IBM TotalStorage SAN Volume Controller

Installation Guide

Version 2.1.0

SC26-7541-04

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Fifth Edition (February 2005)

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

Contents

Figures

Tables

About this guide

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

Who should use this guide?

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

This guide should be read by the IBM service representative who is responsible for the initial installation of the SAN Volume Controller, 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 SC26-7541-04 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 topic describes the changes to this guide since the previous edition, SC26-7541-03. The following sections summarize the changes that have since been implemented from the previous version.

This version includes the following new information:

- The SAN Volume Controller can be used with an uninterruptible power supply (UPS) 5115. This release includes documentation on the UPS 5115 as well as the UPS 5125.

  Note: If text is referring to the “UPS” or to the “uninterruptible power supply,” then it is referring to a generic UPS and can be referring to either UPS. When the UPS is referred to as the “UPS 5115” or the “UPS 5125,” then the specific UPS is designated.
- The following new topics were added for the UPS 5115:
  - Controls and indicators for the uninterruptible power supply 5115
  - Power on indicator
  - On/off button
  - Overload indicator
  - On battery indicator
  - Service indicator
  - Load segment 1 indicator
  - Load segment 2 indicator
  - Installing the uninterruptible power supply 5115 in the rack

- Hardware for the uninterruptible power supply 5115
- Connecting the SAN Volume Controller to the uninterruptible power supply 5115
- Power cables for the uninterruptible power supply 5115
- Power cables for the uninterruptible power supply 5125

Changed information

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

- Support for 4-node configurations has been updated to support 8-node.
- Updated the number of uninterruptible power supplies to support up to 8 nodes.
- Updated Preparing your uninterruptible power supply environment to support UPS 5115
- Provided a list of other IBM publications related to the SAN Volume Controller

Deleted information

Documentation for the Master Console has been removed. You can find information for the Master Console in *IBM TotalStorage Master Console Installation and User's Guide*.

The following topics were deleted for the Master Console:

- Master console
- Master console components
- Preparing your master console environment
- Installing the master console

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:

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

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

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
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

Title	Description	Order number
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
IBM TotalStorage Master Console Installation and User's Guide	This guide includes the instructions on how to install and use the SAN Volume Controller Console	

Other IBM publications

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

Title	Description	Order number
IBM TotalStorage Enterprise Storage Server, IBM TotalStorage SAN Volume Controller, IBM TotalStorage SAN Volume Controller for Cisco MDS 9000, IBM TotalStorage Multipath Subsystem Device Driver: User's Guide	This guide describes the IBM TotalStorage Multipath 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 Multipath Subsystem Device Driver: User's Guide*.	SC26-7608

Related Web sites

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

Type of information	Web site

SAN Volume Controller support	http://www-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:

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- e-mail

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

  starpubs@us.ibm.com

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

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

  International Business Machines Corporation
  RCF Processing Department
  Department 61C

9032 South Rita Road
Tucson, Arizona 85775-4401
U.S.A.

Safety and environmental notices

Safety should be a concern for anyone using the SAN Volume Controller or an uninterruptible power supply (UPS).

This topic describes the information about the following topics:

- Definition of the danger, caution and attention notices used in this guide
- Danger notices for the UPS
- Danger notices for the SAN Volume Controller
- Caution notices for the UPS
- Caution notices for the SAN Volume Controller
- Safety inspection checklist for the SAN Volume Controller
- Checking the grounding of the SAN Volume Controller and UPS
- Safety inspection checklist for the UPS
- Labels for the outside of the UPS
- Labels for the battery unit of the UPS
- Labels for the SAN Volume Controller
- Environmental notices and statements
- Handling static sensitive devices

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 (UPS).

Use the reference numbers in parentheses, for example (1), at the end of each notice to find the matching translated notice. For the translation of the danger, caution, attention notices, and the translation of the safety labels, see the *IBM TotalStorage SAN Volume Controller: Translated Safety Notices*.

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 UPS 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 UPS. (5)

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. For the translation of the danger, caution, attention notices, and the translation of the safety labels, see the *IBM TotalStorage SAN Volume Controller: Translated Safety Notices*.

DANGER

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

Caution notices for the uninterruptible power supply

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

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

caution, attention notices, and the translation of the safety labels, see the *IBM TotalStorage SAN Volume Controller: Translated Safety Notices*.

CAUTION:
The UPS contains its own energy source (batteries). The output receptacles might carry live voltage even when the UPS is not connected to an AC supply. (11)

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

CAUTION:
To reduce the risk of fire or electric shock, install the UPS 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 UPS 5125 must not have an earth leakage current greater than 2.5 milliamperes and for the UPS 5115 it must not be greater than 3.5 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 UPS 5125 weighs 39 kg (86 lb) with the electronics assembly and the battery assembly installed:

- **Do not attempt to lift the UPS 5125 by yourself. Ask another service representative for assistance.**
- **Remove the battery assembly from the UPS 5125 before removing the UPS from the shipping carton.**
- **Do not attempt to install the UPS 5125 into the rack unless the electronics assembly and the battery assembly have been removed.**

CAUTION:
The electronics assembly for the UPS 5125 weighs 6.4 kg (14 lb). Take care when you remove it from the UPS 5125. (16)

CAUTION:
The UPS 5125 battery unit weighs 21 kg (45 lb). Do not attempt to lift the UPS 5125 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)

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. For the translation of the danger, caution, attention notices, and the translation of the safety labels, see the *IBM TotalStorage SAN Volume Controller: Translated Safety Notices*.

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)

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 the following conditions:
   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 that is specified on the product-information label matches the specified voltage of the electrical power outlet. If necessary, verify the voltage.

8. Inspect the power supply assemblies and check that the fasteners (screws or rivets) in the cover of the power-supply unit have not been removed or disturbed.
9. Before connecting the SAN Volume Controller to the SAN, check the grounding.

External machine 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.

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.

Inspecting the uninterruptible power supply for unsafe conditions

Ensure that you take the time to inspect the uninterruptible power supply (UPS) 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 UPS for unsafe conditions. If necessary, see any suitable safety publications.

1. If any equipment has been damaged during the shipment, keep the shipping cartons and packing materials.
2. File a claim for shipping damage within fifteen days of receipt of the equipment.

Emergency power-off event

The SAN Volume Controller and uninterruptible power supplies (UPSs) will occasionally undergo an emergency power-off (EPO) shutdown.

In the event of a room EPO shutdown, the UPS 5115 will automatically shut down within 5 minutes of the input power being removed. When the UPS 5125 detects a loss of input power, this is reported to the SAN Volume Controller which completes the process of shutting down the output from the UPS 5125 within 5 minutes.

Attention: If an EPO event occurs and the UPS 5125 is not connected to at least one operational SAN Volume Controller, you must unplug the output cables of the UPS 5125 to remove output power from the UPS.

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 steps describe how to check the labels on the SAN Volume Controller.

Perform the following label checks:

1. Agency/ratings label. See Figure 1.

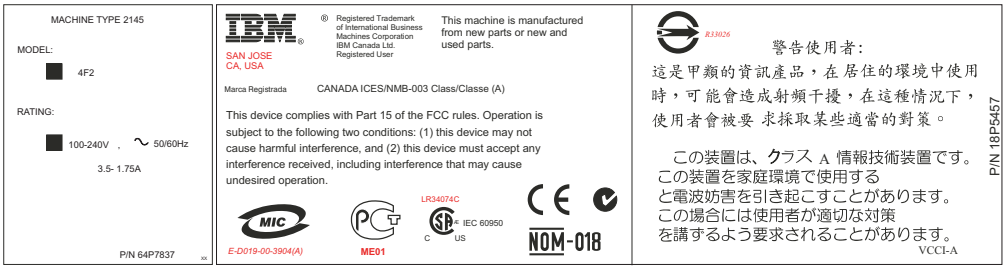


Figure 1. Agency/ratings label for the SAN Volume Controller

2. No user access label. See Figure 2.

Figure 2. No user access label for the SAN Volume Controller

3. Class 1 laser label. See Figure 3 on page xxii.

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.

Figure 3. Class 1 laser label

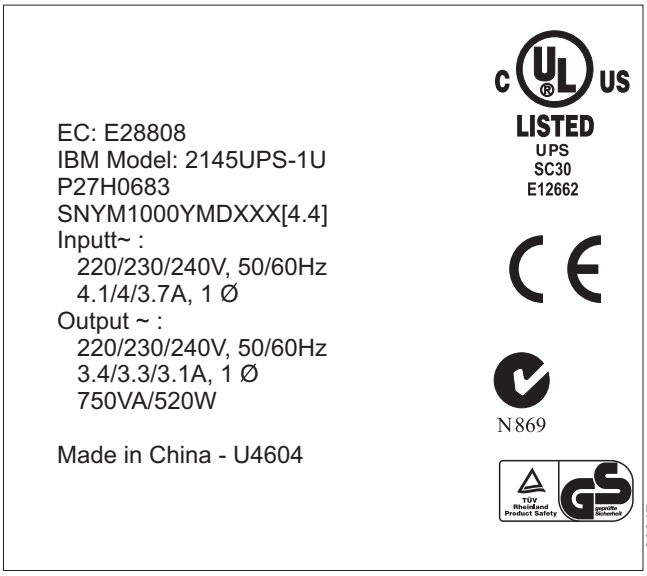
Checking the labels on the outside of the uninterruptible power supply

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

Checking the UPS 5115 labels

Perform the following safety label checks for the UPS 5115:

1. Agency label.



2. IT compatible label.

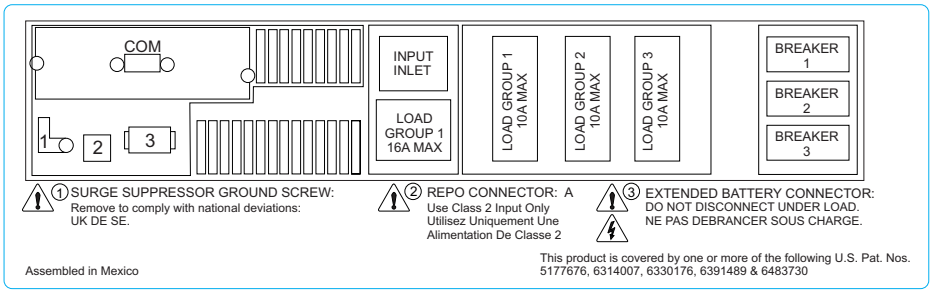
3. Do not discard the UPS or the UPS batteries in the trash. The UPS may contain sealed, lead-acid batteries, which must be recycled.

Checking the UPS 5125 labels

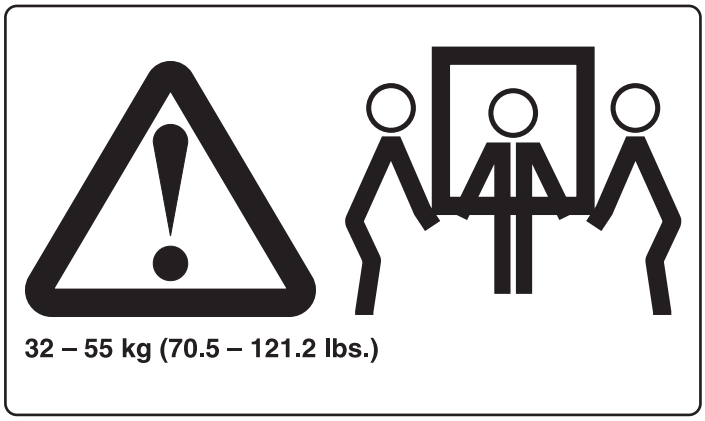
Perform the following safety label checks for the UPS 5125:

1. Agency label.

2. Rear panel configuration. This label is installed on the cover of the power supply of the SAN Volume Controller.

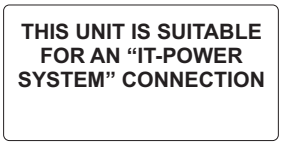


3. Three-man lift.



4. Weight label.

5. IT compatible label.



6. No user access label.

Checking the labels on the battery of the uninterruptible power supply

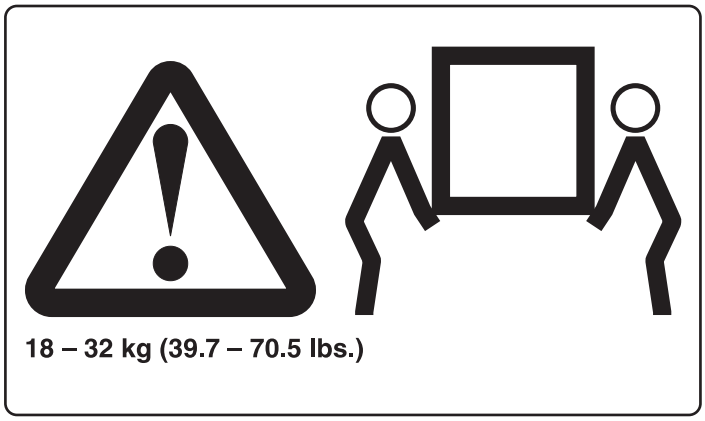
Ensure that you understand how to check the labels on the battery of the uninterruptible power supply (UPS).

Checking the battery labels of the UPS 5115

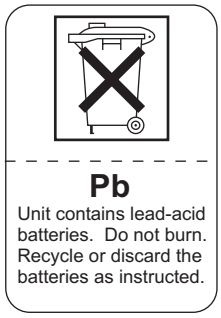
Do not discard the UPS 5115 or the UPS 5115 batteries in the trash. The UPS may contain sealed, lead-acid batteries, which must be recycled.

Checking the battery labels of the UPS 5125

- Two-man lift label.



- Battery recycle label.



- Weight label.

- Power ratings label.

- Battery faceplate label.

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

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 you handle devices during cold weather because heating reduces indoor humidity and increases static electricity.

Chapter 1. Overview of the SAN Volume Controller

This chapter describes the SAN Volume Controller and all of its components.

Related concepts

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

Related reference

"Controls and indicators for the SAN Volume Controller" on page 5
Controls and indicators are located on the front panel of the SAN Volume Controller.

"SAN Volume Controller rear panel indicators" on page 7
The controls and indicators for the SAN Volume Controller are contained on the front and back panel assembly.

"SAN Volume Controller hardware" on page 9
The SAN Volume Controller hardware is identified in the chart and shown in the graphic below.

"SAN Volume Controller connectors" on page 11
The external connectors for the SAN Volume Controller can be located easily.

"Preparing your SAN Volume Controller environment" on page 12
Before installing the SAN Volume Controller, prepare the physical environment.

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
- Logical unit virtualization
- Manages logical volumes
- Provides advanced functions for the SAN, such as:
  - Large scalable cache
  - Copy services
    - FlashCopy® (point-in-time copy)
    - Metro Mirror (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. Figure 4 provides an illustration 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 (UPS) 5115 or uninterruptible power supply (UPS) 5125 units.

