without first shutting down the SAN Volume Controller nodes that it supports.

It is very important that the two nodes in the I/O group are connected to different uninterruptible power supplies. This configuration ensures that cache and cluster state information is protected in the event of a failure of the uninterruptible power supply or mainline power source.

When nodes are added to the cluster, you must specify the I/O group they will join. The configuration interfaces will also check the uninterruptible power supply units and ensure that the two nodes in the I/O group are not connected to the same uninterruptible power supply units.

Figure 16 shows a cluster of four nodes, with two I/O groups and two uninterruptible power supply units.
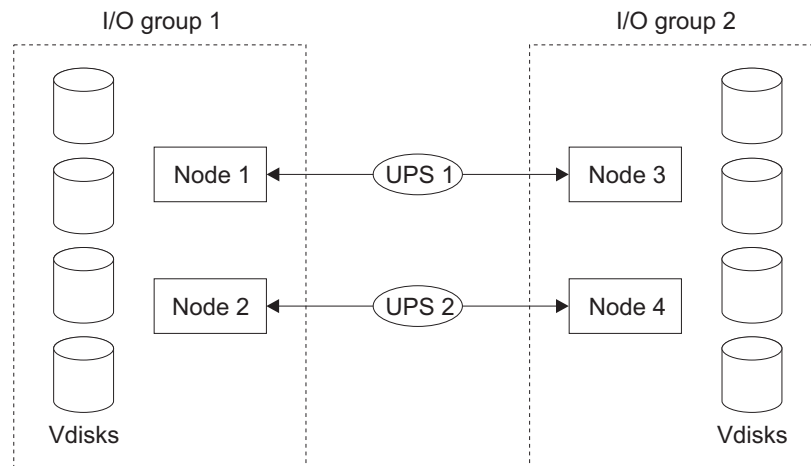

Figure 16. I/O groups and uninterruptible power supply relationship

Related reference

"Preparing your uninterruptible power supply environment" on page xxi
Ensure that your physical site meets the installation requirements for the uninterruptible power supply.

Controls and indicators for the uninterruptible power supply

All controls for the uninterruptible power supply are located on the front panel assembly.
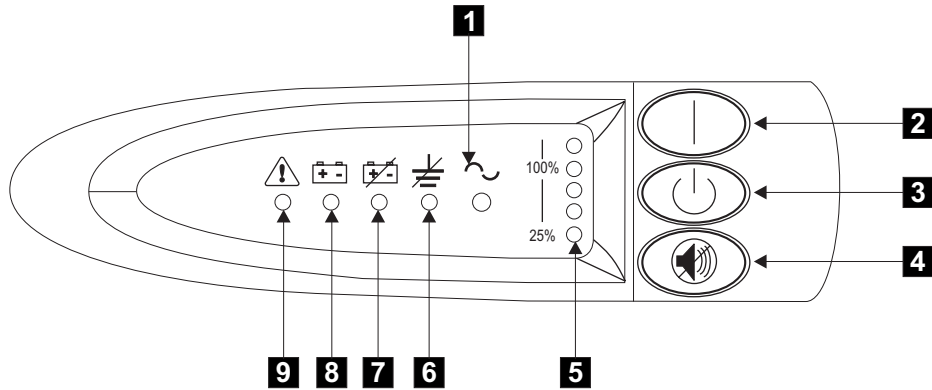
See Figure 17 on page 12.

Figure 17. 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

Related reference

"Mode indicator" on page 13
The mode indicator provides status information on the uninterruptible power supply.

"On button" on page 13
The on button turns on the main power to the uninterruptible power supply.

"Off button" on page 13
The off button turns off the main power to the uninterruptible power supply.

"Test and alarm reset button" on page 14
Use the test and alarm reset button to start the self-test.

"Load-level indicators" on page 14
The load-level indicators show the percentage of uninterruptible power supply capacity that the SAN Volume Controller is using.

"Site wiring fault indicators" on page 14
The site wiring fault indicator shows that either a ground wire connection does not exist or the live and neutral wires are reversed in the input power connection.

"Battery service indicator" on page 14
The battery service indicator shows that the charge in the battery has become low while the uninterruptible power supply is in battery mode.

"Battery mode indicator" on page 15
The battery mode indicator shows that the uninterruptible power supply is operating on batteries.

"General alarm indicator" on page 15
The general alarm indicator shows that the battery is low.

Mode indicator

The mode indicator provides status information on the uninterruptible power supply.

The mode indicator **1** is located on the front panel of the uninterruptible power supply.

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

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

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

Related reference

"Controls and indicators for the uninterruptible power supply" on page 11
All controls for the uninterruptible power supply are located on the front panel assembly.

On button

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

To turn on the power, press and hold the on button **2** until you hear a beep (approximately one second). The mode indicator stops flashing, and the load-level indicators **5** display the percentage of load that is being applied to the uninterruptible power supply.

Related reference

"Controls and indicators for the uninterruptible power supply" on page 11
All controls for the uninterruptible power supply are located on the front panel assembly.

Off button

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

Attention: Never use the off button **3** unless you are specifically directed to in the instructions that are given in the publications for the SAN Volume Controller. If you press it at any other time, you might lose data in the cluster if the other 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 uninterruptible power supply remains in standby mode until you disconnect the uninterruptible power supply from the main power outlet.

Related reference

"Controls and indicators for the uninterruptible power supply" on page 11
All controls for the uninterruptible power supply are located on the front panel assembly.

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 **4** for three seconds. This button also resets the alarm.

Related reference

"Controls and indicators for the uninterruptible power supply" on page 11
All controls for the uninterruptible power supply are located on the front panel assembly.

Load-level indicators

The load-level indicators show the percentage of uninterruptible power supply capacity that the SAN Volume Controller is using.

When all the indicators **5** are lit, the power requirements of the SAN Volume Controller have exceeded the capacity of the uninterruptible power supply.

Related reference

"Controls and indicators for the uninterruptible power supply" on page 11
All controls for the uninterruptible power supply are located on the front panel assembly.

Site wiring fault indicators

The site wiring fault indicator 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 **6** is located on the front panel of the uninterruptible power supply.

Related reference

"Controls and indicators for the uninterruptible power supply" on page 11
All controls for the uninterruptible power supply are located on the front panel assembly.

Battery service indicator

The battery service indicator shows that the charge in the battery has become low while the uninterruptible power supply is in battery mode.

The battery service indicator **7** is located on the front panel of the uninterruptible power supply. 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 uninterruptible power supply shuts down, it automatically restarts when the main power returns.

Related reference

"Controls and indicators for the uninterruptible power supply" on page 11
All controls for the uninterruptible power supply are located on the front panel assembly.

Battery mode indicator

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

The battery mode indicator **8** comes on when the main power source fails and the uninterruptible power supply is running on battery power. The alarm beeps once every five seconds. When main power returns, the uninterruptible power supply returns to normal mode, and the battery recharges. The battery mode indicator goes out, and the alarm stops.

Related reference

"Controls and indicators for the uninterruptible power supply" on page 11
All controls for the uninterruptible power supply are located on the front panel assembly.

General alarm indicator

The general alarm indicator shows that the battery is low.

When accompanied by the audio alarm beeping every 5 seconds, the general alarm indicator **9** shows that the battery is low. When accompanied by a continuous audio alarm, it shows that the internal temperature of the uninterruptible power supply is too high, or there has been a momentary output overload.

Related reference

"Controls and indicators for the uninterruptible power supply" on page 11
All controls for the uninterruptible power supply are located on the front panel assembly.

Chapter 3. Master console

The SAN Volume Controller provides a master console that can be used as a single platform to configure, manage, and service the SAN Volume Controller.

The master console allows system administrators to integrate rapidly the SAN Volume Controller into their environment. The master console monitors the configuration of the whole system and all of the internal components. It offers a standard and central location for all aspects of the operation, including SAN topology rendering, SNMP trap management, Call Home (Service Alert) and Remote Service facilities, as well as all the configuration and diagnostic utilities for the components.

Note: VPN connection is required for Remote Service facilities.

The master console provides the following functions:
- Browser support for:
  - SAN Volume Controller Console
  - Fibre-channel switch
- CLI configuration support using Secure Shell (SSH)
- SAN Topology rendering using Tivoli® SAN Manager
- Remote Service capability through VPN
- IBM Director
  - SNMP Trap management
  - Call Home (Service Alert) capability
  - E-mail notification to the customer, for example, to the system administrator

  Related tasks

  "Installing the master console" on page 28
  There are a number of steps you must do to install the master console in the rack.

Chapter 4. Installing the uninterruptible power supply, the master console, and the SAN Volume Controller

These are the steps you need to do to install the SAN Volume Controller and the uninterruptible power supply.

To install the SAN Volume Controller and the uninterruptible power supply, perform the following steps:

1. Preparing for the installation
2. Installing the support rails for the uninterruptible power supply
3. Installing the uninterruptible power supply
4. Installing the master console
5. Installing the support rails for the SAN Volume Controller
6. Installing the SAN Volume Controller into the rack
7. Connecting the SAN Volume Controller to the uninterruptible power supply

Attention: Before you begin the installation, ensure that the customer has completed the planning table provided in the *IBM TotalStorage SAN Volume Controller: Planning Guide* for the hardware that you are about to install. 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.

Preparing for installation

There are several steps you need to do to prepare for the installation of the uninterruptible power supply and the SAN Volume Controller.