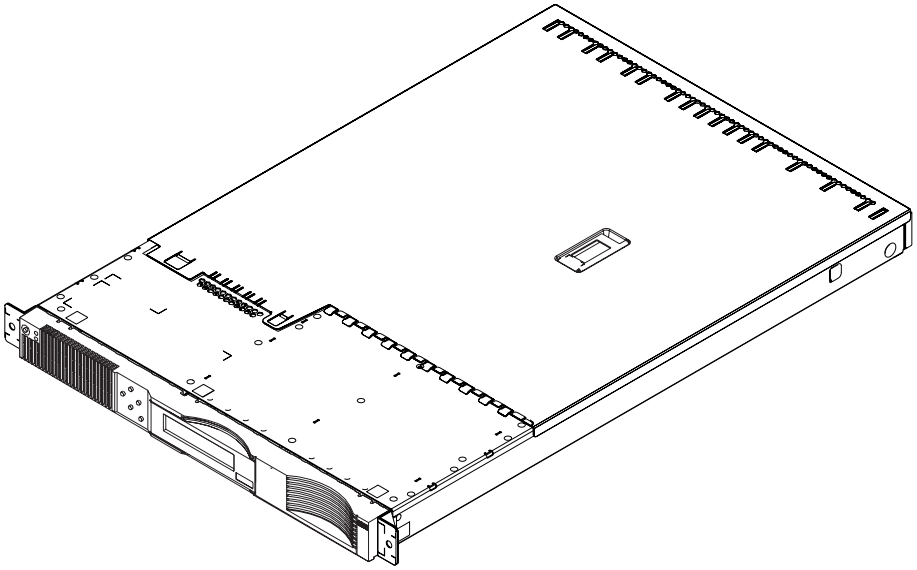


Figure 4. A SAN Volume Controller node

The SAN Volume Controller I/O groups recognize the storage presented to the SAN by the backend controllers as a number of disks known as *managed disks*. The application servers do not recognize 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 be in only 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. Figure 5 on page 3 shows that several host systems can be connected to a SAN fabric. A cluster of SAN Volume Controller nodes is connected to the same fabric and presents virtual disks to the host systems. You create these virtual disks from units of space within a managed disk group. A managed disk group is a collection of managed disks presented by the back-end RAID controllers, providing a storage

pool. You choose how each group is made up, and you can combine managed disks from different manufacturers' controllers in the same managed disk group if required.

Note: Some operating systems cannot tolerate other operating systems in the same zone.

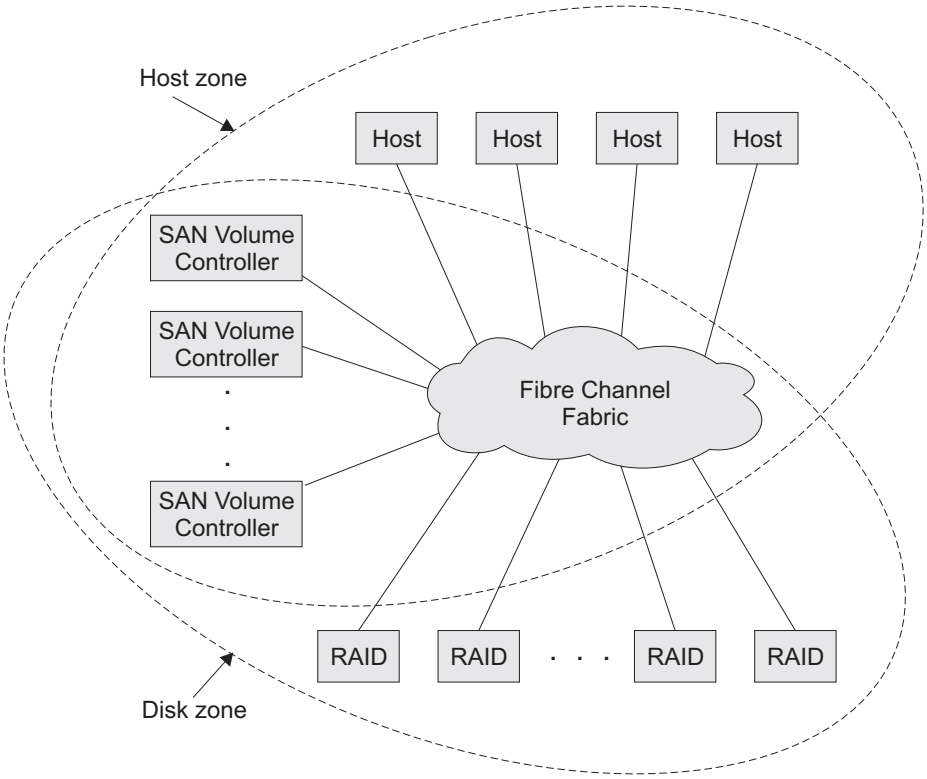


Figure 5. Example of a SAN Volume Controller in a fabric

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 of 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: Directly-attached hosts that share a back-end storage controller with a SAN Volume Controller can run multipath drivers SDD and RDAC simultaneously. Other multipath drivers running with SDD are not supported.

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.

Related reference

"Controls and indicators for the SAN Volume Controller" on page 5
Controls and indicators are located on the front panel of the SAN Volume Controller.

"SAN Volume Controller rear panel indicators" on page 7
The controls and indicators for the SAN Volume Controller are contained on the front and back panel assembly.

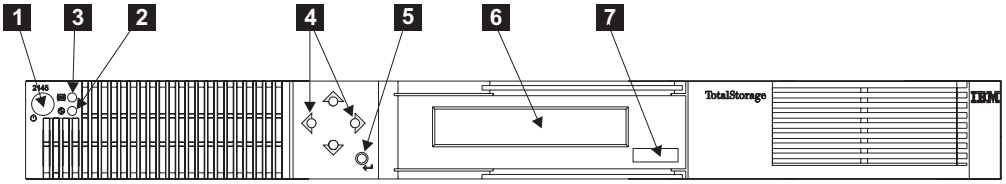
"SAN Volume Controller hardware" on page 9
The SAN Volume Controller hardware is identified in the chart and shown in the graphic below.

“SAN Volume Controller connectors” on page 11
The external connectors for the SAN Volume Controller can be located easily.
“Preparing your SAN Volume Controller environment” on page 12
Before installing the SAN Volume Controller, prepare the physical environment.

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.



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” on page 6
The green power LED indicates the power status of the SAN Volume Controller:

“Check LED” on page 6
This is an amber LED used to indicate critical failures on the service controller.

“Navigation buttons” on page 6
Use the navigation buttons to move through menus.

“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.

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 that is connected to an uninterruptible power supply (UPS) 5125, the UPS 5125 also powers off. To power on the SAN Volume Controller, you must first power on the UPS 5125 to which it is connected.

Note: The UPS 5115 will not power off when the SAN Volume Controller is shut down from the power button.

Power LED

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

The properties of the green power LED are as follows:

Off

- One or more 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.)

Check LED

This is an amber LED used to indicate critical failures on the service controller.

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

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

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

Navigation buttons

Use the navigation buttons to move through menus.

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

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

Select button

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

The select button is located on the front panel of the SAN Volume Controller, near the navigation buttons.

Front panel display

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

Information on the front panel display is available in several 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

Node identification label

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

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

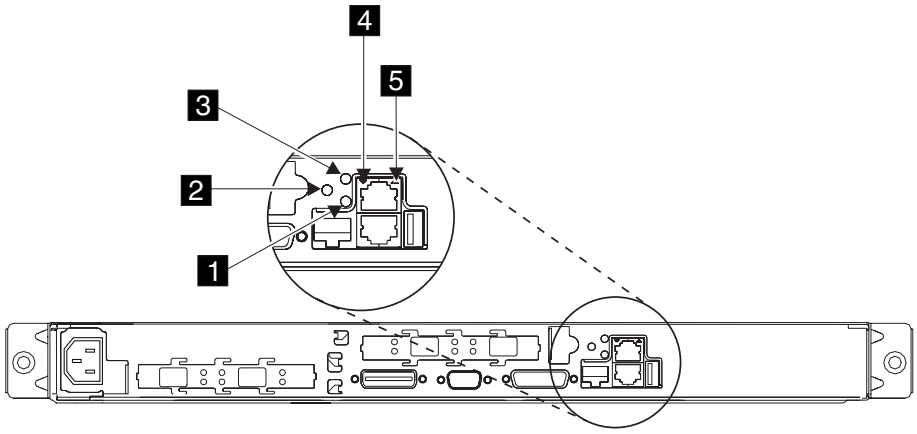
If the front panel is replaced, the configuration and service software displays the number that is printed on the front of the replacement panel. Future error reports will also contain the new number. No cluster reconfiguration is necessary when the front panel is replaced.

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.

SAN Volume Controller rear panel indicators

The controls and indicators for the SAN Volume Controller are contained on the front and back panel assembly.

The following figure shows the location of the controls and indicators:



1 System board power LED

2 System board fault LED

3 Monitor LED (not used)

4 Lower Ethernet connection LED

5 Upper Ethernet connection LED

Related reference

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

“System board fault LED” on page 9
The amber system board fault LED indicates that the system board has detected a critical failure.

“Monitor LED” on page 9
The green monitor LED is not used on the SAN Volume Controller.

“Lower Ethernet connection LED” on page 9
The lower Ethernet connection LED indicates the operational status of Ethernet port 1. This LED is illuminated when a good Ethernet connection exists between the SAN Volume Controller and the Ethernet network.

“Upper Ethernet connection LED” on page 9
The upper Ethernet connection LED indicates the operational status of Ethernet port 2. Ethernet port 2 is not used on the SAN Volume Controller except during Ethernet problem determination.

System board power LED

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

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 (UPS) 5125, the UPS 5125 will also power off. To power on the SAN Volume Controller, you must first power on its UPS 5125 to which it is connected.

Note: The UPS 5115 will not power off when the SAN Volume Controller is shut down from the power button.

System board fault LED

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

You can view the system board fault LED in “SAN Volume Controller rear panel indicators.”

Monitor LED

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

You can view the monitor LED in “SAN Volume Controller rear panel indicators.”

Lower Ethernet connection LED

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

You can view the lower Ethernet connection LED in “SAN Volume Controller rear panel indicators.”

Upper Ethernet connection LED

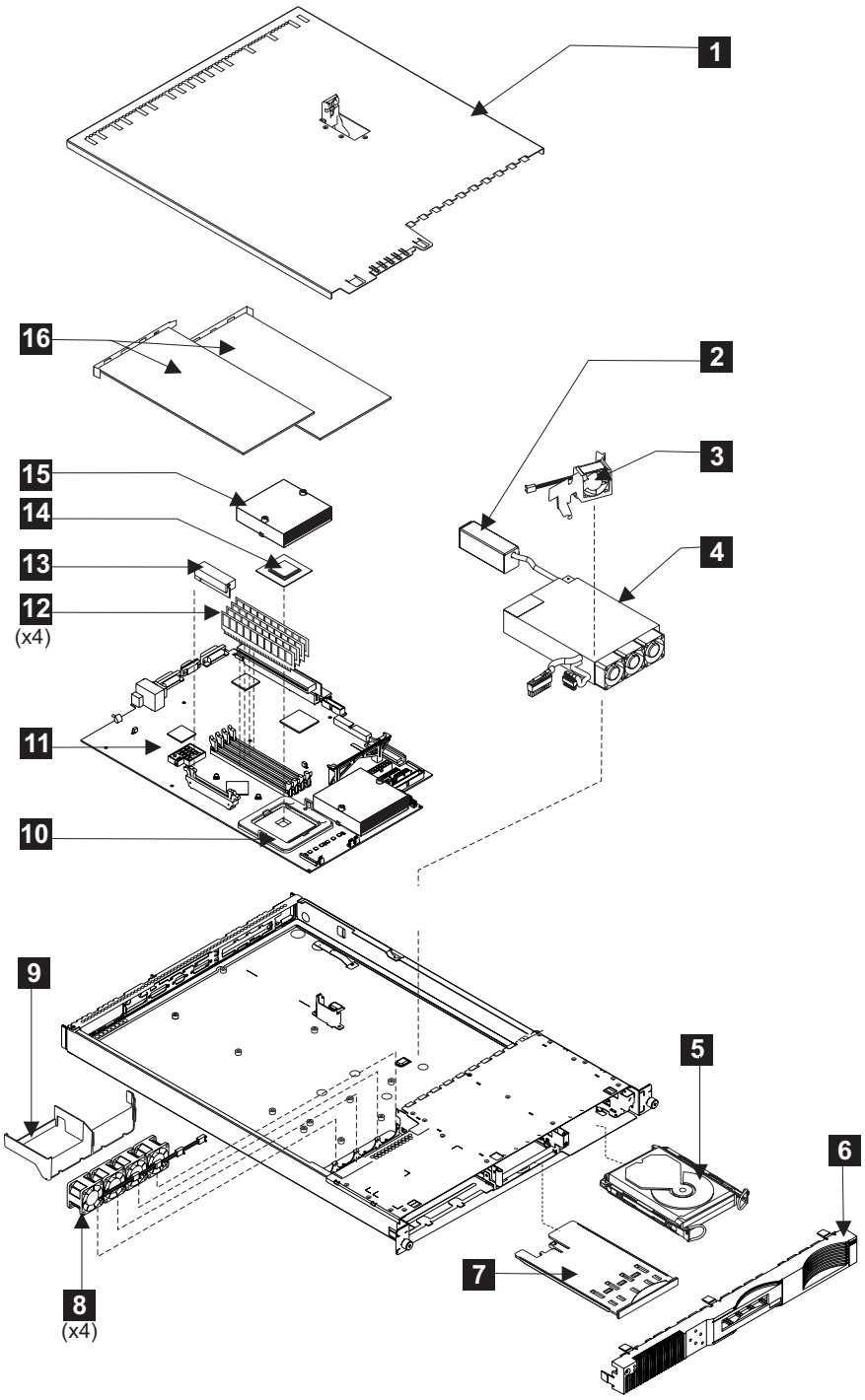
The upper Ethernet connection LED indicates the operational status of Ethernet port 2. Ethernet port 2 is not used on the SAN Volume Controller except during Ethernet problem determination.

You can view the upper Ethernet connection LED in “SAN Volume Controller rear panel indicators.”

SAN Volume Controller hardware

The SAN Volume Controller hardware is identified in the chart and shown in the graphic below.

The following figure displays a breakout view for the parts to the SAN Volume Controller. Use the reference keys below the figure to match the reference keys in the example.