Before you start to install the uninterruptible power supply and the SAN Volume Controller, ensure that you have everything that you need, including the customer completed planning tables and charts provided in the *IBM TotalStorage SAN Volume Controller: Planning Guide*. These tables include the location of hardware, cable connection, and configuration data information that you will need to complete the installation procedures.

1. Check all the parts and quantities against the items shown in Figure 18 on page 20. If any item is missing, contact your marketing representative.
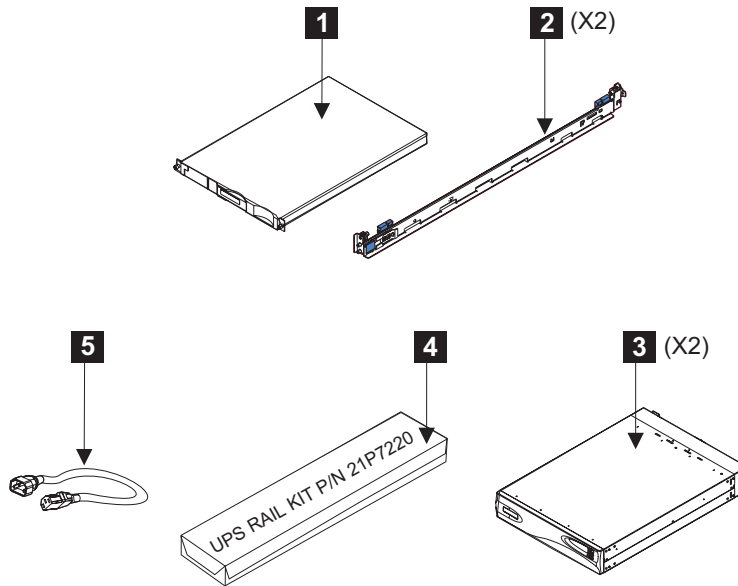
Figure 18. Items for installation in the rack

1 SAN Volume Controller

2 SAN Volume Controller support rails (2)

3 Uninterruptible power supply (2)

4 Uninterruptible power supply rail kit

5 Power and signal cable

2. If you are installing uninterruptible power supplies, read through the safety and environmental notices.

    Note: If you are installing the SAN Volume Controller into a rack that already contains other SAN Volume Controller and uninterruptible power supplies, the installed uninterruptible power supplies might have spare capacity. If the customer intends to use that spare capacity, the SAN Volume Controller that you are going to install might have been delivered without uninterruptible power supplies.

Related tasks

"Installing the support rails for the uninterruptible power supply"
You must install the support rails in the rack before you can install the uninterruptible power supply.

"Installing the support rails and the SAN Volume Controller in the rack" on page 30
Support rails are installed in the rack to hold the SAN Volume Controller.

Installing the support rails for the uninterruptible power supply

You must install the support rails in the rack before you can install the uninterruptible power supply.

1. Refer to the customer's hardware location table to find out where in the rack the uninterruptible power supplies are to be installed.
2. Discard the two handles and their associated nuts that are shipped with the support rails for the uninterruptible power supply.

3. At the back of the rack, observe the Electrical Industries Association (EIA) positions, and determine where you are going to install the uninterruptible power supply (see Figure 19). An uninterruptible power supply must always be installed into the lowest available position in the rack. The only device that can be below a uninterruptible power supply is another uninterruptible power supply.

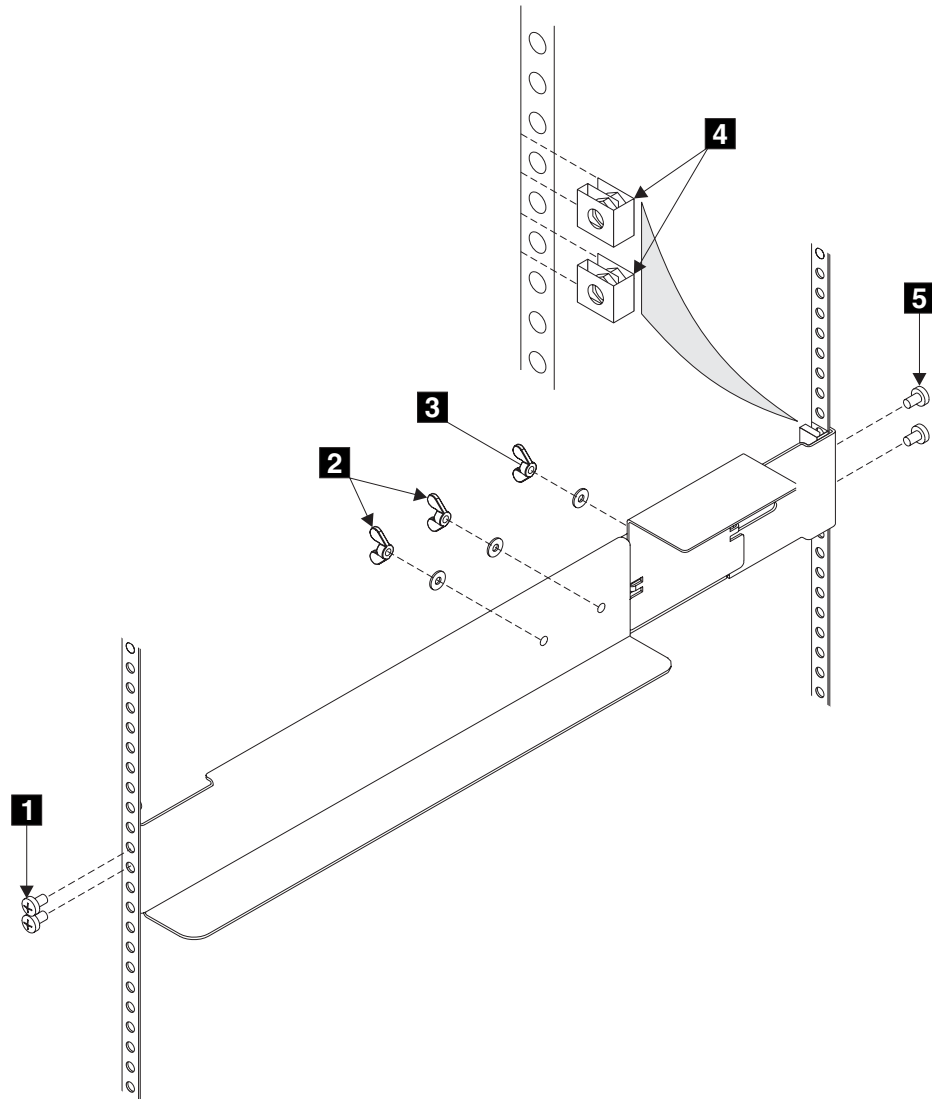   **Note:** The bottom of the flange of the support rail must align with the EIA mark on the rack.

Figure 19. Installing support rails for a uninterruptible power supply into the rack

   Attention: To tighten wing nuts **2** and **3** you will require access from above the rails. Ensure that the support rails are installed before anything is installed in the 8 EIA units above the rails. If any devices have already been installed in that space it might be necessary to remove those devices before installing the rails.

4. Perform the following steps for each rail:

a. Attach nut clips **4** to the rack. These nut clips must align with the second and fourth holes of the support rail flange.

b. Loosen the two wing nuts **2** .

c. Loosen the wing nut **3** and slide the bracket toward the back of the rail.

d. Remain at the back of the rack, hold the support rail in position in the rack, then install and fully tighten the two mounting screws **5** .

e. Go to the front of the rack.

f. Extend the support rail toward the front of the rack.

   Note: Hold the support rail in position until you have completed step 4h.

g. Ensure that the support rail is horizontal (a level might be useful here).

h. Install the two mounting screws **1** into the third and fourth holes of the support rail flange. Fully tighten the screws.

i. Fully tighten the two wing nuts **2** .

j. Ensure that wing nut **3** is loosened 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. Fully tighten the wing nut **3** .

Installing the uninterruptible power supply in the rack

After you have completed the preparation procedures, you are ready to install the uninterruptible power supply in the rack.

Ensure that you have completed the following before installing the uninterruptible power supply in the rack:

- The pre-installation procedures
- Installing the support rails for the uninterruptible power supply
- Preparing your uninterruptible power supply environment

Attention: Before you begin to install the uninterruptible power supply, read the safety and environmental notices.

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

   CAUTION:
   The uninterruptible power supply weighs 39 kg (86 lb) with the electronics assembly and the battery assembly installed:

   a. **Do not attempt to lift the uninterruptible power supply by yourself. Ask another service representative for assistance.**

   b. **Remove the battery assembly from the uninterruptible power supply before removing the uninterruptible power supply from the shipping carton.**

   c. **Do not attempt to install the uninterruptible power supply into the rack unless the electronics assembly and the battery assembly have been removed.**

   The weight of the uninterruptible power supply must be reduced by removing the battery assembly before removing it from the shipping carton. Perform the following steps to remove the battery assembly:

a. Open the top of the uninterruptible power supply shipping carton; and then, with the assistance of another service representative, grip the flaps on either side of the uninterruptible power supply.

Figure 20. Opening the top of the uninterruptible power supply shipping carton

b. Slide the uninterruptible power supply to the end of the carton and rest its front edge of the edge of the carton as shown.

Figure 21. Sliding the 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 and remove the battery retaining bracket **3** .
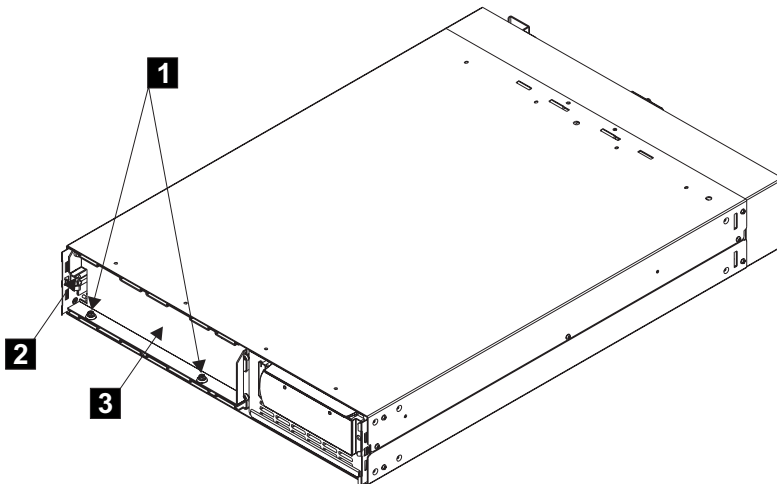
Figure 22. Removing the battery retaining bracket

    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 uninterruptible power supply and place to one side.

        Note: The cover for the uninterruptible power supply is not installed, however, it is included in the box with the uninterruptible power supply. Install the front cover after you have completed the other installation steps.

2. With the assistance of another service representative, lift the uninterruptible power supply clear of the shipping carton and place it on a flat, stable surface.

3. Remove the two screws (**1** in Figure 23 on page 25).

   CAUTION:
   The electronics assembly weighs 6.4 kg (14 lb). Take care when you remove it from the uninterruptible power supply.
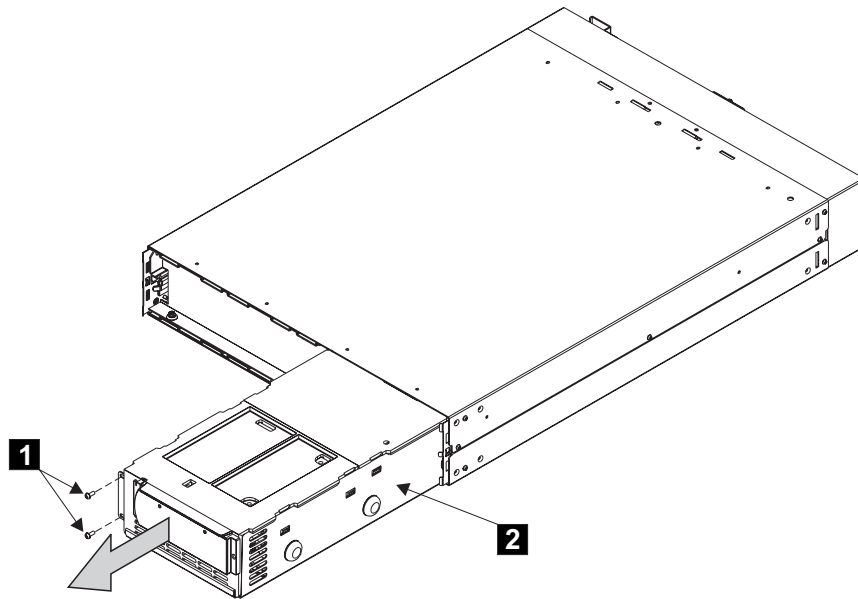
Figure 23. Removing the uninterruptible power supply electronics assembly

4. Pull the electronics assembly (**2** in Figure 23) out of the uninterruptible power supply, and put it to one side.

5. Stand at the front of the rack and, with the help of another service representative, place the back of the uninterruptible power supply onto the support rails, then slide the uninterruptible power supply into the rack.

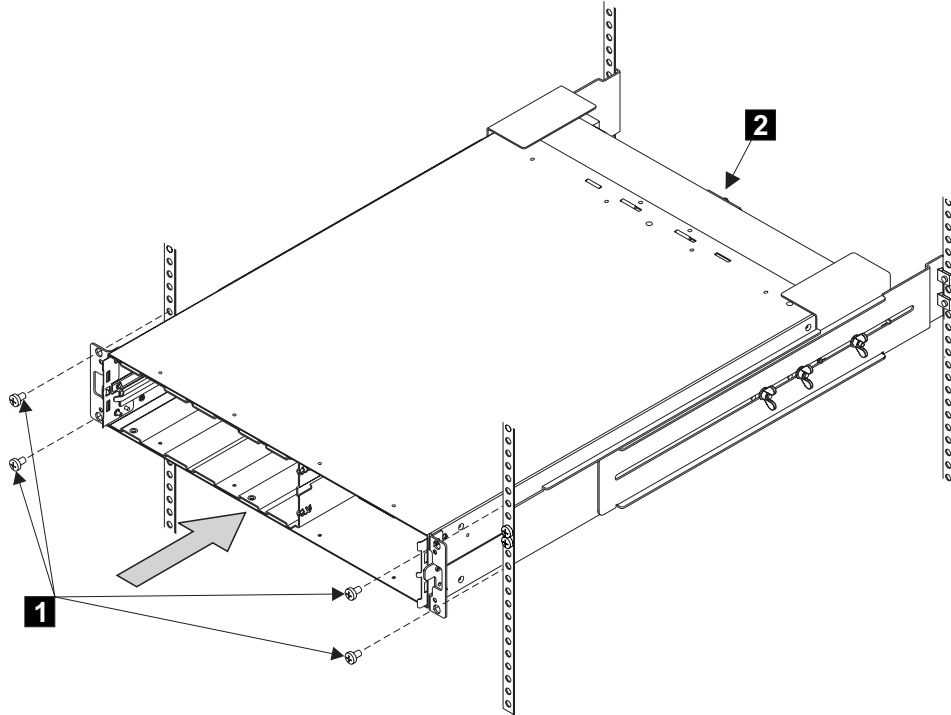6. Install the front flathead screws (**1** in Figure 24 on page 26).

Figure 24. Installing the uninterruptible power supply into a rack

7. With aid from another service representative, reinstall the following parts:
   a. Battery assembly
   b. Battery retaining bracket
   c. Electronics assembly
8. At the back of the uninterruptible power supply, plug the uninterruptible power supply main power cable into the power socket (**1** inFigure 25).
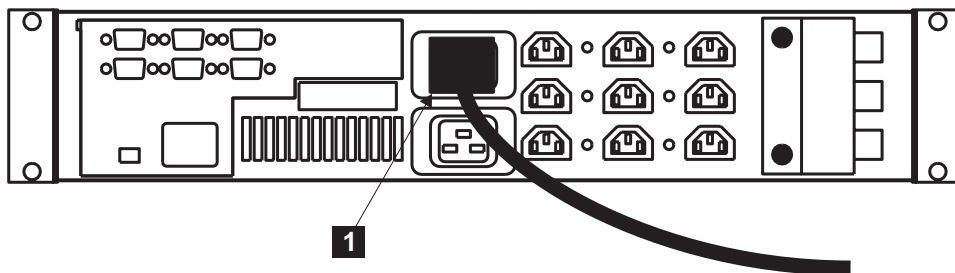
Figure 25. Installing the uninterruptible power supply power cable

9. If possible, ensure that the two uninterruptible power supplies are not both connected to the same power source.

Attention: Ensure that you comply with the following requirements for uninterruptible power supplies:

- Each 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 uninterruptible power supply.
- The voltage supplied to the uninterruptible power supply must be 200–240 V single phase.
- The frequency supplied must be between 50 and 60 Hz.

Note: If the 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% with any single harmonic being less than 1%. The uninterruptible power supply also should have input voltage capture that has a slew rate faster than 3 Hz per second and 1 msec glitch rejection.

10. All front panel indicators of the uninterruptible power supply flash for a short time while the uninterruptible power supply runs a self test. When the test is complete, the mode indicator **1** flashes to show that the uninterruptible power supply is in standby mode (see Figure 26).

    Press and hold the uninterruptible power supply on switch (**2** in Figure 26) until you hear the 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 uninterruptible power supply. The uninterruptible power supply is now in normal mode, and is charging its battery.
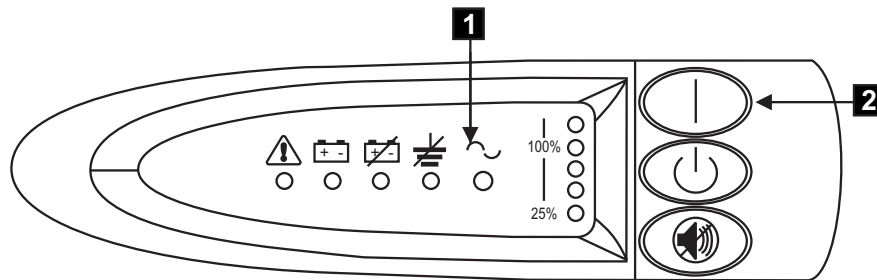

Figure 26. Power switch and indicators on the uninterruptible power supply

    If the mode indicator 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 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 uninterruptible power supply and powered on.