1 Top cover

2 Power supply connector

3 Fan with baffle

4 Power supply assembly

5 Hard disk drive

6 Front panel

7 Service controller card

8 Fan assembly (4)

9 Air baffle

10 Microprocessor heat sink retention module

11 System board

12 DIMM modules (4)

13 Microprocessor Voltage Regulator

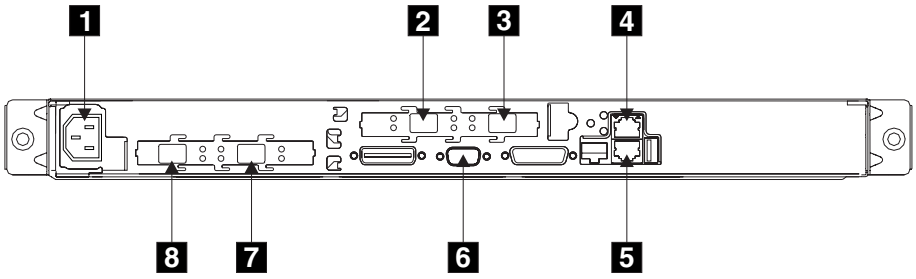
14 Microprocessor

15 Microprocessor heat sink

16 Fibre-channel adapters (2)

SAN Volume Controller connectors

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



Use the reference keys below to cross reference the reference keys in the example above:

1 Power connector indicator

2 Fibre-channel port 3

3 Fibre-channel port 4

4 Ethernet port 2 ***(not used on the SAN Volume Controller)***

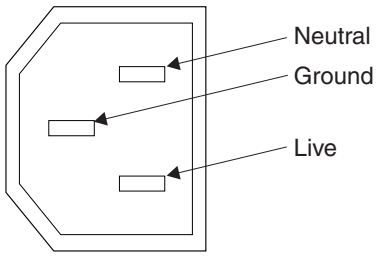
5 Ethernet port 1

6 Serial connector

7 Fibre-channel port 2

8 Fibre-channel port 1

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



Preparing your SAN Volume Controller environment

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

Dimensions and weight

The following tables list the physical dimensions and weight of the SAN Volume Controller, as well as other environmental requirements that you must consider before you install your SAN Volume Controller:

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

Power Supply Assembly Type	Voltage	Frequency
200 to 240 V	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)

Environment	Temperature	Altitude	Relative Humidity	Maximum Wet Bulb Temperature
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 30
Ensure that your physical site meets the installation requirements for the uninterruptible power supply (UPS).

Chapter 2. Overview of the uninterruptible power supply

This chapter describes the uninterruptible power supply and all of its components.

Related reference

"Controls and indicators for the uninterruptible power supply 5115" on page 19
All controls for the uninterruptible power supply 5115 are located on the front panel assembly.

"Controls and indicators for the uninterruptible power supply 5125" on page 22
All controls for the uninterruptible power supply 5125 are located on the front panel assembly.

"Hardware for the uninterruptible power supply 5115" on page 25
Diagrams of the hardware for the uninterruptible power supply (UPS) 5115 are shown below:

"Hardware for the uninterruptible power supply 5125" on page 26
Diagrams of the hardware for the uninterruptible power supply (UPS) 5125 are shown below:

"Preparing your uninterruptible power supply environment" on page 30
Ensure that your physical site meets the installation requirements for the uninterruptible power supply (UPS).

Uninterruptible power supply overview

The uninterruptible power supply (UPS) 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. Two types of UPS units can be used with the SAN Volume Controller: the UPS 5115 and the UPS 5125.

If a power outage occurs, the UPS maintains power long enough to save any configuration and cache data contained in the dynamic random access memory (DRAM). The data is saved to the SAN Volume Controller internal disk. Figure 6 on page 16 and Figure 7 on page 16 provide illustrations of the two types of UPS units.

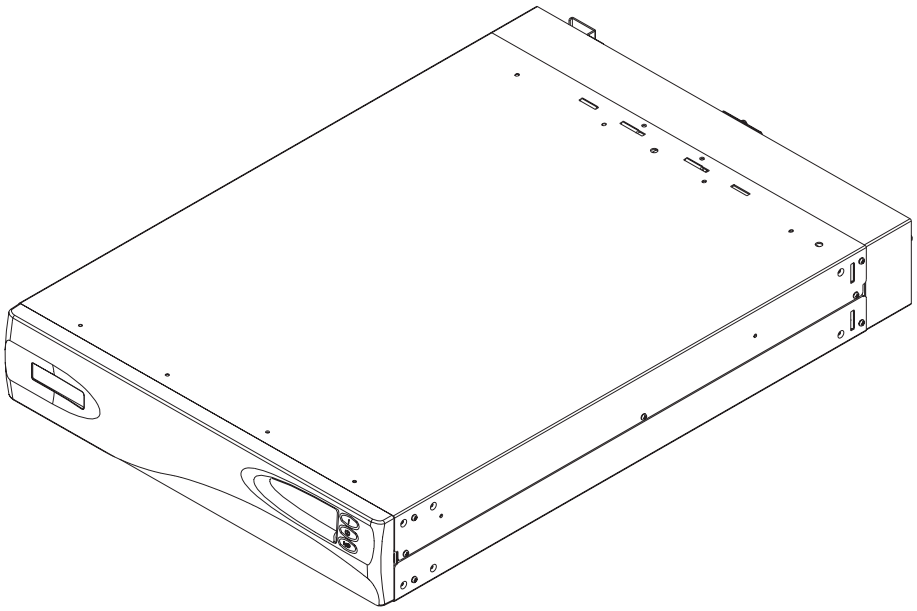


Figure 6. Uninterruptible power supply 5125

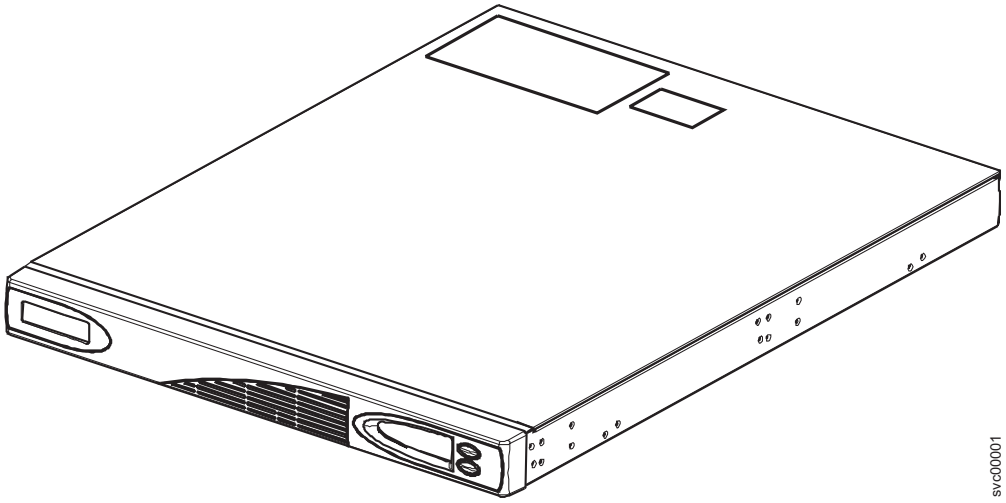


Figure 7. Uninterruptible power supply 5115

Note: The SAN Volume Controller UPS is an integral part of the SAN Volume Controller solution. It maintains continuous SAN Volume Controller specific communications with its attached SAN Volume Controller nodes. The SAN Volume Controller cannot operate without the UPS. The SAN Volume Controller UPS 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 UPS. Each UPS 5125 can support up to two SAN Volume Controller nodes. The UPS 5115 can support one SAN Volume Controller node. It is also

recommended that you connect the two UPS units for the pair to different independent electrical power sources. This reduces the chance of an input power failure at both UPS units.

The UPS must be in the same rack as the nodes. Ensure that you are following the UPS guidelines that are provided in Table 1.

Table 1. Uninterruptible power supply support guidelines

Number of nodes	Number of uninterruptible power supply 5125 units	Number of uninterruptible power supply 5115 units
2	2	2
4	2	4
6	4	6
8	4	8

Attention:

1. Do not connect the uninterruptible power supplies to an input power source that does not conform to standards.
2. Each UPS pair must power only one SAN Volume Controller cluster.

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

The UPS 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 UPS 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 UPS.

Each SAN Volume Controller monitors the operational state of the UPS to which it is attached. If the UPS 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 UPS 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 UPS battery charge state indicates that it has sufficient capacity to power the SAN Volume Controller long enough to permit it to save all its memory to the disk drive in the event of a power loss. The UPS has sufficient capacity to save all the data on the SAN Volume Controller at least twice. For a fully-charged UPS, even after battery capacity has been used to power the SAN Volume Controllers while they save DRAM data, sufficient battery capacity remains 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 UPS, the SAN Volume Controller connected to that UPS performs 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 UPS. In the event of a delay in the completion of the power down sequence, the UPS

output power is removed five minutes after the power was disconnected to the UPS. Because this operation is controlled by the SAN Volume Controller, a UPS 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 must manually shut down the UPS by pushing the UPS 5125 power off button, or the UPS 5115 on/off button.

Attention: Data integrity could be compromised by pushing the UPS 5125 power off button or the UPS 5115 on/off button. Never shut down a UPS 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 UPS or mainline power source.

When nodes are added to the cluster, you must specify the I/O group that they will join. The configuration interfaces also checks the UPS units and ensures that the two nodes in the I/O group are not connected to the same UPS units.

Figure 8 shows a cluster of four nodes, with two I/O groups and two UPS 5125 units.

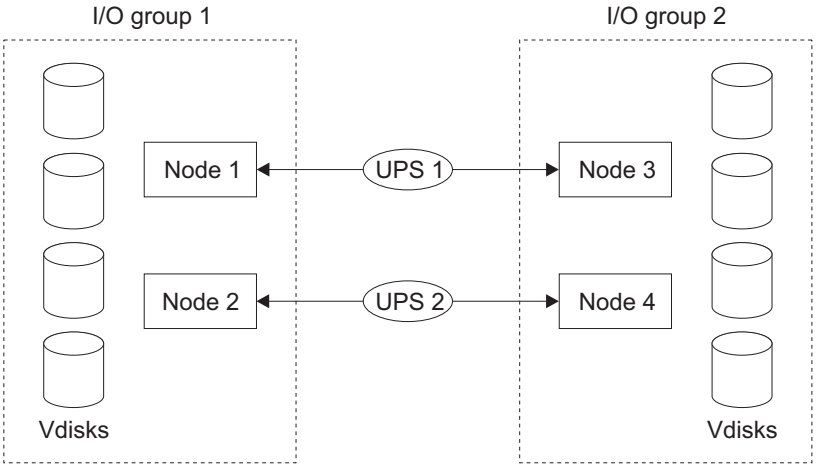


Figure 8. I/O groups and uninterruptible power supply 5125 relationship

Related reference

"Controls and indicators for the uninterruptible power supply 5115" on page 19
All controls for the uninterruptible power supply 5115 are located on the front panel assembly.

"Controls and indicators for the uninterruptible power supply 5125" on page 22
All controls for the uninterruptible power supply 5125 are located on the front panel assembly.

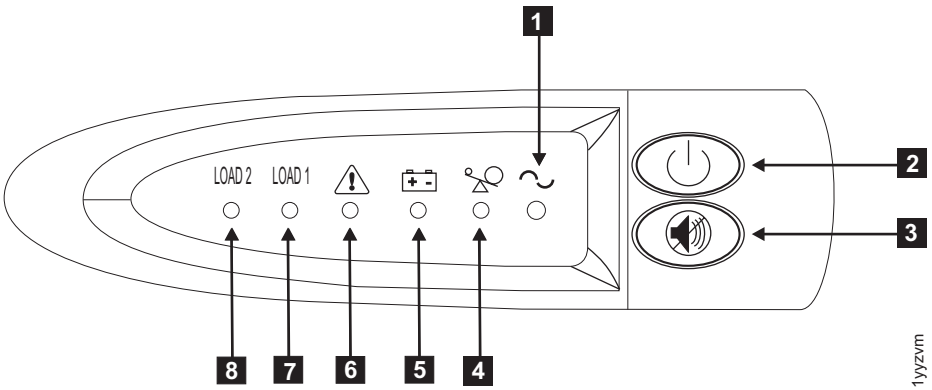
"Hardware for the uninterruptible power supply 5115" on page 25
Diagrams of the hardware for the uninterruptible power supply (UPS) 5115 are shown below:

"Hardware for the uninterruptible power supply 5125" on page 26
Diagrams of the hardware for the uninterruptible power supply (UPS) 5125 are shown below:

“Preparing your uninterruptible power supply environment” on page 30
Ensure that your physical site meets the installation requirements for the uninterruptible power supply (UPS).

Controls and indicators for the uninterruptible power supply 5115

All controls for the uninterruptible power supply 5115 are located on the front panel assembly.



1. Power-on indicator
2. On/off button
3. Test and alarm reset button
4. Overload indicator
5. On-battery indicator
6. Service indicator
7. Load segment 1 indicator
8. Load segment 2 indicator

Related reference

“Power-on indicator” on page 20
The power-on indicator shows when the uninterruptible power supply (UPS) 5115 is functioning.

“On/off button” on page 20
The on/off button turns the power on or off to the uninterruptible power supply (UPS) 5115.

“Test and alarm reset button” on page 20
Use the test and alarm reset button to start the self-test.

“Overload indicator” on page 21
The overload indicator beeps when the capacity of the uninterruptible power supply (UPS) 5115 is exceeded.

“On-battery indicator” on page 21
The on-battery indicator glows yellow when the uninterruptible power supply (UPS) 5115 is powered by the battery. This indicates that the main power source has failed.

“Service indicator” on page 21
If the service indicator on the uninterruptible power supply (UPS) 5115 is flashing red, maintenance is required.

“Load segment 1 indicator” on page 21
The load segment 1 indicator on the uninterruptible power supply (UPS) 5115 is lit (yellow) when power is available to load segment 1.

“Load segment 2 indicator” on page 21
The load segment 2 indicator on the uninterruptible power supply (UPS) 5115 is lit (green) when power is available to load segment 2.

Power-on indicator

The power-on indicator shows when the uninterruptible power supply (UPS) 5115 is functioning.

When the power-on indicator is a steady green, the UPS 5115 is active.

Related reference

“Controls and indicators for the uninterruptible power supply 5115” on page 19
All controls for the uninterruptible power supply 5115 are located on the front panel assembly.

On/off button

The on/off button turns the power on or off to the uninterruptible power supply (UPS) 5115.

Turning on the uninterruptible power supply 5115

After connecting the UPS 5115 to the outlet, it will be in “standby” mode until you turn it on. Press and hold the on/off button until a beep sounds (approximately two seconds). This indicates that the UPS 5115 is powered on and a self-test is initiated. The UPS 5115 then reverts to “normal” mode.

Turning off the uninterruptible power supply 5115

Press and hold the on/off button for two seconds. This will place the UPS 5115 in “standby” mode. You must then unplug the UPS 5115 to power-off the unit.

Related reference

“Controls and indicators for the uninterruptible power supply 5115” on page 19
All controls for the uninterruptible power supply 5115 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 for three seconds. This button also resets the alarm.

Note: This button is applicable to both the uninterruptible power supply (UPS) 5115 and the UPS 5125.

Related reference

“Controls and indicators for the uninterruptible power supply 5115” on page 19
All controls for the uninterruptible power supply 5115 are located on the front panel assembly.

Overload indicator

The overload indicator beeps when the capacity of the uninterruptible power supply (UPS) 5115 is exceeded.

If the overload indicator is on, go to MAP 5200: Uninterruptible Power Supply 5115 to resolve the problem.

Related reference

"Controls and indicators for the uninterruptible power supply 5115" on page 19
All controls for the uninterruptible power supply 5115 are located on the front panel assembly.

On-battery indicator

The on-battery indicator glows yellow when the uninterruptible power supply (UPS) 5115 is powered by the battery. This indicates that the main power source has failed.

If the on-battery indicator is on, go to MAP 5200: Uninterruptible Power Supply 5115 to resolve the problem.

Related reference

"Controls and indicators for the uninterruptible power supply 5115" on page 19
All controls for the uninterruptible power supply 5115 are located on the front panel assembly.