11. Repeat this entire procedure to install the other uninterruptible power supply.

    Related tasks

    "Installing the support rails for the uninterruptible power supply" on page 20
    You must install the support rails in the rack before you can install the uninterruptible power supply.

    Related reference

"Preparing your uninterruptible power supply environment" on page xxi
Ensure that your physical site meets the installation requirements for the
uninterruptible power supply.

Installing the master console

There are a number of steps you must do to install the master console in the rack.

This section provides information on how to install the master console with the SAN
Volume Controller. Software installation is not necessary since all software for the
master console is pre-installed. To install the master console in the rack, follow the
instructions provided in your xSeries Installation Guide as well as those provided
with the mounting rails.

Attention: Before you begin the installation, review and complete all of the safety
checks detailed in the documentation for the master console, the keyboard, and the
display.

Ensure that the customer has all of the information needed prior to installation.
Refer to the *IBM TotalStorage SAN Volume Controller: Planning Guide*, which
provides the hardware location chart, the cable connection table, and the
configuration data table for the customer to complete prior to installation.

1. Ensure that no cables are connected to the Ethernet ports.
2. Connect a fibre channel cable from one port on the fibre channel host bus
   adapter (HBA) to the other port to allow for a loopback data test to check that
   the fibre channel HBA is operational.
3. Turn on the master console.
4. When the following message displays, immediately press Ctrl-Q to display a
   list of I/O addresses:

   ```
   Qlogic Corporation
   Q123XX PCI Fibre Channel ROM BIOS version X
   Copyright (C) Qlogic Corporation 1993 2002 all rights reserved
   www.qlogic.com
   Press <Ctrl-Q> for Fast!UTIL
   ```

   Note: This message displays for only a few seconds and you must press
   Ctrl-Q while it displays.
5. Select one of the I/O address and press **Enter**.
6. A Fast!UTIL Option list is displayed.
7. Select the Loopback data test option and press **Enter**.
8. Select the Continue with loopback data test option and press **Enter**. One of
   the following messages is displayed:

   ```
   Loopback Data Test failed
   ```
   ```
   Press any key to stop the Loopback Data Test
   Press Enter twice to get back to the Fast!UTIL Option List
   Select Exit Fast!UTIL
   ```

   If the loopback data test fails, replace the fibre channel cable with a new one.
   If the test fails again, replace the fibre channel card.
9. Remove the fibre channel cable that you installed between the two ports on
   the fibre channel HBA.
10. Restart the machine to start the Windows® operating system:
    a. Enter `administrator` in the User ID field.

b. Enter `passw0rd` in the password field; this password applies to all required password fields.

   c. The master console continues booting.

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

11. Refer to the *IBM TotalStorage SAN Volume Controller: Planning Guide* for the customer-completed configuration data table and connect the fibre-channel cables from the master console as specified in that table.

   Note: You will also use the configuration data table for steps 12 and 13.

12. To enter the master console IP address provided by the customer, complete the following steps:

   a. Right-click the My Network Places icon and select **Properties**

   b. Right-click the Local Area Connection 2 option and select **Properties**.

   c. Select **Internet Protocol (TCP/IP)** and select **Properties**

   d. Enter all required information for the IP and DNS addresses.

   e. Connect Ethernet port-2 to the users network.

13. To enter the master console name provided by the customer, complete the following steps:

   a. Right-click the My Computer icon and select **Properties**.

   b. Select the Network Identification tab and select **Properties**.

   c. Enter the master console name.

   d. Select the **More** button.

   e. Enter the full path information in the Primary DNS suffix of this computer field.

   f. If the customer needs Remote Support, perform step 12 again for Local Area Connection and connect an Ethernet cable from Ethernet port 1 on the master console to the designated connection (for example, Firewall DMZ Port). For more information on configuring a Remote Support, go to the following Web site and select the Enhanced Remote Support topic:

   www.ibm.com/storage/support/2145

   g. Restart the master console.

14. Attach a RID tag to the master console using machine type **2145** and the serial number of the SAN Volume Controller that is being installed with the master console.

15. **IMPORTANT**: This step must be the last step you perform on the master console before handing over the machine; it sets up the master console to present a Windows license agreement screen at the next power on and then shuts down the master console.

   a. Select **Start** –> **Run**

   b. Enter c:\sysprep\sysprep.exe

   c. Click **OK**.

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

Installing the support rails and the SAN Volume Controller in the rack

Support rails are installed in the rack to hold the SAN Volume Controller.

This topic and its subtopics provides information about installing the support rails for the SAN Volume Controller and installing the SAN Volume Controller in a rack.

Installing the support rails for the SAN Volume Controller

The SAN Volume Controller support rails may need to be installed at some time.

1. Refer to the customer's hardware location table to find out where in the rack the SAN Volume Controller is to be installed.
2. Refer to the EIA markings on the rack and decide where you are going to install the support rails.
3. 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.
4. Put your finger against the side of the latch lever **1** and put your thumb against the front of the latch lock **2** (see Figure 27).
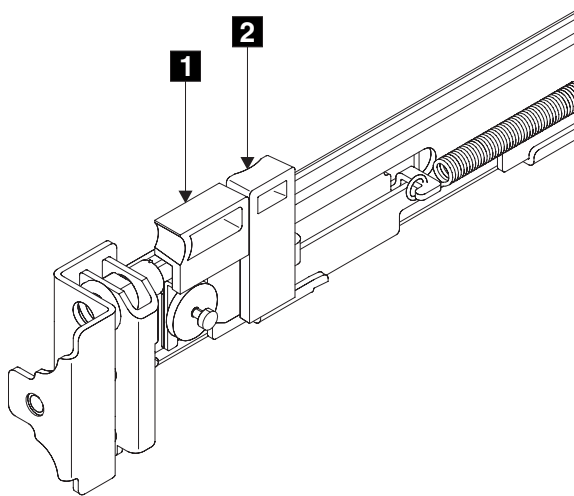
Figure 27. Retracting the latch lock carrier

5. Gently push the latch lock **2** (Figure 28 on page 31) away from the rail as you move the latch lever **1** towards the far end of the rail. The latch-lock carrier assembly slides against the spring tension.
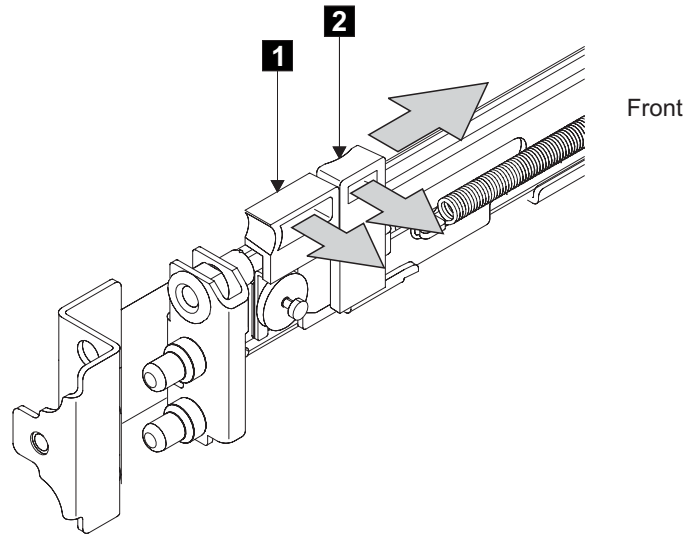
Figure 28. Opening the front latch-lock carrier assembly

6. 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.

7. Push the back rail bracket **1** (Figure 29) toward the front of the rail until it stops. The rail is now at its shortest adjustment.
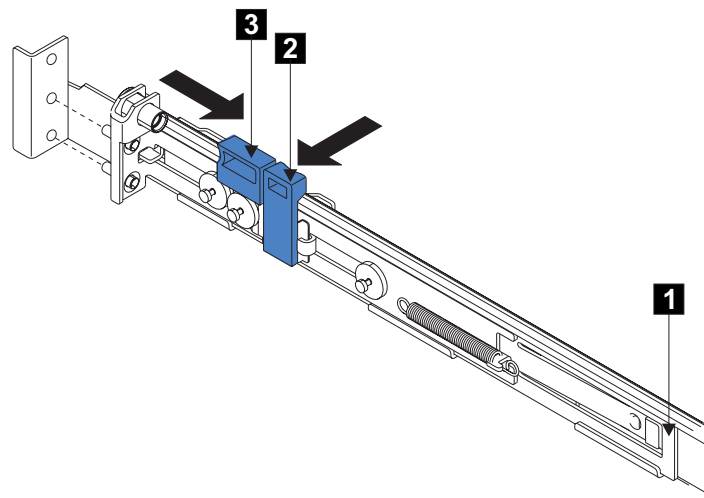

Figure 29. Opening the back latch-lock carrier assembly

8. Put your index finger against the side of the latch lever **3** and your thumb against the front of the latch lock **2** .

9. Gently push the latch lock **2** away form the rail as you move the latch-lever **3** towards the front of the rail. The latch-lock carrier assembly slides against the spring tension.

10. Release the latch lock and continue to slide the latch-lock carrier for approximately 13 mm (0.5 in). The latch lever engages in a hole in the back bracket assembly, and holds the latch-lock carrier in the retracted position

11. Place the front end of the left rail in the rack cabinet. Align the top of the front bracket **1** (Figure 30) with the required EIA marking that is on the rack.
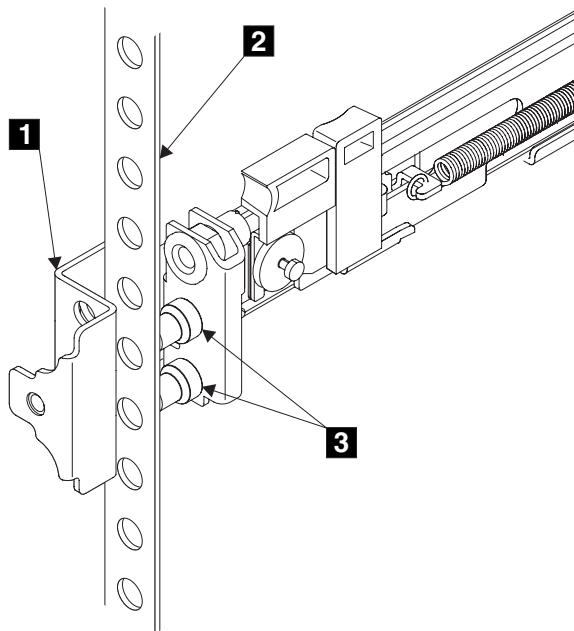
Figure 30. Installing the front end of the rail

12. Align the locating pins **3** with the holes that are in the rack-mounting flange **2** .

13. Push the latch lock **2** (Figure 31 on page 33) 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.
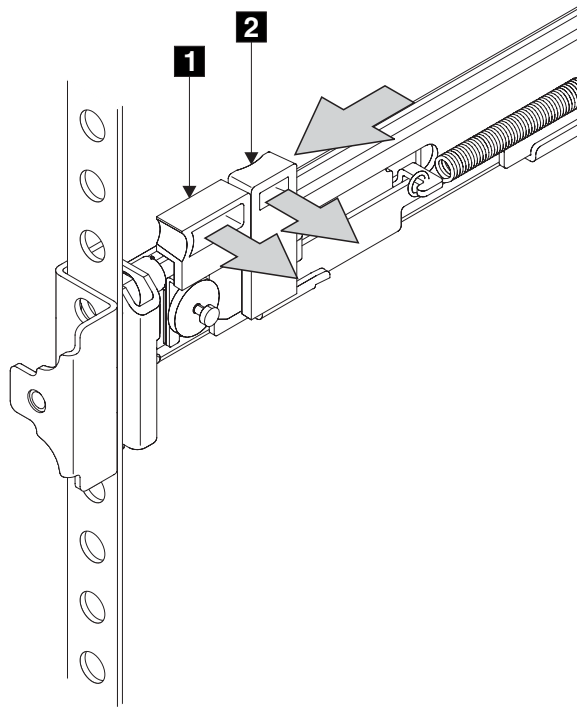
Figure 31. Closing the latch-lock carrier assembly

14. Push the back rail bracket **1** (see Figure 29 on page 31) toward the rear of the rack and align the locating pins with the rack-mounting flange.

15. Push the latch lock **2** (see Figure 29 on page 31) 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.

16. 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.

Installing the SAN Volume Controller in the rack

There are a number of steps you must do to install the SAN Volume Controller in the rack.

Before you install the SAN Volume Controller in the rack, read the following caution notice.

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

1. Stand at the front of the rack and place the back of the SAN Volume Controller onto the support rails. Then slide the SAN Volume Controller fully into the rack.

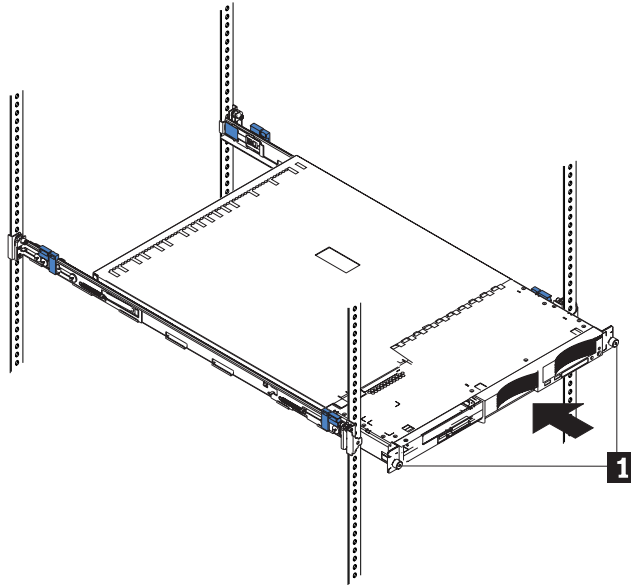2. Fully tighten the two captive thumbscrews 1 (see Figure 32 on page 34).

Figure 32. Installing the SAN Volume Controller into a rack

3. Repeat this procedure for each SAN Volume Controller.

Connecting the SAN Volume Controller to the uninterruptible power supply

There are a few restrictions you should be aware of before connecting the SAN Volume Controller node to the uninterruptible power supply.

Each SAN Volume Controller of a pair should be connected to a different uninterruptible power supply. Each uninterruptible power supply can support up to two SAN Volume Controllers.

Attention: Do not connect two clusters to the same pair of uninterruptible power supplies. Both clusters will be lost in the event that a power failure occurs on both of those uninterruptible power supplies.

Note: You must install uninterruptible power supplies in pairs. There must be at least two uninterruptible power supplies per cluster. A cluster can contain no more than eight SAN Volume Controllers. Also, each uninterruptible power supply of a pair should be connected to a separate electrical input power source (if possible) to reduce the chance of input power failure at both uninterruptible power supplies.

Before you begin this task, refer to the customer's cable connection table in the *IBM TotalStorage SAN Volume Controller: Planning Guide* to identify the uninterruptible power supply to which this SAN Volume Controller is to be connected.

Perform the following steps to connect the SAN Volume Controller to the uninterruptible power supply

1. At the back of the SAN Volume Controller, plug a power cable into the socket **1** (see Figure 33 on page 35).
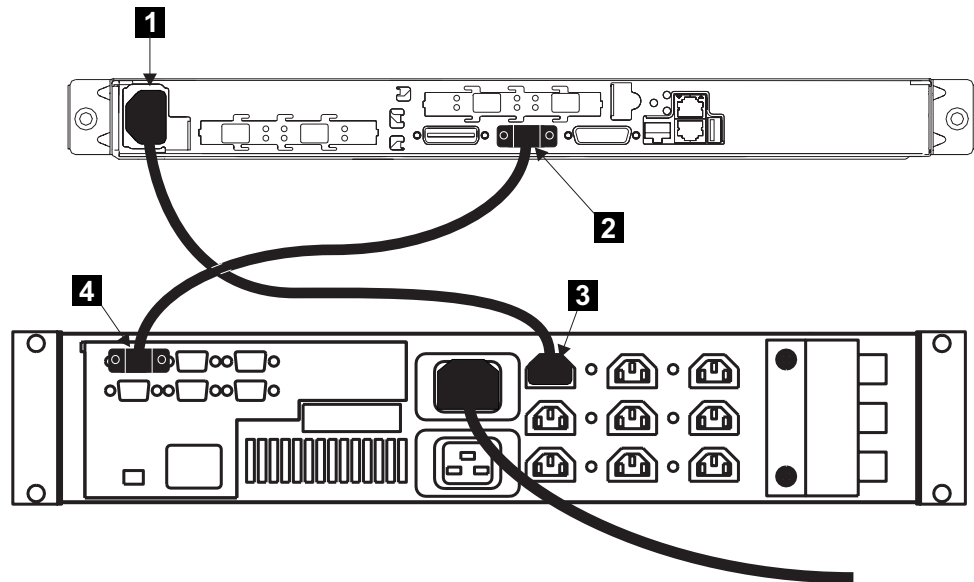
Figure 33. Connecting the SAN Volume Controller power cable to the uninterruptible power supply

2. Plug the serial cable of the power cable assembly into the serial socket **2** .

   DANGER

   You have already switched on the uninterruptible power supply. The output sockets of the uninterruptible power supply are live.

3. Place the free end of the SAN Volume Controller power cable into any vacant output socket **3** on the uninterruptible power supply.

4. Place the free end of the signal cable into any vacant position on the top row of serial connectors **4** on the uninterruptible power supply. Do not plug any serial cables into the bottom row of serial connectors or the uninterruptible power supply will malfunction.

The SAN Volume Controller power is connected to the uninterruptible power supply.

   Related reference

   "Preparing your uninterruptible power supply environment" on page xxi
   Ensure that your physical site meets the installation requirements for the uninterruptible power supply.

Connecting the SAN Volume Controller to the SAN and to the Ethernet network

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

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

1. Connect the Ethernet cable to the Ethernet port 1, number **5** (See Figure 34 on page 36).

   Attention: You must use only Ethernet port 1 on the SAN Volume Controller. The software is configured only for Ethernet port 1.
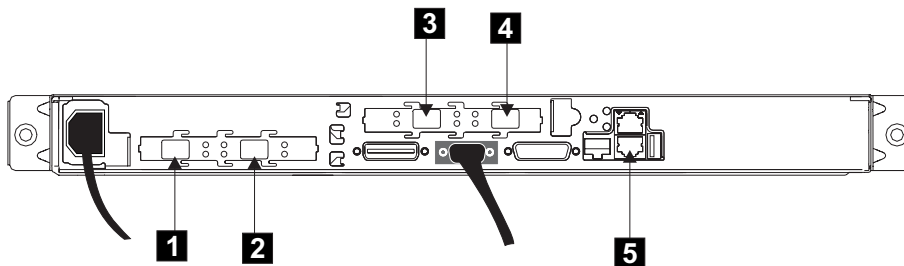
Figure 34. Connectors at the back of the SAN Volume Controller

> **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.).