Service indicator

If the service indicator on the uninterruptible power supply (UPS) 5115 is flashing red, maintenance is required.

If the service indicator is on, go to MAP 5200: Uninterruptible Power Supply 5115 to resolve the problem.

Related reference

"Controls and indicators for the uninterruptible power supply 5115" on page 19
All controls for the uninterruptible power supply 5115 are located on the front panel assembly.

Load segment 1 indicator

The load segment 1 indicator on the uninterruptible power supply (UPS) 5115 is lit (yellow) when power is available to load segment 1.

Note: Load segment 1 is unused by the SAN Volume Controller. When the UPS 5115 is configured by the SAN Volume Controller, this load segment is disabled. During normal operation, the load segment 1 indicator will be off.

Related reference

"Controls and indicators for the uninterruptible power supply 5115" on page 19
All controls for the uninterruptible power supply 5115 are located on the front panel assembly.

Load segment 2 indicator

The load segment 2 indicator on the uninterruptible power supply (UPS) 5115 is lit (green) when power is available to load segment 2.

When the load segment 2 indicator is green, the UPS 5115 is running normally and power is available to this segment.

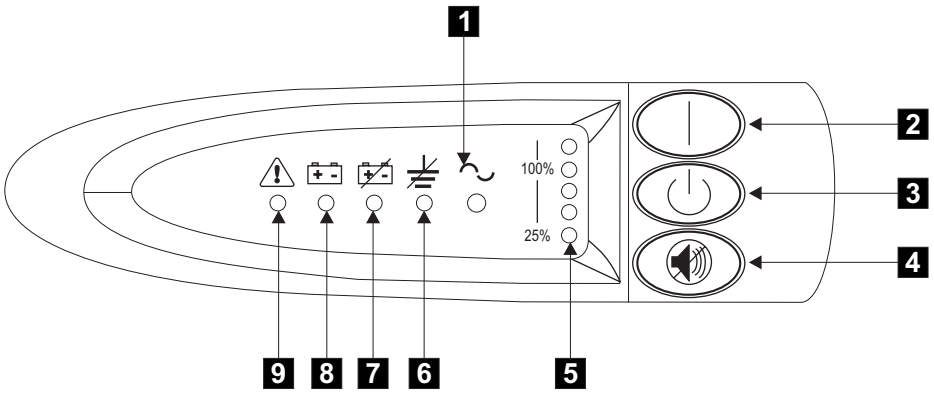
See “Hardware for the uninterruptible power supply 5115” for the location of the power outlets for this segment.

Related reference

“Controls and indicators for the uninterruptible power supply 5115” on page 19
All controls for the uninterruptible power supply 5115 are located on the front panel assembly.

Controls and indicators for the uninterruptible power supply 5125

All controls for the uninterruptible power supply 5125 are located on the front panel assembly.



1 Mode indicator

2 On button

3 Off button

4 Test and alarm reset button

5 Load-level indicators

6 Site wiring fault indicators

7 Battery service indicator

8 Battery mode indicator

9 General alarm indicator

Related reference

“Mode indicator” on page 23
The mode indicator provides status information on the uninterruptible power supply (UPS) 5125.

“On button” on page 23
The on button turns on the main power to the uninterruptible power supply (UPS) 5125.

“Off button” on page 24
The off button turns off the main power to the uninterruptible power supply (UPS) 5125.

"Test and alarm reset button" on page 20
Use the test and alarm reset button to start the self-test.

"Load-level indicators" on page 24
The load-level indicators show the percentage of uninterruptible power supply (UPS) 5125 capacity that the SAN Volume Controller is using.

"Site wiring fault indicators" on page 24
The site wiring fault indicator on the uninterruptible power supply (UPS) 5125 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 24
The battery service indicator shows that the charge in the battery has become low while the uninterruptible power supply (UPS) 5125 is in battery mode.

"Battery mode indicator" on page 24
The battery mode indicator shows that the uninterruptible power supply (UPS) 5125 is operating on batteries.

"General alarm indicator" on page 24
The general alarm indicator on the uninterruptible power supply (UPS) 5125 turns on when a power or temperature problem occurs.

Mode indicator

The mode indicator provides status information on the uninterruptible power supply (UPS) 5125.

The mode indicator is located on the front panel of the UPS 5125.

When the mode indicator is steady green, the UPS 5125 is in normal mode. The UPS 5125 checks and charges its battery as necessary.

When the mode indicator is flashing green, the UPS 5125 is in standby mode. Standby mode means that the UPS 5125 is turned off, but is still connected to the main power source. No power is available from the UPS 5125 output sockets but the UPS 5125 monitors and charges its battery as necessary.

When the mode indicator is steady red, the UPS 5125 is in bypass mode because of one of the following conditions:

- The UPS 5125 has overheated
- The UPS 5125 has an overload condition of 103% through 110% for 30 seconds
- The UPS 5125 detects a fault in the battery or in the UPS 5125 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 UPS 5125, 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 UPS 5125 and powered on.

On button

The on button turns on the main power to the uninterruptible power supply (UPS) 5125.

To turn on the power, press and hold the on button until you hear a beep (approximately one second). The mode indicator stops flashing, and the load-level indicators display the percentage of load that is being applied to the UPS 5125.

Off button

The off button turns off the main power to the uninterruptible power supply (UPS) 5125.

Attention: Never use the off button 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 UPS 5125 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 UPS 5125 remains in standby mode until you disconnect the UPS 5125 from the main power outlet.

Load-level indicators

The load-level indicators show the percentage of uninterruptible power supply (UPS) 5125 capacity that the SAN Volume Controller is using.

When all the indicators are lit, the power requirements of the SAN Volume Controller have exceeded the capacity of the UPS 5125.

Site wiring fault indicators

The site wiring fault indicator on the uninterruptible power supply (UPS) 5125 shows that either a ground wire connection does not exist or the live and neutral wires are reversed in the input power connection.

The site wiring fault indicator is located on the front panel of the UPS 5125.

Battery service indicator

The battery service indicator shows that the charge in the battery has become low while the uninterruptible power supply (UPS) 5125 is in battery mode.

The battery service indicator is located on the front panel of the UPS 5125. 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 UPS 5125 shuts down, it automatically restarts when the main power returns.

Battery mode indicator

The battery mode indicator shows that the uninterruptible power supply (UPS) 5125 is operating on batteries.

The battery mode indicator comes on when the main power source fails and the UPS 5125 is running on battery power. The alarm beeps once every five seconds. When main power returns, the UPS 5125 returns to normal mode, and the battery recharges. The battery mode indicator goes out, and the alarm stops.

General alarm indicator

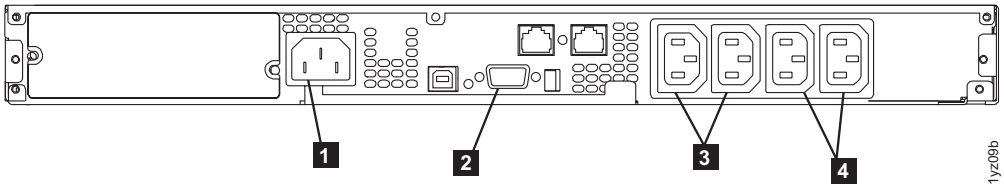
The general alarm indicator on the uninterruptible power supply (UPS) 5125 turns on when a power or temperature problem occurs.

When the general alarm indicator is accompanied by the audio alarm beeping every 5 seconds, the battery is low. If the audio alarm is continuous, the internal temperature of the UPS 5125 is too high, or there has been a momentary output overload.

Hardware for the uninterruptible power supply 5115

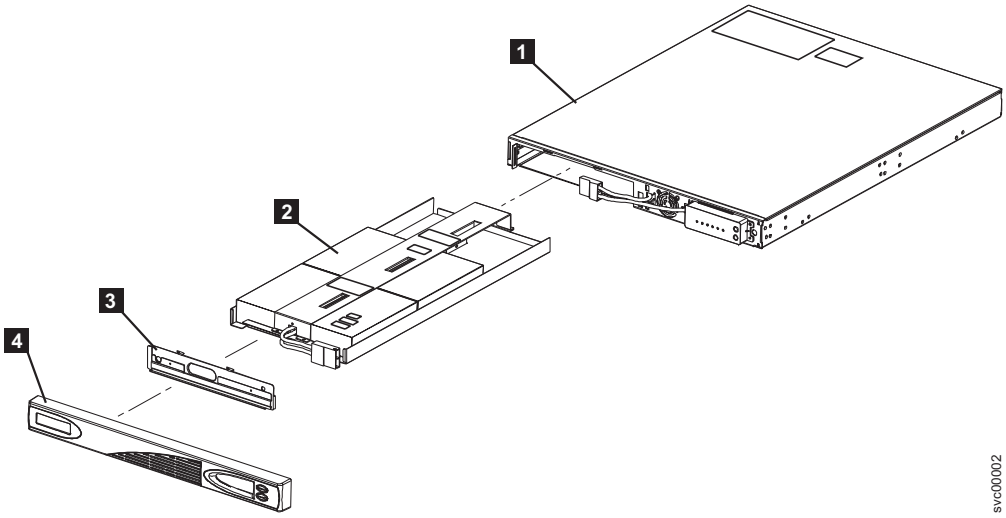
Diagrams of the hardware for the uninterruptible power supply (UPS) 5115 are shown below:

Locations for the uninterruptible power supply 5115 connectors



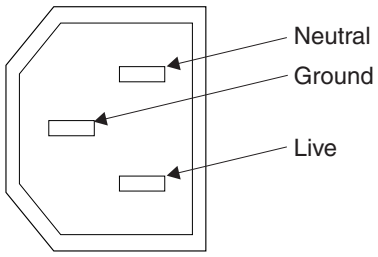
1. Main power connectors
2. Communication port
3. Load segment 1 receptacles
4. Load segment 2 receptacles

Hardware locations for the uninterruptible power supply 5115



1. Frame assembly
2. Battery pack assembly
3. Battery plate
4. Front panel assembly

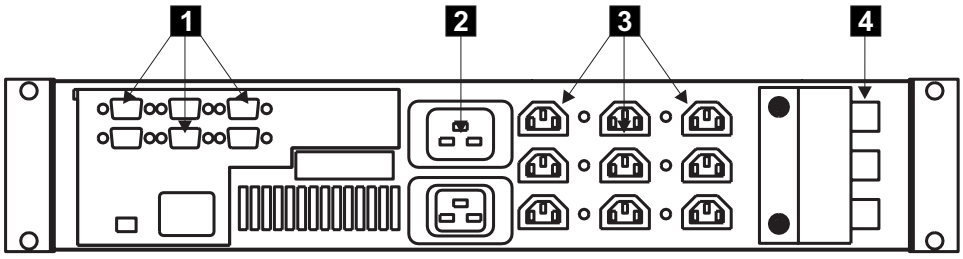
Uninterruptible power supply power connector



Hardware for the uninterruptible power supply 5125

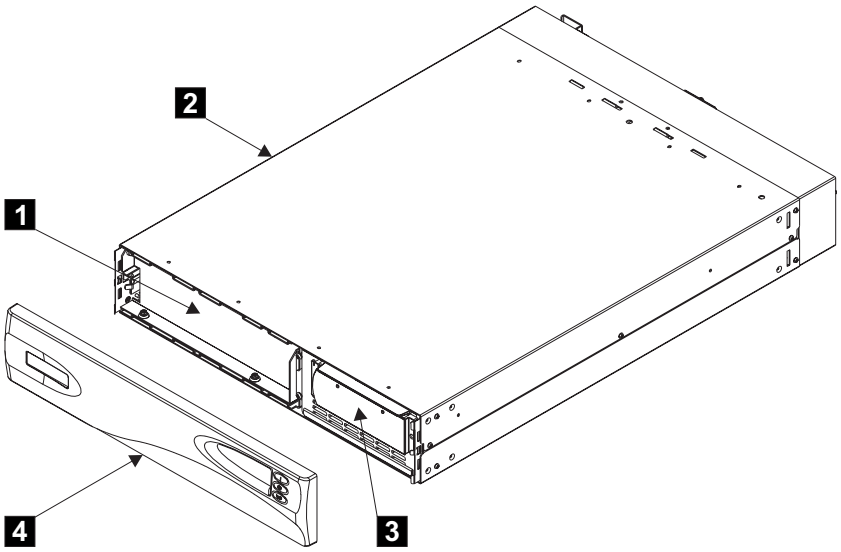
Diagrams of the hardware for the uninterruptible power supply (UPS) 5125 are shown below:

Locations for the uninterruptible power supply 5125 connectors and circuit breakers



1. Signal cable connectors
2. Main power connector
3. Output connectors
4. Circuit breakers

Hardware locations for the uninterruptible power supply 5125



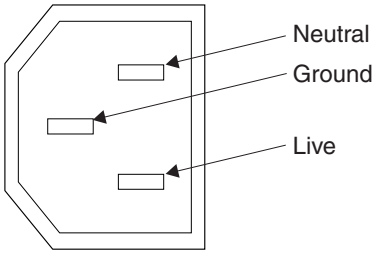
1 Battery assembly

2 Frame assembly

3 Electronics assembly

4 Front panel assembly

Uninterruptible power supply connector



Power cables for the uninterruptible power supply 5115

You must follow your country or region's power requirements to choose the appropriate power cable for the uninterruptible power supply 5115.

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

Country or region	Length	Connection type (attached plug designed for 200-240V AC input)	Part
United States of America (Chicago), Canada, Mexico	1.8 m (6 ft)	NEMA L6-15P	7842122

Country or region	Length	Connection type (attached plug designed for 200-240V AC input)	Part
Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela	2.8 m (9 ft)	NEMA L6-15P	7842123
Antigua, Bahrain, Brunei, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dubai, Fiji, Ghana, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia	2.8 m (9 ft)	BS 1363/A	14F0033
Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	2.8 m (9 ft)	AZ/NZS C112	13F9940
Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, China (Macau S.A.R.), Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe	2.8 m (9 ft)	CEE 7-VII	13F9979
Denmark	2.8 m (9 ft)	DK2-5a	13F9997
Bangladesh, Burma, Pakistan, South Africa, Sri Lanka	2.8 m (9 ft)	SABS 164	14F0015
Liechtenstein, Switzerland	2.8 m (9 ft)	1011-S2450 7	14F0051
Chile, Ethiopia, Italy, Libya, Somalia	2.8 m (9 ft)	CEI 23-16	14F0069
Israel	2.8 m (9 ft)	SI 32	14F0087

Power cables for the uninterruptible power supply 5125

You must follow your country or region's power requirements to choose the appropriate power cable for the uninterruptible power supply 5125.

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

Country or region	Length	Connection type (attached plug designed for 200-240V AC input)	Part
United States of America (Chicago), Canada, Mexico	1.8 m (6 ft)	NEMA L6-15P	14F1549
Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela	2.5 m (8 ft)	NEMA L6-15P	12J5119
Antigua, Bahrain, Brunei, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Denmark, Dubai, Fiji, Ghana, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia	2.5 m (8 ft)	IEC 309	36L8822
Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	2.5 m (8 ft)	L6-20P	12J5118
Afghanistan, Albania, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, China (Macau S.A.R.), Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe	2.5 m (8 ft)	CEE7	55H6643

Country or region	Length	Connection type (attached plug designed for 200-240V AC input)	Part
Bangladesh, Burma, Pakistan, South Africa, Sri Lanka	2.5 m (8 ft)	SABS 164	12J5124
Thailand	2.5 m (8 ft)	NEMA 6-15P	12J5120

Preparing your uninterruptible power supply environment

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

Use the following considerations when you configure the UPS 5115:

- The voltage that is supplied to the UPS 5115 must be 220 – 240 V, single phase (note that the UPS 5115 has an integrated circuit breaker and does not require external protection).