2. Connect the fibre channel cables to the fibre channel connectors as required by the customer's configuration. The connectors are numbered **1** , **2** , **3** , and **4** from left to right, as shown in Figure 34. These numbers correspond to the numbers that are shown in the customer's cable connection table.

3. Connect the other end of the Ethernet cable to the designated connector on the Ethernet hub or switch.

4. Connect the other ends of the fibre channel cables to the designated connectors of the fibre channel switches.

Related concepts

"SAN Volume Controller menu options" on page 42
Menu options are available on the front panel display on the SAN Volume Controller.

Related reference

"Controls and indicators for the SAN Volume Controller" on page 4
Controls and indicators are located on the front panel of the SAN Volume Controller.

Verifying the SAN Volume Controller installation

Once the SAN Volume Controller is installed, you can verify the installation.

Check the speed at which the SAN Volume Controller nodes are to be operated (usually 2 Gbps) in the configuration data table provided by the customer.

This task shows you how to verify the installation after you install the SAN Volume Controller in the rack and connect it to both the uninterruptible power supply and the SAN.

1. Press the SAN Volume Controller power switch. Verify that the green power light is on. If the light is not on go to MAP 5000: Start 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, the `Charging` message is displayed in line 1 of the front panel display. A progress bar is displayed in line 2 of the front panel display. Battery charging can take up to 3 hours until the battery is fully charged. When the battery is charged enough, `Cluster:` is displayed in line 1 of the front panel display; line 2 is 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. See Figure 35, which 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 to exit the test.
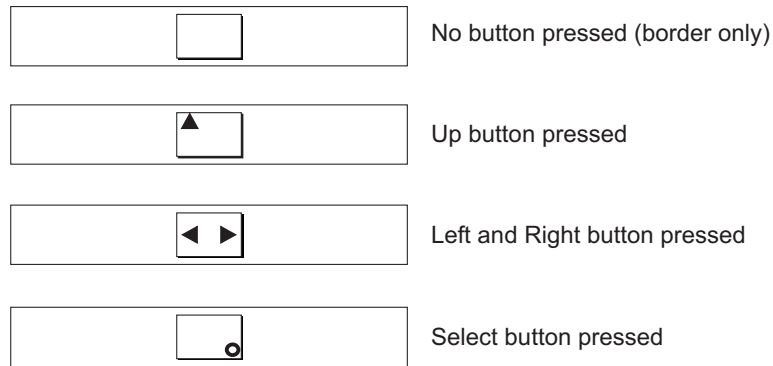
No button pressed (border only)

Up button pressed

Left and Right button pressed

Select button pressed

Figure 35. Front panel display when push buttons are pressed

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

5. Keep pressing and releasing the up or down button until the `Node:` option is displayed in line 1 of the front panel display.

6. Verify that the node number that is displayed in line 2 of the display is the same as the node number that is printed on the front panel of the node (see Figure 36).

```
Node:
xxxxxx
```

Figure 36. Node number

7. Keep pressing and releasing the up or down button until the `Ethernet` option is shown on the front panel display. Line 2 of the front panel display shows the message `Inactive`. This message shows that, although an Ethernet connection is available, it cannot yet be used (see Figure 37).

```
Ethernet:
Inactive
```

Figure 37. Ethernet mode

8. Keep pressing and releasing the up or down button until the `FC Port-1` option shows in the display.

9. Check whether line 2 of the display shows the message `Active`.

10. Keep pressing and releasing the left or right button to display the other port options. Check whether for each port, line 2 of the display shows the message `Active`. If `Active` is not shown for any port, go to MAP 5600: Fibre-channel to repair the fault.

11. If the configuration data table provided by the customer indicates that the SAN Volume Controller nodes are to be operated at 1 Gbps, press and hold the down button; press and release the select button. Release the down button. The second line of the display will show 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?` displays.

    b. Press the select button.

    c. Press the left or right button until the required language is displayed.

    d. Press the select button.

13. Repeat steps 1 on page 35 through 12 for each SAN Volume Controller.

14. When the battery is fully charged, the charge progress bar is replaced by the `Cluster` option on the front panel display of the SAN Volume Controller.

Chapter 5. Using the front panel display on the SAN Volume Controller

The front panel display contains status and menu indicators.

This chapter provides information about how to use the front panel display which includes:
- Status indicators
- Menu selections

    Related concepts

    "SAN Volume Controller menu options" on page 42
    Menu options are available on the front panel display on the SAN Volume Controller.

    Related reference

    "Status indicators"
    The front panel displays the status indicators.

Status indicators

The front panel displays the status indicators.

Status indicators are shown on the front panel for the following processes:
- Boot progress
- Boot failed
- Hardware boot
- Node rescue request
- Power failure
- Powering off
- Restarting
- Shutting down
- Error codes

    Related concepts

    "Boot progress indicator" on page 40
    Boot progress is displayed on the front panel of the SAN Volume Controller.

    "Boot failed" on page 40
    If the boot operation fails, a boot code is displayed.

    "Hardware boot" on page 40
    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.

    "Node rescue request" on page 41
    If software is lost, node rescue may be used to copy all software from another node.

    "Power failure" on page 41
    The SAN Volume Controller runs on battery power when main power is lost.

    "Powering off" on page 41
    The progress bar on the display shows the progress of the power-off operation.

    "Restarting" on page 42
    The front panel indicates when the software on a node is restarting.

The front panel indicator tracks shutdown operations.

Related reference

Error codes are displayed on the front panel display.

Boot progress indicator

Boot progress is displayed on the front panel of the SAN Volume Controller.

Figure 38 shows that the node is starting.

```
Booting                130
```

Figure 38. Boot progress display

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.

Figure 39 shows that the boot operation has failed.

```
Failed                 180
```

Figure 39. Boot failed display

See ″Understanding the boot codes″ of the *IBM TotalStorage SAN Volume Controller: Service Guide* for the boot codes, a description of the failure, and the appropriate steps 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.

Figure 40 shows what is displayed when you first power on the node.

Figure 40. Hardware-boot display

If this display remains active for longer than 3 minutes, there might be a problem.

Node rescue request

If software is lost, node rescue may be used to copy all software from another node.

Figure 41 shows that a request has been made to exchange the software on this node. The SAN Volume Controller software is pre-installed on all SAN Volume Controller nodes. This software includes the operating system, the application software, and the SAN Volume Controller publications. It is not normally necessary to replace the software on a node, but if the software is lost for some reason, for example if the hard disk drive in the node fails, it is possible to copy all the software from another node connected to the same Fibre Channel fabric. This process is known as node rescue.

Figure 41. Node-rescue-request display

Power failure

The SAN Volume Controller runs on battery power when main power is lost.

Figure 42 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 the node cache data to the internal disk drive. When the progress bar reaches zero, the node will power off.

Note: When input power is restored to the uninterruptible power supply, the SAN Volume Controller is turned on without the front panel power button being pressed.

Figure 42. Power failure display

Powering off

The progress bar on the display shows the progress of the power-off operation.

Figure 43 shows that the power button has been pressed and the node is powering off. Powering off may take several minutes.

Figure 43. Powering-off display

The progress bar moves backward when the power is removed.

Restarting

The front panel indicates when the software on a node is restarting.

Restarting

Figure 44. Restarting display

The software is restarting either because:
- An internal error was detected
- A power-off operation was ended when the power button was pressed again while the node was powering off

If a power-off operation was ended, the progress bar continues to move backward until the node finishes saving its data. After the data is saved, the progress bar moves forward during the restart operation.

Shutting down

The front panel indicator tracks shutdown operations.

Figure 45 is an example of what the front panel indicator shows when you issue a shutdown command to a SAN Volume Controller cluster or a SAN Volume Controller node. The progress bar continues to move left until it is safe to be powered off. When the shutdown operation is complete, all power will be removed from the node. When power has been removed from the last node connected to the uninterruptible power supply, the uninterruptible power supply also will be shut down.

Shutting Down

Figure 45. Shutting down display

Error codes

Error codes are displayed on the front panel display.

For descriptions of the error codes that can be displayed on the front panel display, see the appropriate section of the *IBM TotalStorage SAN Volume Controller: Service Guide*. The *Service Guide* contains a full description of the failure and the actions that you must perform to correct the failure.

SAN Volume Controller menu options

Menu options are available on the front panel display on the SAN Volume Controller.

Menu options enable you to review the operational status of the cluster, node, and external interfaces. They also provide access to the tools that you need to install and service the node.