Use the following considerations when configuring the UPS 5125:

- Each UPS 5125 must 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 UPS 5125.
- The voltage that is supplied to the UPS 5125 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 UPS is cascaded from another UPS, the source UPS must have at least three times the capacity per phase, and the total harmonic distortion must be less than 5% with any single harmonic being less than 1%. The UPS must also have input voltage capture that has a slew rate faster than 3 Hz per second and 1 msec glitch rejection.

Uninterruptible Power Supply 5115 Dimensions and Weight

Height	Width	Depth	Maximum weight
44 mm (1.73 in.)	439 mm (17.3 in.)	579 mm (22.8 in.)	18.8 kg (41.4 lb.) Packaged

Uninterruptible Power Supply 5125 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

	UPS 5115	UPS 5125
Power Rating	750 VA/520 W	3000 VA/2700 W

	UPS 5115	UPS 5125
Voltage	220/230/240 V	200 – 240 V
Frequency	50 – 60 Hz	50 – 60 Hz

Environment

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

Altitude

	Operating Environment	Non-operating Environment	Storing Environment	Shipping Environment
Altitude (from sea level)	0 – 2000 m (0 – 6560 ft.)	0 – 2000 m (0 – 6560 ft.)	0 – 2000 m (0 – 6560 ft.)	0 – 15 000 m (0 – 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 UPS is supplying power to the nodes of the SAN Volume Controller.

Related reference

“Preparing your SAN Volume Controller environment” on page 12
Before installing the SAN Volume Controller, prepare the physical environment.

Chapter 3. Installing the uninterruptible power supply and the SAN Volume Controller

This chapter describes the steps you must perform to install the SAN Volume Controller and 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.

Related tasks

"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.

"Installing the support rails for the uninterruptible power supply" on page 35
You must install the support rails in the rack before installing the uninterruptible power supply (UPS) 5115 or the uninterruptible power supply (UPS) 5125.

"Installing the uninterruptible power supply 5115 in the rack" on page 37
After you have completed the preparation procedures, you are ready to install the uninterruptible power supply (UPS) 5115 in the rack.

"Installing the uninterruptible power supply 5125 in the rack" on page 41
After you have completed the preparation procedures, you are ready to install the uninterruptible power supply (UPS) 5125 in the rack.

"Installing the support rails for the SAN Volume Controller" on page 47
The support rails should be installed to hold the SAN Volume Controller.

"Installing the SAN Volume Controller in the rack" on page 50
After installing the support rails, you are ready to install the SAN Volume Controller in the rack.

"Connecting the SAN Volume Controller to the uninterruptible power supply 5125" on page 53
There are a few restrictions you should be aware of before you connect the SAN Volume Controller node to the uninterruptible power supply (UPS) 5125.

"Connecting the SAN Volume Controller to the SAN and to the Ethernet network" on page 56
Before you connect the SAN Volume Controller to the SAN, you must connect the Ethernet and fibre channel cables.

"Verifying the SAN Volume Controller installation" on page 57
Once the SAN Volume Controller is installed, you can verify the installation.

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.

Perform the following steps to prepare for installation:

1. Check all the parts and quantities against the items shown in Figure 9. If any item is missing, contact your marketing representative.

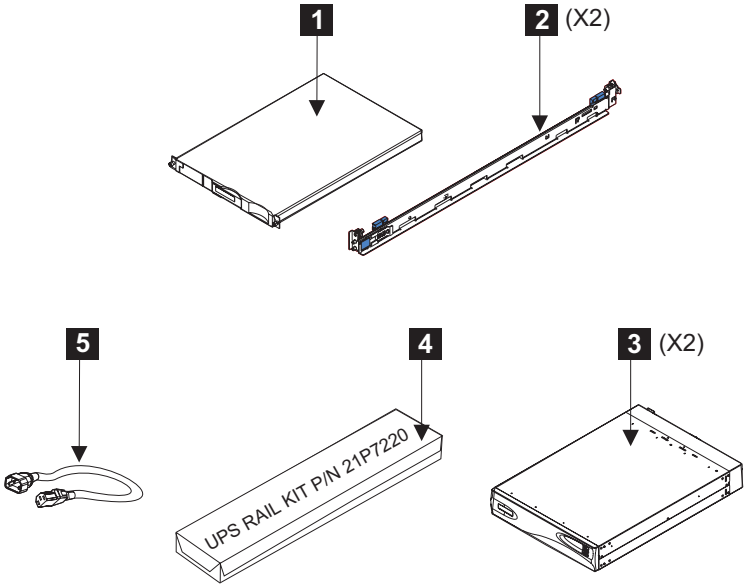


Figure 9. Items for installation in the rack

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" on page 35
You must install the support rails in the rack before installing the uninterruptible power supply (UPS) 5115 or the uninterruptible power supply (UPS) 5125.

"Installing the support rails for the SAN Volume Controller" on page 47
The support rails should be installed to hold the SAN Volume Controller.

Related reference

"Danger notices for the uninterruptible power supply" on page xvi
Ensure that you understand the danger notices for the uninterruptible power supply (UPS).

"Danger notices for the SAN Volume Controller" on page xvii
Ensure that you are familiar with the danger notices on the SAN Volume Controller.

"Caution notices for the uninterruptible power supply" on page xvii
Ensure that you understand the caution notices for the uninterruptible power supply (UPS).

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

"Preparing your uninterruptible power supply environment" on page 30
Ensure that your physical site meets the installation requirements for the uninterruptible power supply (UPS).

"Preparing your SAN Volume Controller environment" on page 12
Before installing the SAN Volume Controller, prepare the physical environment.

Installing the support rails for the uninterruptible power supply

You must install the support rails in the rack before installing the uninterruptible power supply (UPS) 5115 or the uninterruptible power supply (UPS) 5125.

Complete the following prerequisites before installing the support rails:

- Refer to the customer's hardware location table to determine where in the rack the uninterruptible power supplies are to be installed.
- Discard the two handles and their associated nuts that are shipped with the support rails for the uninterruptible power supply.
- 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 10 on page 36). 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.

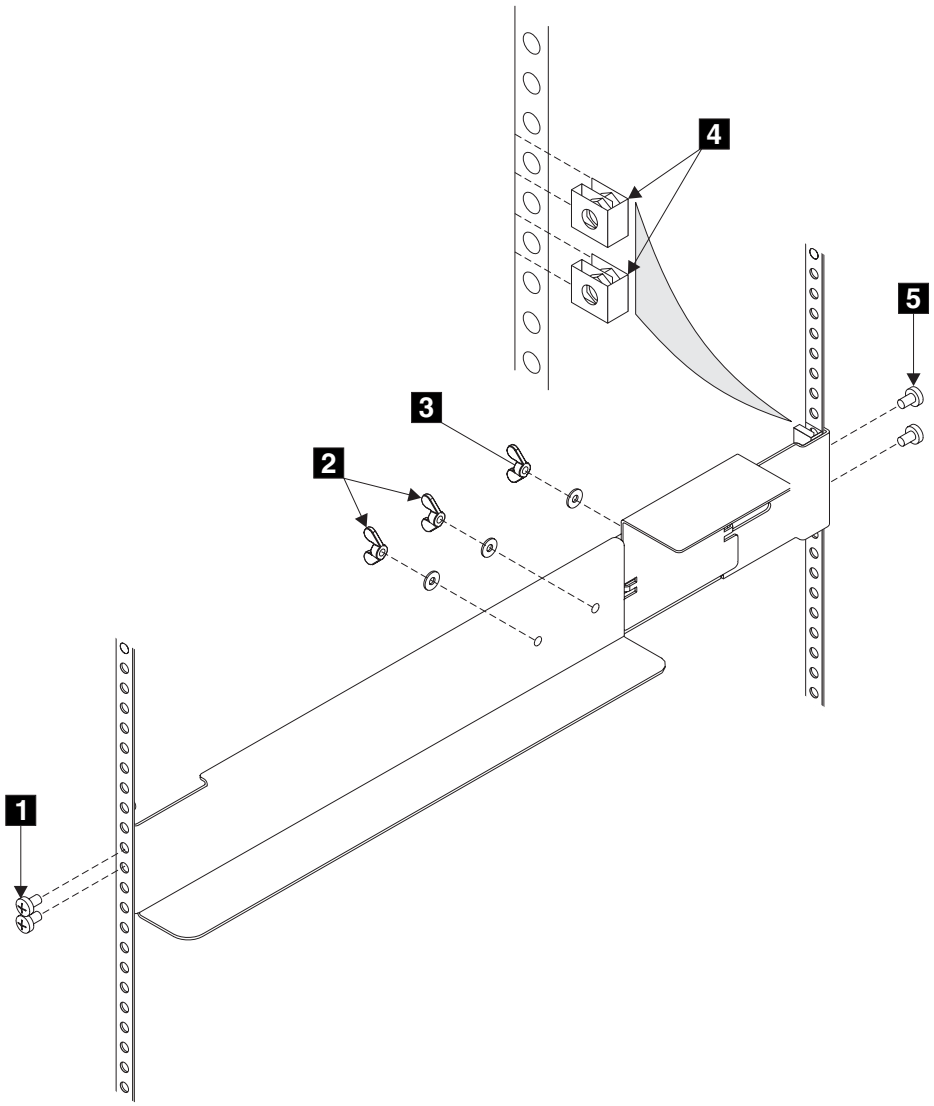


Figure 10. Installing support rails for a uninterruptible power supply into the rack

1. Mounting screws
2. Wing nuts
3. Wing nut
4. Nut clips
5. Mounting screws

Attention: In order to tighten wing nuts 2 and 3, you will need 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 there are devices already installed in that space, it might be necessary to remove them before installing the rails.

Perform the following steps to install each support rail:

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

2. Loosen wing nuts 2 and 3 .
3. Slide the bracket toward the back of the rail.
4. Remain at the back of the rack, hold the support rail in position in the rack, and then install and fully tighten the two mounting screws 5 .
5. Go to the front of the rack.
6. Extend the support rail toward the front of the rack.

   Note: Hold the support rail in position until you have completed step 8.
7. Ensure that the support rail is horizontal. You may want to use a level to ensure the support rail is straight.
8. Install the two mounting screws 1 into the third and fourth holes of the support rail flange. Fully tighten the screws.
9. Fully tighten the two wing nuts shown as 2 in the figure.
10. With wing nut 3 still loosened, 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 5115 in the rack

After you have completed the preparation procedures, you are ready to install the uninterruptible power supply (UPS) 5115 in the rack.

You must complete the following prerequisites before installing the UPS 5115 in the rack:

- Complete the preinstallation procedures.
- Install the support rails for the UPS 5115.
- Prepare your UPS 5115 environment.

Attention: Read all safety and environmental notices before starting the installation process.

CAUTION:
The UPS 5115 contains its own energy source (sealed, lead-acid batteries). The output receptacles may carry live voltage, even when the UPS 5115 is not connected to an AC supply. (11)

CAUTION:
Do not remove or unplug the input cord when the UPS 5115 is turned on. This removes the safety ground from the UPS 5115 and the equipment connected to the UPS 5115. (12)

CAUTION:
To reduce the risk of fire or electric shock, install the UPS 5115 in a temperature- and humidity-controlled indoor environment, free of conductive contaminants. Ambient temperature must not exceed 40°C (104°F). Do not operate near water or excessive humidity (95% maximum). (13)

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

Once all of the prerequisites have been completed, you can start the installation process.

Perform the following steps to install the UPS 5115 in the rack:

1. Open the top of the UPS 5115 shipping carton. Grip the flaps on either side of the UPS 5115.
2. Lift the UPS 5115 clear of the shipping carton and place it on a flat, stable surface.
3. On each side of the UPS 5115, attach the long end of a mounting bracket **1** to the UPS 5115 using four of the supplied M3 × 6 screws **2** . See Figure 11.

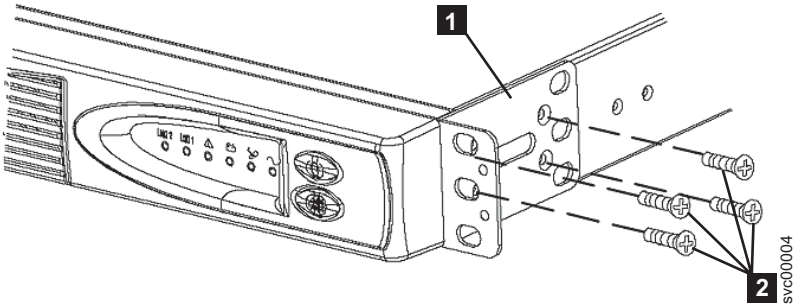


Figure 11. Attaching the mounting bracket to the uninterruptible power supply 5115

1 Mounting bracket

2 M3 × 6 screws

4. Stand at the front of the rack and place the back of the UPS 5115 onto the support rails, and then slide the UPS 5115 into the rack.
5. At the front of the UPS 5115, install the two mounting screws **1** . See Figure 12 on page 39

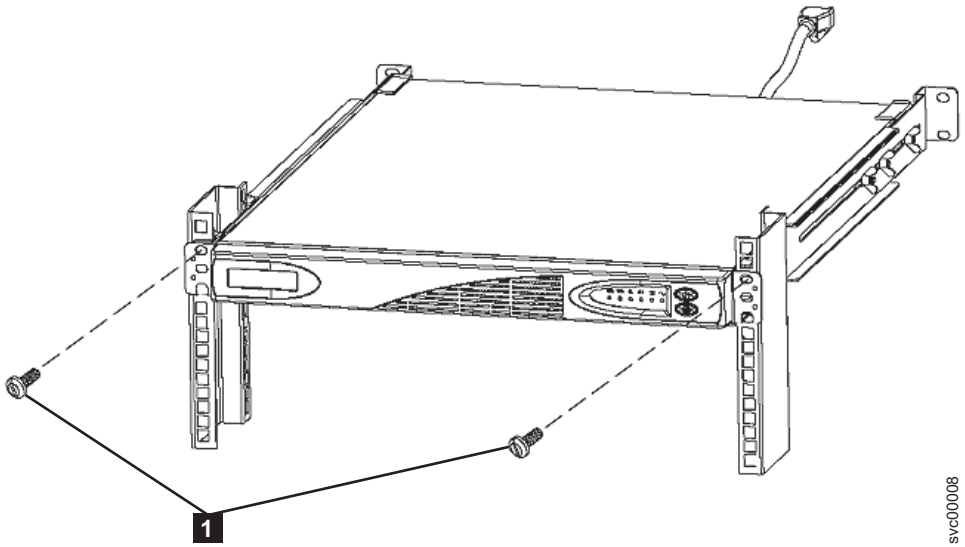


Figure 12. Installing the mounting screws for the uninterruptible power supply 5115

1 Mounting screws

If possible, the two uninterruptible power supplies should not be connected to the same power source.