Figure 46 shows the sequence of the menu options. Only one option at a time is displayed on the front panel display. For some options, additional data is displayed on line 2. The first option displayed is the cluster option.
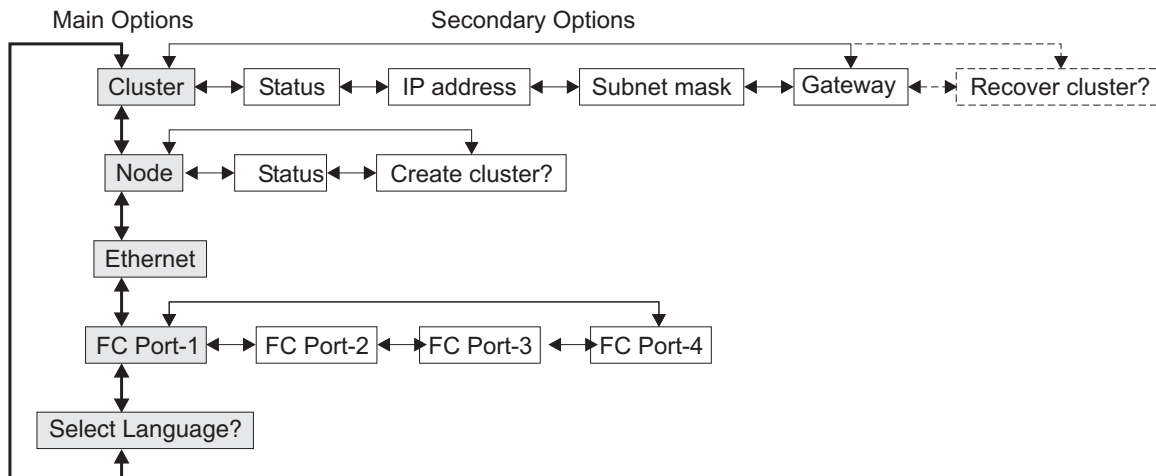
Figure 46. Menu options sequence

Use the Left and Right buttons to navigate through the secondary fields that are associated with some of the main fields.

Note: Sometimes a message might not display fully on the screen. You might see a right angle bracket (>) in the right hand side of the display screen. If you see a right angle bracket, press the `right` arrow button to scroll through the display. This action displays the rest of the text. Press `left` arrow button to scroll back. When there is no more text to display, you can move to the next item in the menu by pressing the `right` arrow button.

There are five main options available:
- Cluster
- Node
- Ethernet
- FC port–1 through 4
- Select language

  Related concepts

  "Cluster options" on page 44
  The main cluster option from the menu can display the cluster name, IP address, or it may be blank.

  "Node options" on page 45
  The node option displays the identification number or name of the SAN Volume Controller.

  Related reference

  "Ethernet option" on page 48
  The Ethernet option displays the operational states of the Ethernet port.

"Fibre channel port–1 through 4 option" on page 49
The FC port–1 through 4 options display the operational status of the fibre channel ports.

"Select language? option" on page 49
The language displayed can be changed from the menu.

Cluster options

The main cluster option from the menu can display the cluster name, IP address, or it may be blank.

The main cluster option displays the cluster name that the user has assigned. If no name has been assigned, the IP address of the cluster is displayed. If this SAN Volume Controller is not assigned to a cluster, the field is blank.

Related concepts

"Status"
Status is indicated on the front panel.

"IP address"
The IP address is used to access the cluster from the command line tools or web browser.

"Subnet mask" on page 45
The subnet mask address is set when a cluster is created.

Related reference

"Gateway" on page 45
The gateway address is set when the cluster is created.

"Recover cluster?" on page 45
The Recover cluster? option is useful if the administrator password has been lost or forgotten.

Status

Status is indicated on the front panel.

This field is blank if this SAN Volume Controller is not a member of a cluster. If this SAN Volume Controller is a member of a cluster, the field indicates the operational status of the cluster, as follows:

Active

* Indicates that this SAN Volume Controller is an active member of the cluster.

Inactive

* Indicates that the SAN Volume Controller is a member of a cluster, but is not now operational. It is not operational either because the other SAN Volume Controllers that are in the cluster cannot be accessed, or because this SAN Volume Controller has been excluded from the cluster.

Degraded

* Indicates that the cluster is operational, but one or more of the member SAN Volume Controllers are missing or have failed.

IP address

The IP address is used to access the cluster from the command line tools or web browser.

This field contains the existing Ethernet IP address of the cluster. It is set during the create-cluster operation. You use this address to access the cluster from the command line tools or from a web browser. If this SAN Volume Controller is not a member of a cluster, this field is blank.

Subnet mask

The subnet mask address is set when a cluster is created.

The subnet mask option displays the subnet mask address. It is set during the create-cluster operation.

Gateway

The gateway address is set when the cluster is created.

The gateway option displays the gateway address.

Recover cluster?

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

This field allows you to recover a lost administrator password or make the node accessible via the service password.

Figure 47 shows the Recover cluster? menu sequence.

```
Recover Cluster?
    |
    | Select
Service Access
```
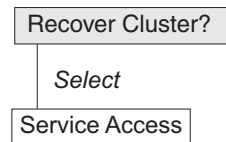
Figure 47. Recover Cluster? menu sequence

During installation, you should not need to use this field. For more information about this field, see the *IBM TotalStorage SAN Volume Controller: Service Guide*.

Node options

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

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

Related reference

"Status"
Use the status to diagnose cluster failures.

"Create cluster?" on page 46
Clusters can be created from the Create Cluster menu.

Status

Use the status to diagnose cluster failures.

Active

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

Inactive

- TheSAN Volume Controller is operational and assigned to a cluster. It does not have access to the fibre channel fabric.

Free

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

Disconnected

- TheSAN Volume Controller is operational, but has not been assigned to any cluster. It has no access to the fibre channel fabric.

Failed

- TheSAN Volume Controller is not operational. A hardware fault is preventing theSAN Volume Controllerz from being part of a cluster.

Create cluster?

Clusters can be created from the Create Cluster menu.

This field allows you to create a new SAN Volume Controller cluster. Press **Select** to go to the create cluster menu. Figure 48 shows the create cluster menu sequence.
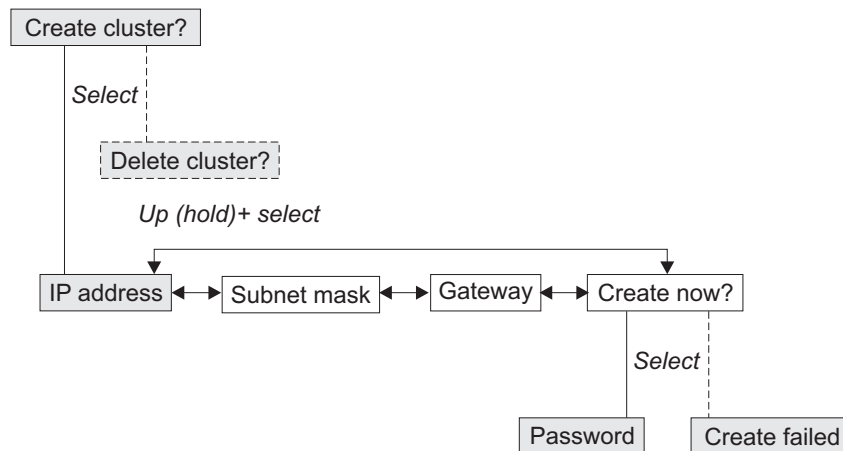
Figure 48. Create cluster? menu sequence

Press the left and right buttons to navigate through the secondary options that are associated the create cluster option. When you have navigated to the desired option, press the select button. The secondary options available include:

- IP address
- Subnet mask
- Gateway
- Create now?

IP address

The IP address lets you display or change the Ethernet IP address for the cluster that you are going to create. Be sure to verify the correct IP address with the customer before you create a cluster.

Attention: If you change the IP address, ensure that you type the correct address. Otherwise, you cannot access the cluster using the command line tools or a web browser.

Perform the following steps to change the IP address:

1. From the Create Cluster? option, press the select button. The IP address option displays.
2. Press the select button again. The first IP address number is highlighted.
3. Press the up button if you want to increase the value that is displayed; press the down button if you want to decrease that value. If you want to quickly increase or decrease the value, hold the up or down button, respectively.
4. Press the right or left buttons to move to the number field that you want to update.
5. Repeat steps 3 and 4 for each number field that you want to update.
6. Press the select button to complete the change.

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

Subnet Mask

This option lets you display or change the subnet mask.

Attention: If you change the subnet mask address, ensure that you type the correct address. Otherwise, you cannot access the cluster using the command line tools or a web browser.

Perform the following steps to change the subnet mask:

1. Press the select button. The first subnet mask number is displayed.
2. Press the up button if you want to increase the value that is displayed; press the down button if you want to decrease that value. If you want to quickly increase or decrease the value, hold the up or down button, respectively.
3. Press the right or left buttons to move to the number field that you want to update.
4. Repeat steps 2 and 3 for each number field that you want to update.
5. Press the select button to complete the change.

Gateway

Attention: If you change the gateway address, ensure that you type the correct address. Otherwise, you cannot access the cluster from the web interface or command line.

Perform the following steps to change the gateway address:

1. Press the select button. The first gateway address number field is highlighted.
2. Press the up button if you want to increase the value that is displayed; press the down button if you want to decrease that value. If you want to quickly increase or decrease the value, hold the up or down button, respectively.
3. Press the right or left buttons to move to the number field that you want to update.
4. Repeat steps 2 and 3 for each number field that you want to update.
5. Press the select button to complete the change.

Create Now?

This option lets you start an operation to create a cluster. Press the select button to start the operation.

If the create operation is successful, `Password` is displayed on line 1. The password that you can use to access the cluster is displayed on line 2. Be sure to immediately record the password; it is required on the first attempt to access the cluster.