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

- Each UPS 5115 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 UPS 5115.
- The voltage supplied to the UPS 5115 must be 220 – 240 V single phase.
- The frequency supplied must be between 50 and 60 Hz.

Note: If the UPS is cascaded from another UPS, the source UPS must have at least 3 times the capacity per phase and the total harmonic distortion must be less than 5% with any single harmonic being less than 1%. The UPS must also have input voltage capture that has a slew rate faster than 3 Hz per second and 1 msec glitch rejection.

6. At the back of the UPS 5115, plug the UPS 5115 main power connector **1** into the power socket. The UPS 5115 will be in standby mode so all indicators will be off. See Figure 13 on page 40.

   Note: The UPS 5115 is intended to maintain power on SAN Volume Controller nodes until data can be saved to the local hard disk drive. Only SAN Volume Controller nodes can be plugged into the UPS 5115 or the SAN Volume Controller cluster malfunctions.

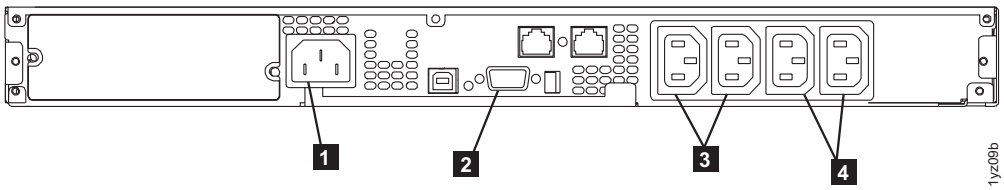


Figure 13. Installing the uninterruptible power supply 5115 power cable

1 Main power connector

2 Communication port

3 Load segment 1 receptacles

4 Load segment 2 receptacles

7. Press and hold the on/off button 2 until you hear the UPS 5115 beep (approximately two seconds). The front panel indicators cycle through a startup sequence while the UPS 5115 conducts a self-test. See Figure 14.

   When the self-test is complete, the Power On Indicator 1 and the Load Indicators (7 and 8) illuminate to indicate that power is being supplied by the UPS 5115. The UPS 5115 is now in normal mode, and is charging its battery. If the Power on indicator 1 is flashing red and the alarm is sounding, the voltage range setting might not be correct. When a SAN Volume Controller is connected to the UPS 5115, 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 UPS 5115 and powered on.

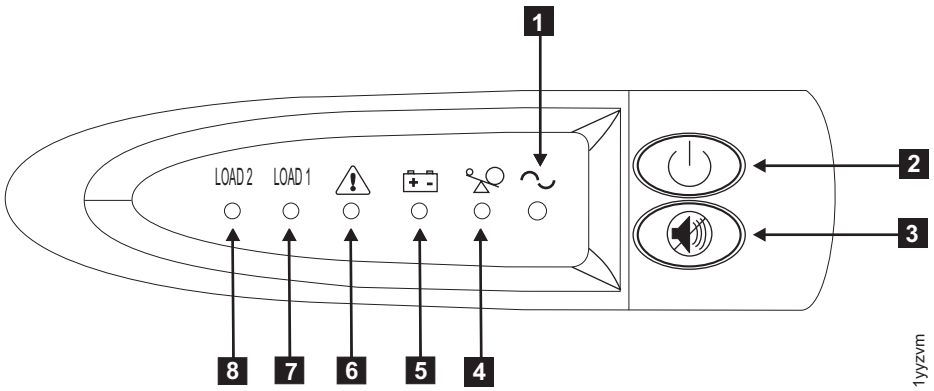


Figure 14. Power switch and indicators of the uninterruptible power supply 5115

1 Power on indicator

2 On/off button

3 Test and alarm reset button

4 Overload indicator

5 On-battery indicator

6 Service indicator

7 Load segment 1 indicator

8 Load segment 2 indicator

8. Repeat all of these steps to install additional UPS 5115's.

Installing the uninterruptible power supply 5125 in the rack

After you have completed the preparation procedures, you are ready to install the uninterruptible power supply (UPS) 5125 in the rack.

You must complete the following prerequisites before installing the UPS 5125 in the rack:

- Complete the preinstallation procedures.
- Install the support rails for the UPS 5125.
- Prepare your UPS 5125 environment.

Attention: Read all safety and environmental notices before starting the installation process.

CAUTION:
The UPS 5125 contains its own energy source (batteries). The output receptacles might carry live voltage even when the UPS 5125 is not connected to an AC supply. (11)

CAUTION:
Do not remove or unplug the input cord when the UPS 5125 is turned on. This removes the safety ground from the UPS 5125 and the equipment connected to the UPS 5125. (12)

CAUTION:
To reduce the risk of fire or electric shock, install the UPS 5125 in a temperature and humidity controlled, indoor environment, free of conductive contaminants. Ambient temperature must not exceed 40°C (104°F). Do not operate near water or excessive humidity (95% maximum). (13)

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

The UPS 5125 weighs 39 kg (86 lb) with the electronics assembly and the battery assembly installed:

- **Do not attempt to lift the UPS 5125 by yourself. Ask another service representatives for assistance.**
- **Remove the battery assembly from the UPS 5125 before removing the UPS 5125 from the shipping carton.**
- **Do not attempt to install the UPS 5125 into the rack unless the electronics assembly and the battery assembly have been removed.**

Once all of the prerequisites have been completed, you can start the installation process.

Perform the following steps to install the UPS 5125 in the rack:

1. Before removing the UPS 5125 from the shipping carton, you must reduce its weight by removing the battery assembly. To remove the battery assembly:

a. Open the top of the UPS 5125 shipping carton. With the assistance of another service representative, grip the flaps on either side of the UPS 5125. See Figure 15.

Figure 15. Opening the top of the uninterruptible power supply shipping carton

b. Slide the UPS 5125 to the end of the carton and rest its front edge on the edge of the carton. See Figure 16.

Figure 16. 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. Next, remove the battery retaining bracket 3. See Figure 17 on page 43.

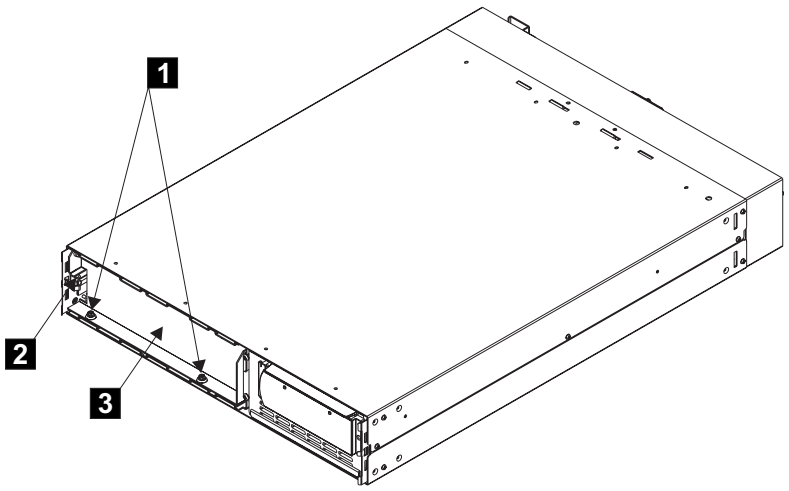


Figure 17. Removing the battery retaining bracket

1 Bolts

2 Nut

3 Battery retaining bracket

d. Grip the tab on the front of the battery and pull the battery forward until it can be accessed by two service representatives.

e. With the assistance of another service representative, lift the battery assembly clear of the UPS 5125 and place to one side.

Note: The front cover for the UPS 5125 is not installed, however, it is included inside of the shipping carton. You will install the front cover later in the installation process.

2. With the assistance of another service representative, lift the UPS 5125 clear of the shipping carton and place it on a flat, stable surface.

3. Remove the two screws 1 . See Figure 18 on page 44.

4. Pull the electronics assembly 2 out of the UPS 5125, and put it to one side. See Figure 18 on page 44.

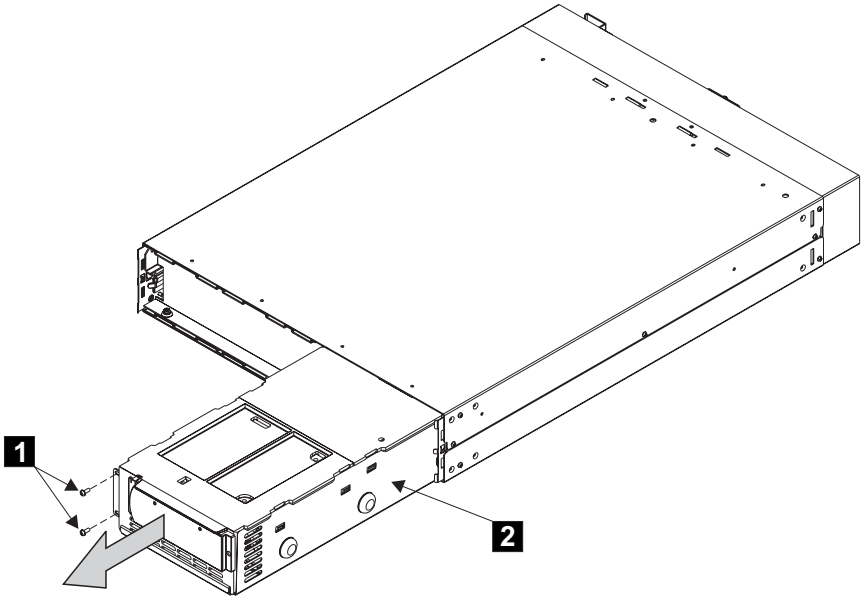


Figure 18. Removing the uninterruptible power supply electronics assembly

1 Screws

2 Electronics assembly

5. Stand at the front of the rack. With the help of another service representative, place the back of the UPS 5125 onto the support rails and then slide it into the rack.
6. Install the front flathead screws**1** . See Figure 19 on page 45.

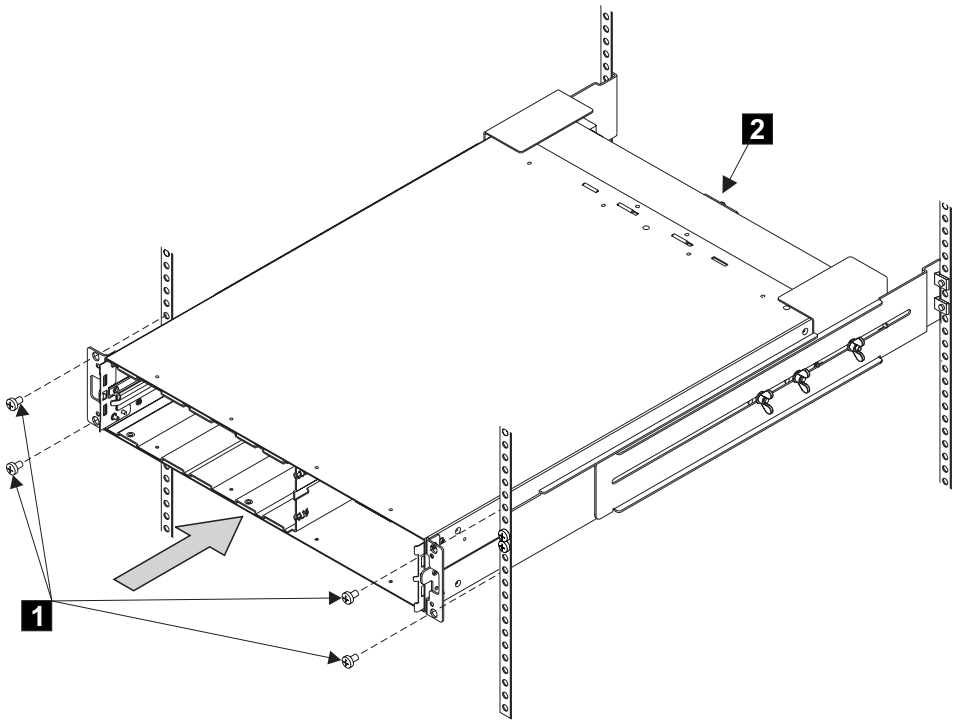


Figure 19. Installing the uninterruptible power supply 5125 into a rack

1 Front flathead screws

7. With the assistance of another service representative, reinstall the following parts:
   a. Battery assembly
   b. Battery retaining bracket
   c. Electronics assembly

      Attention: A grounding screw feature is provided on the back of the UPS 5125 so that you can attach a ground bonding wire if required by local wiring codes. Since safety earthing of the UPS 5125 chassis is maintained through the input line power cord, you are usually not required to use this additional grounding screw feature.
8. Install the front panel.
9. At the back of the UPS 5125, plug the UPS 5125 main power cable **1** into the power socket. See Figure 20 on page 46.

   Note: The UPS 5125 is intended to maintain power on SAN Volume Controller nodes until data can be saved to the local hard disk drive. Only SAN Volume Controller nodes can be plugged into the UPS 5125 or the SAN Volume Controller cluster malfunctions.

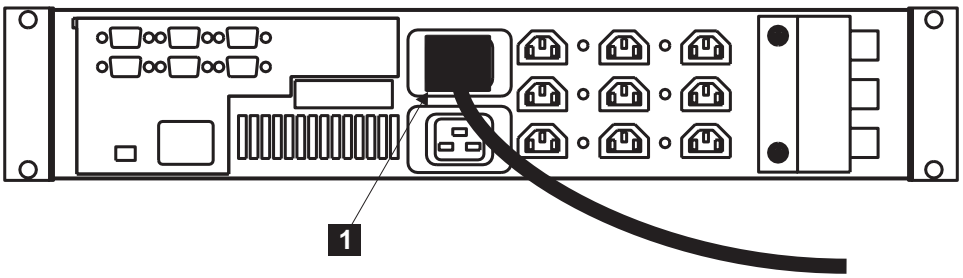


Figure 20. Installing the uninterruptible power supply power cable

1 Main power cable

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 UPS 5125 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 UPS 5125.
- The voltage supplied to the UPS 5125 must be 200 – 240 V single phase.
- The frequency supplied must be between 50 and 60 Hz.

Note: If the UPS 5125 is cascaded from another UPS, the source UPS must have at least 3 times the capacity per phase and the total harmonic distortion must be less than 5% with any single harmonic being less than 1%. The UPS 5125 should also 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 UPS 5125 flash for a short time while the UPS 5125 runs a self-test. When the test is complete, the mode indicator **1** flashes to show that the UPS 5125 is in standby mode. See Figure 21.

    Press and hold the UPS 5125 on button **2** until you hear the UPS 5125 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 UPS 5125. The UPS 5125 is now in normal mode, and is charging its battery. See Figure 21.