Attention: The password displays for only 60 seconds, or until a front panel button is pressed. The cluster is created only after the password display is cleared.

If the create operation fails, `Create Failed:` is displayed in line 1 of the service display screen. Line 2 of the service displays one of two possible error codes that you can use to isolate the cause of the failure.

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

Delete Cluster?

The field for Delete Cluster? is displayed only if you select Create Cluster? on a SAN Volume Controller that is already a member of a cluster. Normally, you can use the command line or the graphical user interface (GUI) to delete a cluster. However, if you cannot use the command line or GUI, you can use Delete Cluster to force the deletion of a node from a cluster. To delete a node from the cluster:
* Press and hold Up
* Press and release Select
* Then release Up

The SAN Volume Controller is deleted from the cluster, and the node is restarted. The display will then return to the default menu. The create cluster option must be selected again to start the create option.

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

Ethernet option

The Ethernet option displays the operational states of the Ethernet port.

When a cluster is created, only one node's Ethernet port becomes active for cluster configuration. If the node which has the active port fails then another node in the cluster will open its Ethernet port and gain configuration access to that cluster.

Table 6 shows the possible states of the Ethernet port.

Table 6. Ethernet Port States

Active	The cluster is accessible through this port.
Inactive	The port is operational, but it is not being 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.

Fibre channel port–1 through 4 option

The FC port–1 through 4 options display the operational status of the fibre channel ports.

The properties are as follows:

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 exists: • 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, then press the select button, and release the down button. This action also allows you to change the fibre–channel port speed.

Select language? option

The language displayed can be changed from the menu.

The select language option allows you to change the language that is displayed on the menu. Figure 49 shows the select language option sequence.
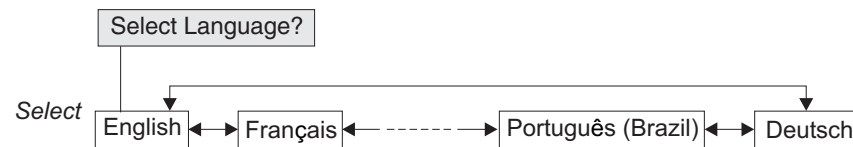
Figure 49. Select language? menu sequence

Press the right button to display the national language that you want. When the required language is displayed, press the select button.

Note: Line 1 of the menu displays an option. For some options, additional data is displayed on line 2. If, the front panel is set to Japanese, Korean, or Chinese, the menu shows only line 1. To display line 2, press the select button. To return to the option on line 1, press the select button again.

The following languages are available:
• English
• French
• German
• Italian
• Japanese
• Korean
• Portuguese
• Spanish
• Chinese (simplified)
• Chinese (traditional)

If you do not understand the language that is displayed, wait for at least 60 seconds for the menu to reset to the default option. To select the required language, perform the following steps:

1. Press the up button once.
2. Press the select button once. If the display changes, go to step 5.
3. Press the up button once.
4. Press the select button once.
5. Press the right button until your required language is displayed.
6. Press the select button.

Note: This procedure will not work if the node is displaying a boot error.

Accessibility

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

Features

These are the major accessibility features in the SAN Volume Controller master 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: JAWS v4.5 and IBM Home Page Reader v3.0.
- You can operate all features using the keyboard instead of the mouse.

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 on a CD that is packaged with the product or you can access them at the following Web site:

http://www-1.ibm.com/servers/storage/support/virtual/2145.html

> **Related reference**
>
> "SAN Volume Controller library and related publications" on page x
> A list of other publications that are related to this product are provided to you for your reference.

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"Trademarks"

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Other company, product, and service names may be trademarks or service marks of others.

Electronic emission notices

The following electronic emission statements apply to this product. The statements for other products that are intended for use with this product are included in their accompanying documentation.

Federal Communications Commission (FCC) statement

Ensure that you are familiar with the Federal Communications Commission (FCC) statement.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, might cause interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Neither the provider nor the manufacturer is responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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

Japanese Voluntary Control Council for Interference (VCCI) statement

Ensure that you are familiar with the Japanese Voluntary Control Council for Interference (VCCI) statement.

This product is a Class A Information Technology Equipment and conforms to the standards set by the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). In a domestic environment, this product might cause radio interference, in which event the user might be required to take adequate measures.

Korean Government Ministry of Communication (MOC) statement

Ensure that you are familiar with the Korean Government Ministry of Communication (MOC) statement.

Please note that this device has been approved for business purposes with regard to electromagnetic interference. If you find that this device is not suitable for your use, you can exchange it for one that is approved for non-business purposes.

China Class A EMC compliance in Simplified Chinese

Ensure that you are familiar with the China Class A EMC compliance in Simplified Chinese statement.

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may need to perform practical actions.

声　明
此为A级产品，在生活环境中，该产品可能会造成无线电干扰，在这种情况下，可能需要用户对其干扰采取切实可行的措施。

Figure 50. Chinese EMC compliance statement

Avis de conformité à la réglementation d'Industrie Canada

Ensure that you are familiar with the avis de conformité à la réglementation d'Industrie Canada.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

New Zealand compliance statement

Ensure that you are familiar with the New Zealand compliance statement.

This is a Class A product. In a domestic environment this product might cause radio interference, in which event the user might be required to take adequate measures.

International Electrotechnical Commission (IEC) statement

This product has been designed and built to comply with (IEC) Standard 950.

Industry Canada compliance statement

This Class A digital apparatus complies with IECS-003.

United Kingdom telecommunications requirements

This apparatus is manufactured to the International Safety Standard EN60950 and as such is approved in the U.K. under approval number NS/G/1234/J/100003 for indirect connection to public telecommunications systems in the United Kingdom.

European Union (EU) statement

Ensure that you are familiar with the European Union (EU) statement.

This product is in conformity with the protection requirements of EU council directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Neither the provider nor the manufacturer can accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of option cards not supplied by the manufacturer.

Radio protection for Germany

Ensure that you are familiar with the radio protection for Germany.

Zulassungsbescheinigung laut Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 30, August 1995.

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

Der Aussteller der Konformitätserklärung ist die IBM Deutschland.

Informationen in Hinsicht EMVG Paragraph 3 Abs. (2):

Das Gerät erfüllt die Schutzanforderungen nach EN 50082-1 und EN 55022 Klasse A.

EN55022 Klasse A Geräte bedürfen folgender Hinweise:

Nach dem EMVG: ″Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministeriums für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind.″ (Auszug aus dem EMVG, Para.3, Abs.4). Dieses Genehmigungsverfahren ist nach Paragraph 9 EMVG in Verbindung mit der entsprechenden Kostenverordnung (Amtsblatt 14/93) kostenpflichtig.

Nach der EN 55022: ″Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Massnahmen durchzuführen und dafür aufzukommen.″

Anmerkung: Um die Einhaltung des EMVG sicherzustellen, sind die Geräte wie in den Handbüchern angegeben zu installieren und zu betreiben.

Taiwan Class A compliance statement

Ensure that you are familiar with the Taiwan Class A compliance statement.

警告使用者:
這是甲類的資訊產品,在居住的環境中使用
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使用者會被要求採取某些適當的對策。

Glossary

Ensure you are familiar with the list of terms and their definitions used in this guide.

A

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*

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.

cluster
> In SAN Volume Controller, a pair of nodes that provides a single configuration and service interface.

CIM See *Common Information Model*.

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.

D

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.

directed maintenance procedures
> The set of maintenance procedures that can be run for a cluster. These procedures are documented in the service guide.

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.

E

error code
> A value that identifies an error condition.

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

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.

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.

FC See *fibre channel*.

G

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.

H

HBA See *host bus adapter*.

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.

I

inconsistent

In a Remote Copy relationship, pertaining to a secondary virtual disk (VDisk) that is being synchronized with the primary VDisk.

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.

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.

IP See *Internet Protocol*.

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.

L

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.

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)

LU See *logical unit*.

LUN See *logical unit number*.

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).

mapping
See *FlashCopy mapping*.

MDisk See *managed disk*.

N

node One SAN Volume Controller. Each node provides virtualization, cache, and Copy Services to the storage area network (SAN).

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.

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.

P

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.

R

RAID See *redundant array of independent disks*.

reliability
> The ability of a system to continue to return data even if a component fails.

S

SAN See *storage area network*.

SCSI See *Small Computer Systems Interface*.

Small Computer System Interface (SCSI)
> A standard hardware interface that enables a variety of peripheral devices to communicate with one another.

SNMP See *Simple Network Management Protocol*.

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)

IBM Subsystem Device Driver (SDD)
> An IBM pseudo device driver designed to support the multipath configuration environments in IBM products.

U

uninterruptible power supply
> A device 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.

V

valid configuration
> A configuration that is supported.

VDisk See *virtual disk*.

virtual disk (VDisk)
> In SAN Volume Controller, a device that host systems attached to the storage area network (SAN) recognize as a Small Computer System Interface (SCSI) disk.

virtualization
> In the storage industry, a concept in which a pool of storage is created that contains several disk subsystems. The subsystems can be from various vendors. The pool can be split into virtual disks that are visible to the host systems that use them.

virtualized storage
> Physical storage that has virtualization techniques applied to it by a virtualization engine.

W

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 associated with a fibre-channel adapter port. The WWPN is assigned in an implementation- and protocol-independent manner.

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