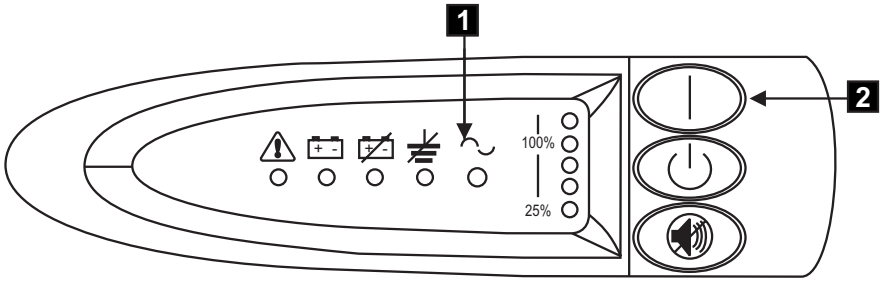


Figure 21. Power switch and indicators on the uninterruptible power supply 5125

1 Mode indicator

2 On button

If the mode indicator 1 is flashing red and the alarm is sounding, the voltage range setting might not be correct. When a SAN Volume Controller is connected to the UPS 5125, 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 UPS 5125 and powered on.

11. Repeat all of these steps to install additional UPS 5125's.

Related tasks

"Installing the support rails for the uninterruptible power supply" on page 35
You must install the support rails in the rack before installing the uninterruptible power supply (UPS) 5115 or the uninterruptible power supply (UPS) 5125.

Related reference

"Preparing your uninterruptible power supply environment" on page 30
Ensure that your physical site meets the installation requirements for the uninterruptible power supply (UPS).

Installing the support rails for the SAN Volume Controller

The support rails should be installed to hold the SAN Volume Controller.

Before you install the support rails, perform the following tasks:

- Determine where the SAN Volume Controller is to be installed in the rack.
- Refer to the EIA markings on the rack and decide where you are going to install the support rails.

Perform the following steps to install the support rails:

1. Check the labels on the support rails; each rail has a label that indicates which is the front end of the rail and whether the rail is for the left or right side of the rack. Perform this procedure for both rails.
2. Put your finger against the side of the latch-lever 1 and put your thumb against the front of the latch-lock 2. See Figure 22.

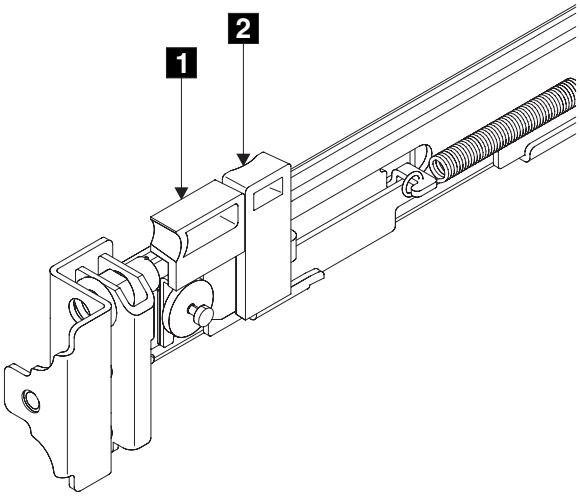


Figure 22. Retracting the latch lock carrier

1 latch-lever

2 latch-lock

3. Gently push the latch lock 2 (Figure 23) 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.

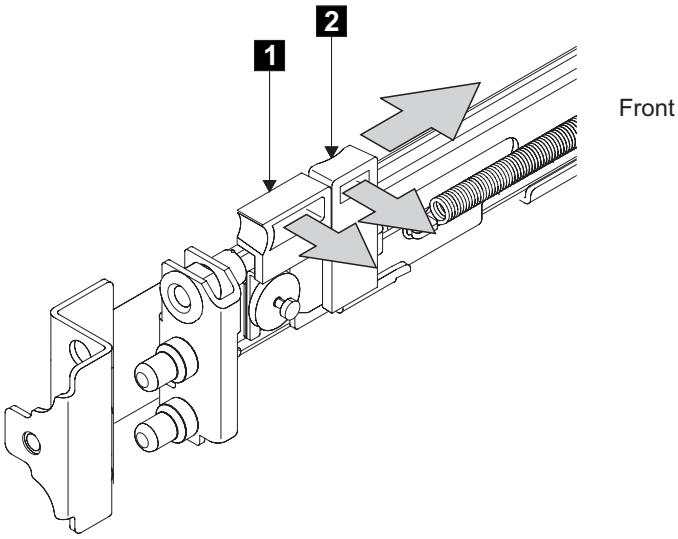


Figure 23. Opening the front latch-lock carrier assembly

1 latch-lever

2 latch-lock

4. Continue to slide the latch-lock carrier for approximately 13 mm (0.5 in). The latch-lever engages a hole in the back bracket assembly and holds the latch-lock carrier in the retracted position.
5. Push the back rail bracket 1 (Figure 24) toward the front of the rail until it stops. The rail is now at its shortest adjustment.

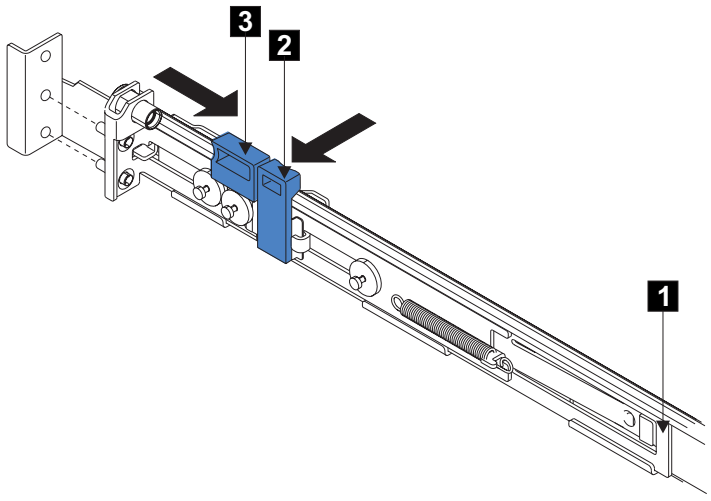


Figure 24. Opening the back latch-lock carrier assembly

1 back rail bracket

2 latch-lock

3 latch-lever

6. Put your index finger against the side of the latch lever 3 and your thumb against the front of the latch lock 2 .
7. 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.
8. 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.
9. Place the front end of the left rail in the rack cabinet. Align the top of the front bracket 1 (Figure 25) with the required EIA marking that is on the rack.

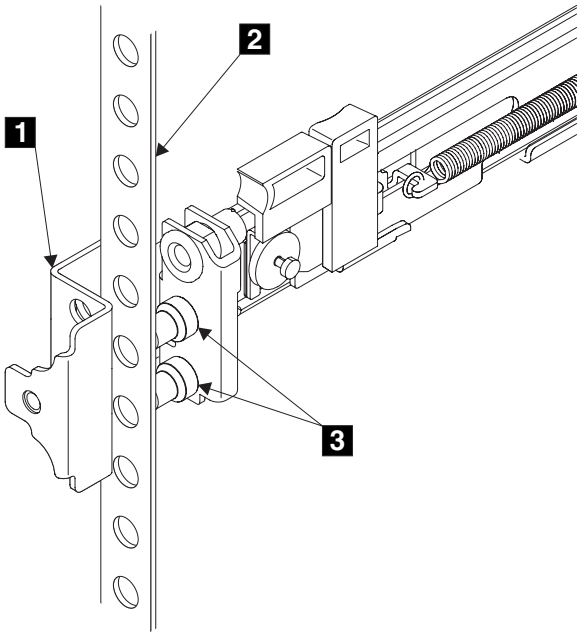


Figure 25. Installing the front end of the rail

1 front bracket

2 rack-mounting flange

3 locating pins

10. Align the locating pins 3 with the holes that are in the rack-mounting flange 2 .
11. Push the latch lock 2 (Figure 26 on page 50) 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.

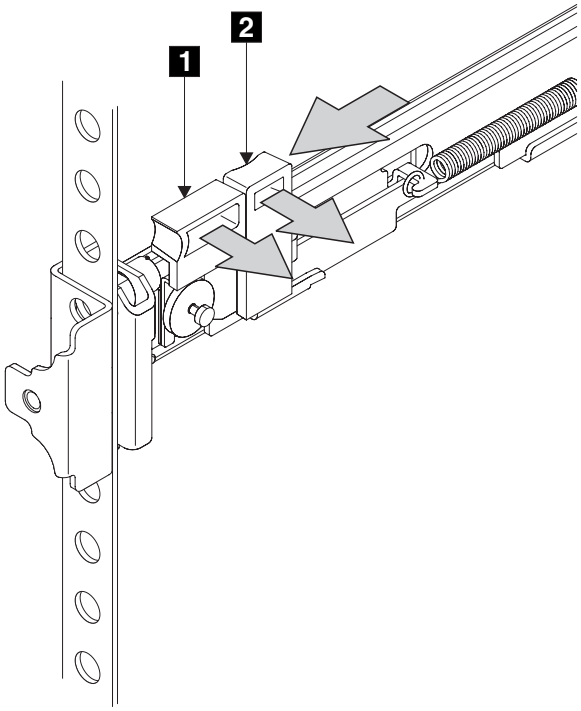


Figure 26. Closing the latch-lock carrier assembly

1 latch-lever

2 latch-lock

12. Push the back rail bracket 1 (see Figure 24 on page 48) toward the rear of the rack and align the locating pins with the rack-mounting flange.
13. Push the latch lock 2 (see Figure 24 on page 48) 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.
14. 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

After installing the support rails, you are ready 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.

Perform the following steps to install the SAN Volume Controller in the rack.

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 27.

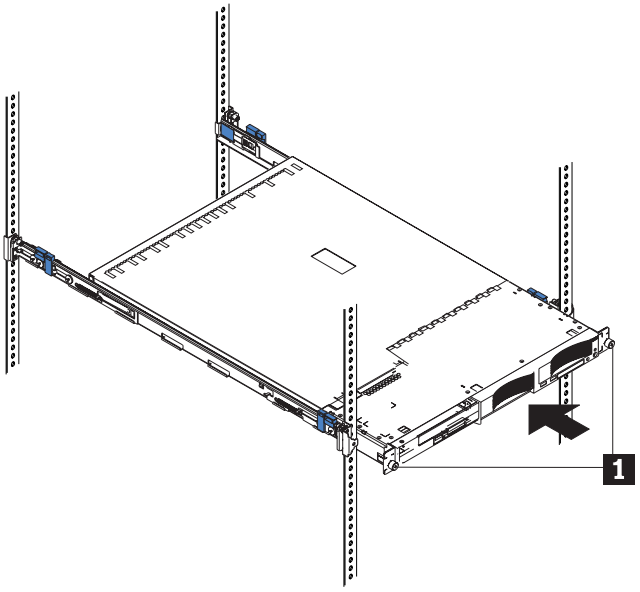


Figure 27. Installing the SAN Volume Controller into a rack

1 thumbscrews

3. Repeat this procedure for each SAN Volume Controller.

Related tasks

"Installing the support rails for the SAN Volume Controller" on page 47
The support rails should be installed to hold the SAN Volume Controller.

Related reference

"Preparing your SAN Volume Controller environment" on page 12
Before installing the SAN Volume Controller, prepare the physical environment.

Connecting the SAN Volume Controller to the uninterruptible power supply 5115

There are a few restrictions you should be aware of before you connect the SAN Volume Controller node to the uninterruptible power supply (UPS) 5115.

Each SAN Volume Controller of a pair must be connected to a different UPS. Each UPS 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, ensure that each UPS of a pair is connected to a separate electrical input power source (if possible) to reduce the chance of input power failure at both 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 UPS to which this SAN Volume Controller is to be connected.

Perform the following steps to connect the SAN Volume Controller to the UPS 5115:

1. At the back of the SAN Volume Controller, plug a power cable into the power connector **1** . See Figure 28.

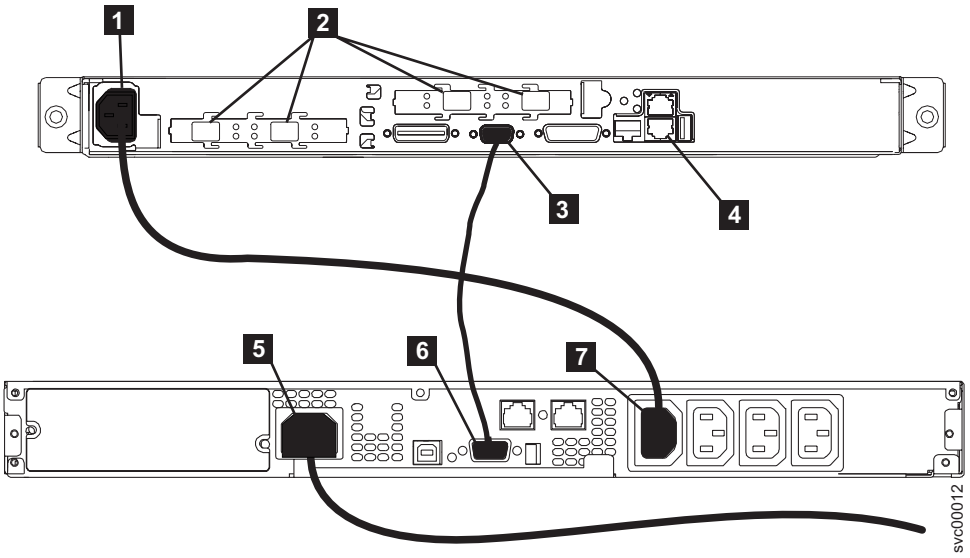


Figure 28. Connecting the SAN Volume Controller power cable to the uninterruptible power supply

1 Power connector

2 Fibre channel ports

3 Serial connector

4 Ethernet ports

5 Main power connector

6 Communication port

7 Load segment 1 receptacle

2. Place the free end of the SAN Volume Controller power cable into the Load segment 1 receptacle **7** on the UPS 5115. See Figure 28.
3. Plug the signal cable into the serial connector **3** located on the SAN Volume Controller. See Figure 28.

DANGER

You have already switched on the UPS 5115. The output sockets of the UPS 5115 are live.

4. Place the free end of the SAN Volume Controller signal cable into the Communication port 6 on the UPS 5115. See Figure 28 on page 52.

   Attention: Do not plug any signal cables into the bottom row of signal cable connectors or the UPS 5115 will malfunction.

The SAN Volume Controller power is connected to the UPS 5115.

Related tasks

"Inspecting the SAN Volume Controller for unsafe conditions" on page xix
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 xx
Ensure that you perform an external machine check on the SAN Volume Controller.

"Internal machine checks" on page xx
Ensure that you perform an internal machine check before installing the SAN Volume Controller.

"Inspecting the uninterruptible power supply for unsafe conditions" on page xx
Ensure that you take the time to inspect the uninterruptible power supply (UPS) for unsafe conditions.

Related reference

"Danger notices for the uninterruptible power supply" on page xvi
Ensure that you understand the danger notices for the uninterruptible power supply (UPS).

"Danger notices for the SAN Volume Controller" on page xvii
Ensure that you are familiar with the danger notices on the SAN Volume Controller.

"Caution notices for the uninterruptible power supply" on page xvii
Ensure that you understand the caution notices for the uninterruptible power supply (UPS).

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

"Controls and indicators for the SAN Volume Controller" on page 5
Controls and indicators are located on the front panel of the SAN Volume Controller.

"SAN Volume Controller rear panel indicators" on page 7
The controls and indicators for the SAN Volume Controller are contained on the front and back panel assembly.

"Controls and indicators for the uninterruptible power supply 5115" on page 19
All controls for the uninterruptible power supply 5115 are located on the front panel assembly.

Connecting the SAN Volume Controller to the uninterruptible power supply 5125

There are a few restrictions you should be aware of before you connect the SAN Volume Controller node to the uninterruptible power supply (UPS) 5125.

Each SAN Volume Controller of a pair must be connected to a different UPS. Each UPS 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, ensure that each UPS of a pair is connected to a separate electrical input power source (if possible) to reduce the chance of input power failure at both 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 UPS to which this SAN Volume Controller is to be connected.

Perform the following steps to connect the SAN Volume Controller to the UPS 5125:

1. At the back of the SAN Volume Controller, plug a power cable into the power connector **1** . See Figure 29.

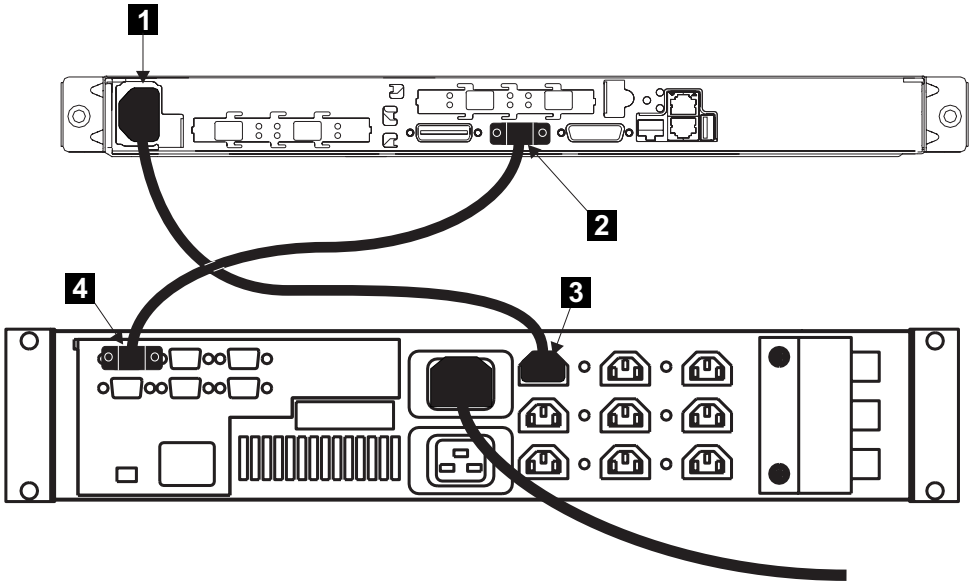


Figure 29. Connecting the SAN Volume Controller power cable to the uninterruptible power supply

1 Power connector

2 Serial connector

3 Output connector

4 Signal cable connector

2. Plug the signal cable of the power cable assembly into the serial connector **2** . See Figure 29.

DANGER

You have already switched on the UPS 5125. The output sockets of the UPS 5125 are live.

3. Place the free end of the SAN Volume Controller power cable into any vacant output connector 3 on the UPS 5125.
4. Place the free end of the signal cable into any vacant position on the top row of serial connectors 4 on the UPS 5125.

   Attention: Do not plug any signal cables into the bottom row of signal cable connectors or the UPS 5125 will malfunction.

The SAN Volume Controller power is connected to the UPS 5125.

Related tasks

"Inspecting the SAN Volume Controller for unsafe conditions" on page xix
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 xx
Ensure that you perform an external machine check on the SAN Volume Controller.

"Internal machine checks" on page xx
Ensure that you perform an internal machine check before installing the SAN Volume Controller.

"Inspecting the uninterruptible power supply for unsafe conditions" on page xx
Ensure that you take the time to inspect the uninterruptible power supply (UPS) for unsafe conditions.

Related reference

"Danger notices for the uninterruptible power supply" on page xvi
Ensure that you understand the danger notices for the uninterruptible power supply (UPS).

"Danger notices for the SAN Volume Controller" on page xvii
Ensure that you are familiar with the danger notices on the SAN Volume Controller.

"Caution notices for the uninterruptible power supply" on page xvii
Ensure that you understand the caution notices for the uninterruptible power supply (UPS).

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

"Controls and indicators for the SAN Volume Controller" on page 5
Controls and indicators are located on the front panel of the SAN Volume Controller.

"SAN Volume Controller rear panel indicators" on page 7
The controls and indicators for the SAN Volume Controller are contained on the front and back panel assembly.

"Controls and indicators for the uninterruptible power supply 5125" on page 22
All controls for the uninterruptible power supply 5125 are located on the front panel assembly.

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 **5** See Figure 30.

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

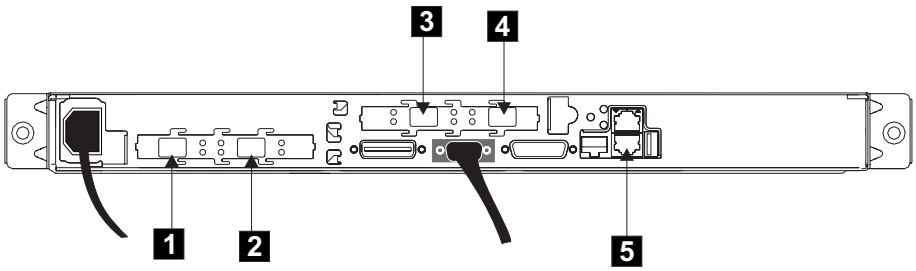


Figure 30. Connectors at the back of the SAN Volume Controller

1 Fibre-channel port 1

2 Fibre-channel port 2

3 Fibre-channel port 3

4 Fibre-channel port 4

5 Ethernet port 1

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

2. Connect the fibre channel cables to the fibre channel ports **1** , **2** , **3** and **4** as required by the customer's configuration. See Figure 30. These numbers correspond to the numbers that are shown in the customer's cable connection table.
3. Connect the free end of the Ethernet cable to the designated connector on the Ethernet hub or switch.
4. Connect the free ends of the fibre channel cables to the designated connectors of the fibre channel switches.

Related concepts

"SAN Volume Controller menu options" on page 62
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 5
Controls and indicators are located on the front panel of the SAN Volume Controller.

"Ethernet option" on page 68
The Ethernet option displays the operational states of the Ethernet port.

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 that is 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.

Perform the following steps to verify installation:

1. Press the SAN Volume Controller power switch. Verify that the green power light is on. If the light is not on 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. Figure 31 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.

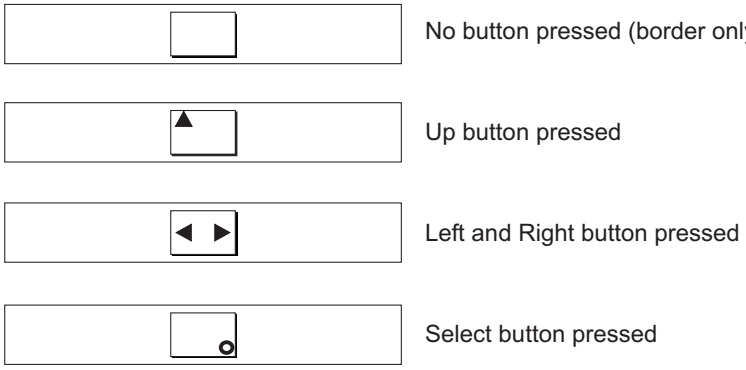


Figure 31. Front panel display when push buttons are pressed

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 32).

Figure 32. 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 33).

Figure 33. 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 shows the current fibre channel speed setting of the node. Press the up or down button until 1 Gbps is displayed and then press the select button. This changes the fibre channel speed for all ports on this node to 1 Gbps.
12. If you want to select a language other than English, perform the following steps:
    a. Press the up or down button until `Select Language?` 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 56 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 4. Using the front panel display on the SAN Volume Controller

This chapter provides information about how to use the front panel display.

Related reference

“Ethernet option” on page 68
The Ethernet option displays the operational states of the Ethernet port.

“Fibre channel port-1 through 4 option” on page 68
The FC port-1 through 4 options display the operational status of the fibre channel ports.

“Select language? option” on page 69
The language displayed can be changed from the menu.

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 60
Boot progress is displayed on the front panel of the SAN Volume Controller.

“Boot failed” on page 60
If the boot operation fails, a boot code is displayed.

“Hardware boot” on page 60
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 60
If software is lost, you can use the node rescue process to copy all software from another node.

“Power failure” on page 61
The SAN Volume Controller runs on battery power when main power is lost.

“Powering off” on page 61
The progress bar on the display shows the progress of the power-off operation.

“Restarting” on page 61
The front panel indicates when the software on a node is restarting.

“Shutting down” on page 62
The front panel indicator tracks shutdown operations.

Related reference

"Error codes" on page 62
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 34 shows that the node is starting.

Figure 34. 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.

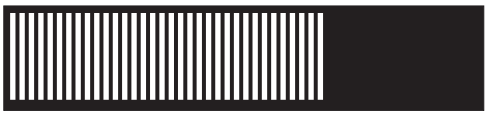
Boot failed

If the boot operation fails, a boot code is displayed.

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.



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

Node rescue request

If software is lost, you can use the node rescue process to copy all software from another node.

Figure 35 on page 61 shows that a request has been made to exchange the software on this node. The SAN Volume Controller software is preinstalled on all SAN Volume Controller nodes. This software includes the operating system, the application software, and the SAN Volume Controller publications. It is 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 35. Node-rescue-request display

Power failure

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

Figure 36 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 36. Power failure display

Powering off

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

Figure 37 shows that the power button has been pressed and the node is powering off. Powering off may take several minutes.

Figure 37. 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.

The software is restarting for one of the following reasons:

- 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 38 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 that is connected to the uninterruptible power supply (UPS), the UPS also will be shut down.

Figure 38. 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 39 on page 63 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.

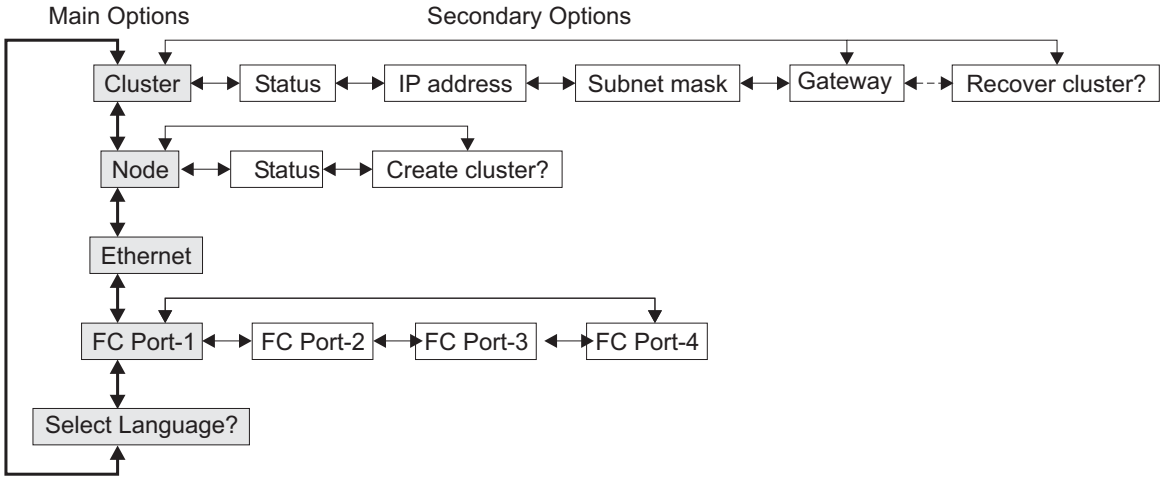


Figure 39. Menu options sequence

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 64
The main cluster option from the menu can display the cluster name, IP address, or it may be blank.

"Node options" on page 65
The node option displays the identification number or name of the SAN Volume Controller.

Related reference

"Ethernet option" on page 68
The Ethernet option displays the operational states of the Ethernet port.

"Fibre channel port-1 through 4 option" on page 68
The FC port-1 through 4 options display the operational status of the fibre channel ports.

"Select language? option" on page 69
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"
The subnet mask address is set when a cluster is created.

Related reference

"Gateway" on page 65
The gateway address is set when the cluster is created.

"Recover cluster?" on page 65
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 40 shows the Recover cluster? menu sequence.

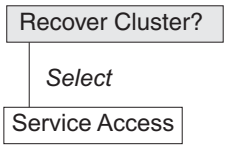


Figure 40. Recover Cluster? menu sequence

During installation, you do 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 66
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

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

Free

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

Disconnected

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

Failed

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

Create cluster?

Clusters can be created from the Create Cluster menu.

This field allows you to create a new SAN Volume Controller cluster. Press **Select** to go to the create cluster menu. Figure 41 shows the create cluster menu sequence.

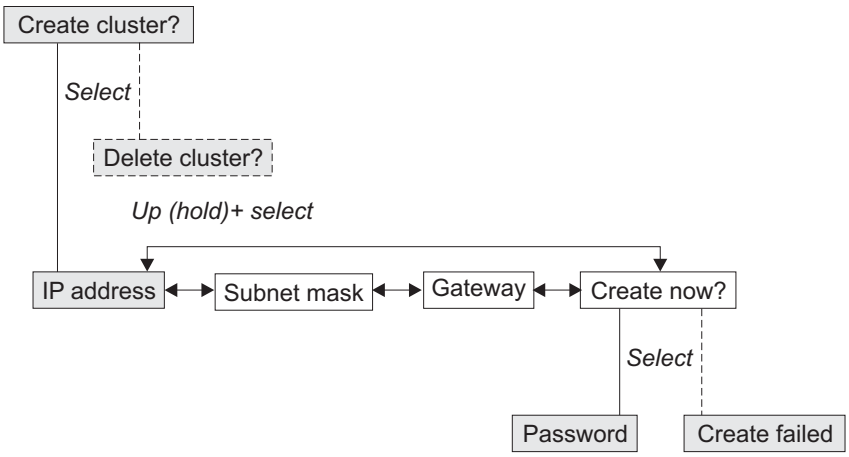


Figure 41. Create cluster? menu sequence

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.

Active	The cluster is accessible through this port.
Inactive	The port is operational, but it cannot access the cluster. This port can be used to access the cluster if the cluster's active port fails.
Failed	The port is not operational.

Fibre channel port-1 through 4 option

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

Active	The port is operational and can access the fibre channel fabric.

Inactive	The port is operational, but cannot access the fibre channel fabric. One of the following conditions 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 42 shows the select language option sequence.

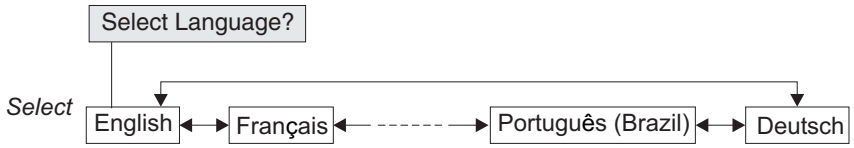


Figure 42. Select language? menu sequence

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 on page 70.
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 xiii
A list of other publications that are related to this product are provided to you for your reference.

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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。

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.

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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 Global Mirror 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 TotalStorage Multipath 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.

Index

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

V

W

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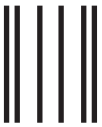

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