IBM TotalStorage
SAN Volume Controller

IBM

Service Guide

Version 1.2.0

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> **Note**
> Before using this information and the product it supports, read the information in "Notices" on page 197.

Second Edition (April 2004)

Contents

About this guide

This guide describes how to service the IBM® TotalStorage™ SAN Volume Controller (SAN Volume Controller). The information is organized as follows:

- Chapter 1, "Overview of the SAN Volume Controller" introduces the SAN Volume Controller.
- Chapter 2, "Overview of the uninterruptible power supply," on page 43 introduces the Uninterruptible Power Supply.
- Chapter 3, "Installing and maintaining the software for the SAN Volume Controller," on page 51 describes the software that is pre-installed on the SAN Volume Controller. This chapter includes instructions about how to obtain, install, and maintain the software.
- Chapter 4, "Introducing the Vital Product Data (VPD)," on page 57 provides information about the Vital Product Data (VPD) that uniquely defines each hardware and microcode element that is in the SAN Volume Controller.
- Chapter 5, "Using the front panel of the SAN Volume Controller," on page 63 provides information about how to configure and check the status of one SAN Volume Controller or a cluster of SAN Volume Controllers.
- Chapter 6, "Diagnosing problems with the SAN Volume Controller, the uninterruptible power supply, and the master console" gives problem determination procedures.
- Chapter 7, "Maintenance analysis procedures (MAPs)," on page 117 provides maintenance analysis procedures (MAPs) that tell you how to analyze failures that occur in a SAN Volume Controller. With the MAPs, you can isolate the field replaceable units (FRUs) of the SAN Volume Controller that fail.

  Note: Start all problem determination and repair procedures from "MAP 5000: Start" on page 118.

- Chapter 8, "Removing and replacing parts" provides step-by-step procedures to remove and replace parts for the SAN Volume Controller and the uninterruptible power supply.
- Appendix A, "Parts catalog" is the parts catalog.
- Appendix B, "Accessibility," on page 195 provides information about accessibility.

Who should use this guide

This guide should be read by the IBM Customer Engineer who is responsible for the service of the IBM® TotalStorage™ SAN Volume Controller, the uninterruptible power supply, and the master console.

Related publications

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

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

SAN Volume Controller library:

Table 1 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.ibm.com/storage/support/2145/

Table 1. Publications in the SAN Volume Controller library

Title	Description	Order number
IBM TotalStorage SAN Volume Controller: CIM Agent Developer's Reference	This reference guide describes the objects and classes in a Common Information Model (CIM) environment.	SC26-7590
IBM TotalStorage SAN Volume Controller: Command-Line Interface User's Guide	This guide describes the commands that you can use from the SAN Volume Controller command-line interface (CLI).	SC26-7544
IBM TotalStorage SAN Volume Controller: Configuration Guide	This guide provides guidelines for configuring your SAN Volume Controller.	SC26-7543
IBM TotalStorage SAN Volume Controller: Host Attachment Guide	This guide provides guidelines for attaching the SAN Volume Controller to your host system.	SC26-7575
IBM TotalStorage SAN Volume Controller: Installation Guide	This guide includes the instructions the service representative uses to install the SAN Volume Controller.	SC26-7541
IBM TotalStorage SAN Volume Controller: Planning Guide	This guide introduces the SAN Volume Controller and lists the features you can order. It also provides guidelines for planning the installation and configuration of the SAN Volume Controller.	GA22-1052
IBM TotalStorage SAN Volume Controller: Service Guide	This guide includes the instructions the service representative uses to service the SAN Volume Controller.	SC26-7542
IBM TotalStorage SAN Volume Controller: Translated Safety Notices	This guide contains the danger and caution notices for the SAN Volume Controller. The notices are shown in English and in numerous other languages.	SC26-7577

Other IBM publications:

Table 2 on page ix lists and describes other IBM publications that contain additional information related to the SAN Volume Controller.

Table 2. Other IBM publications

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

Related topics:
- "How to order IBM publications"
- "How to send your comments" on page x

How to order IBM publications

This topic explains how to order copies of IBM publications and how to set up a profile to receive notifications about new or changed publications.

The IBM publications center:

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

The IBM publications center offers customized search functions to help you find the publications that you need. Some publications are available for you to view or download free of charge. You can also order publications. The publications center displays prices in your local currency. You can access the IBM publications center through the following Web site:

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

Publications notification system:

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

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

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

Related topics:
- "Related publications" on page vii

How to send your comments

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

- e-mail

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

  starpubs@us.ibm.com

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

- Mail or fax

  Fill out the Readers' Comments form (RCF) at the back of this book. Return it by mail or fax (1-408-256-0488), or give it to an IBM representative. If the RCF has been removed, you can address your comments to:

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

Related topics:

- "Related publications" on page vii

Safety and environmental notices

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 uninterruptible power supply
- Danger notices for the SAN Volume Controller
- Caution notices for the uninterruptible power supply
- Caution notices for the SAN Volume Controller
- Safety inspection checklist for the SAN Volume Controller
- Checking the grounding of the SAN Volume Controller and uninterruptible power supply
- Safety inspection checklist for the uninterruptible power supply
- Labels for the outside of the uninterruptible power supply
- Labels for the battery unit of the uninterruptible power supply
- Labels for the SAN Volume Controller
- Environmental notices and statements
- Handling static sensitive devices

Definitions of 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.**

Related topics:
- *IBM TotalStorage SAN Volume Controller: Translated Safety Notices*

Danger notices for the uninterruptible power supply

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

DANGER

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

DANGER

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

DANGER

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

DANGER

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

DANGER

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

Related topics:

- "Caution notices for the uninterruptible power supply"
- *IBM TotalStorage SAN Volume Controller: Translated Safety Notices*

Danger 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.

DANGER

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

Related topics:

- *IBM TotalStorage SAN Volume Controller: Translated Safety Notices*

Caution notices for the uninterruptible power supply

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

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

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

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

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

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

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

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

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

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

Related topics:
- "Danger notices for the uninterruptible power supply" on page xi
- *IBM TotalStorage SAN Volume Controller: Translated Safety Notices*

Caution notices for the SAN Volume Controller

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

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

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

Related topics:
- "Danger notices for the SAN Volume Controller" on page xii
- *IBM TotalStorage SAN Volume Controller: Translated Safety Notices*

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.

Prerequisites:

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.

Steps:

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

1. Turn off the SAN Volume Controller.
2. Check the frame for damage (loose, broken, or sharp edges).
3. Check the power cables and ensure that:
   a. The third-wire ground connector is in good condition. Use a meter to check that the third-wire ground continuity is 0.1 ohm or less between the external ground pin and the frame ground.
   b. The insulation is not worn or damaged.
4. Check for any obvious nonstandard changes. Use good judgment about the safety of any such changes.

5. Check inside the SAN Volume Controller for any obvious unsafe conditions, such as metal particles, water or other fluids, or marks of overheating, fire, or smoke damage.

6. Check for worn, damaged, or pinched cables.

7. Ensure that the voltage specified on the product-information label matches the specified voltage of the electrical power outlet. If necessary, verify the voltage.

8. Inspect the power supply assemblies, and check that the fasteners (screws or rivets) in the cover of the power-supply unit have not been removed or disturbed.

9. Before connecting the SAN Volume Controller to the SAN, check the grounding.

Related topics:

- "Removing the power from the SAN Volume Controller" on page 140
- "Checking the grounding of the SAN Volume Controller and the uninterruptible power supply" on page xvi

External machine checks

This topic describes the checks that you should perform on the outside of the SAN Volume Controller.

Steps:

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

1. Verify that all external covers are present and are not damaged.
2. Ensure that all latches and hinges are in the correct operating condition.
3. If the SAN Volume Controller is not installed in a rack cabinet, check for loose or broken feet.
4. Check the power cord for damage.
5. Check the external signal cable for damage.
6. Check the cover for sharp edges, damage, or alterations that expose the internal parts of the device.
7. Correct any problems that you find.

Related topics:

- "Inspecting the SAN Volume Controller for unsafe conditions" on page xiv

Internal machine checks

This topic describes the checks that you should perform on the inside of the SAN Volume Controller.

Steps:

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

1. Check for any non-IBM changes that might have been made to the machine. If any are present, obtain the "Non-IBM Alteration Attachment Survey" form number R009, from the IBM branch office. Complete the form and return it to the branch office.

2. Check the condition of the inside of the machine for any metal or other contaminants, or any indications of water, other fluid, fire, or smoke damage.
3. Check for any obvious mechanical problems, such as loose components.
4. Check any exposed cables and connectors for wear, cracks, or pinching.

Related topics:
- "Inspecting the SAN Volume Controller for unsafe conditions" on page xiv
- "External machine checks" on page xv

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

This topic tells you how to check the grounding of the SAN Volume Controller. Figure 1 shows the connectors for the SAN Volume Controller and the uninterruptible power supply.

Steps:

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

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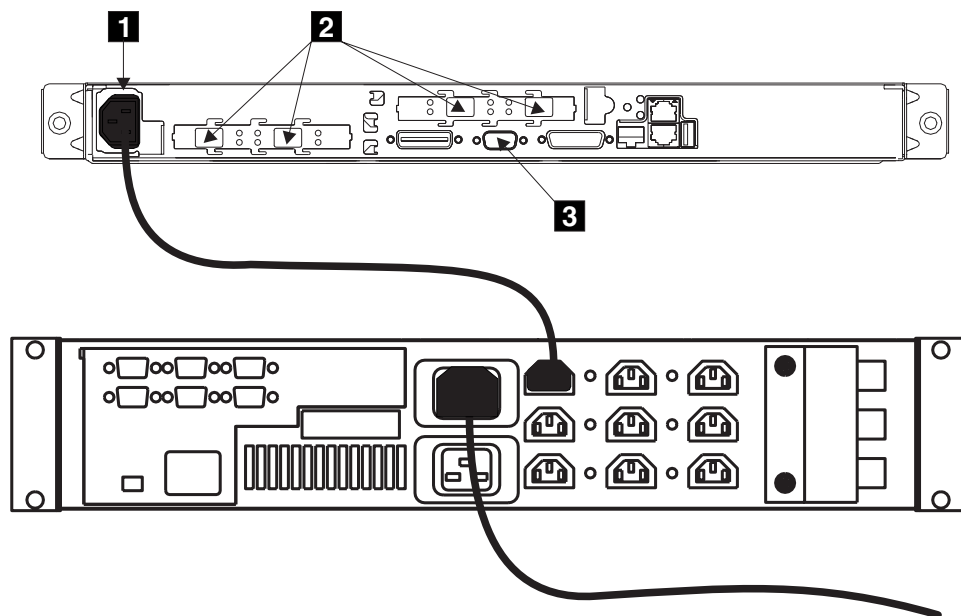
Figure 1. Power cable and signal sockets

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

   Ensure that no external cables are present at connectors **2** and **3** .
4. Disconnect and remove the Ethernet cable.

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

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

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

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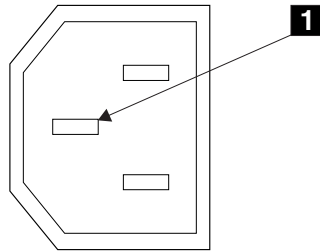
Figure 2. Ground pin

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

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

8. Check the power cable for continuity.

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

Inspecting the uninterruptible power supply 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.

Prerequisites:

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.

Steps:

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

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

2. File a claim for shipping damage within fifteen days of receipt of the equipment.

Uninterruptible power supply requirements

This topic lists the requirements for the uninterruptible power supply.

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

- Each uninterruptible power supply should be connected to a separate branch circuit.
- A UL listed 15 A circuit breaker must be installed in each branch circuit that supplies power to the uninterruptible power supply.
- If a rack power distribution unit is used, each uninterruptible power supply must be connected to a separate power distribution unit.
- The voltage supplied to the uninterruptible power supply must be 200–240 V single phase.
- The frequency supplied must be between 50 and 60 Hz.

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

Emergency power-off (EPO) event

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

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

Checking the safety labels on the SAN Volume Controller

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

Steps:

Perform the following label checks:

1. Agency/ratings label. See Figure 3 on page xix.
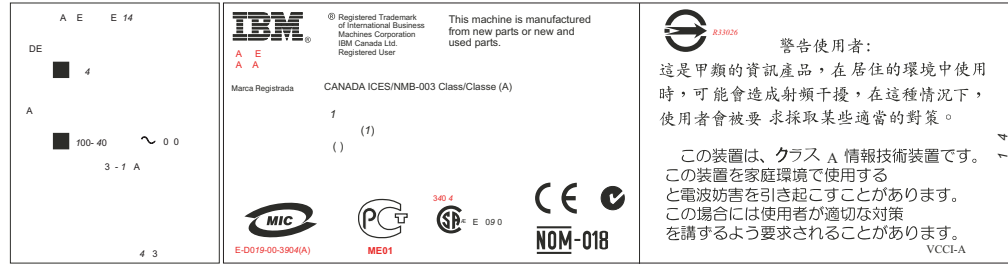
Figure 3. Agency/ratings label for SAN Volume Controller

2. No user access label. See Figure 4.

Figure 4. No user access label for SAN Volume Controller

3. Class 1 laser label. See Figure 5.

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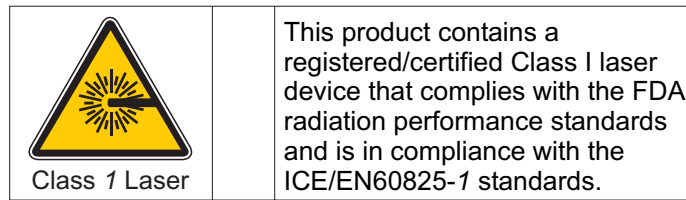
Figure 5. Class 1 laser label

Checking the labels on the outside of the uninterruptible power supply

This topic tells you how to perform the safety label checks for the uninterruptible power supply.

Steps:

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

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

EC: H633*17*
IBM Model: 2*145*UPS
P*18*P5864
SNYM*1000*YMDXXX [*4.4*]
Input ~ :
   200-2*4*0V, 50/60Hz
    *16*A MAX
Input ⎓ : DC *1*20V, 30A
Output ~ :
   200-2*4*0V, 50/60Hz
    *15*A MAX
   3000VA/2700W

LISTED
UPS
33C0
E82662

Assembled in Mexico - TWWYY [*4.7*]

Figure 6. Agency label for the uninterruptible power supply

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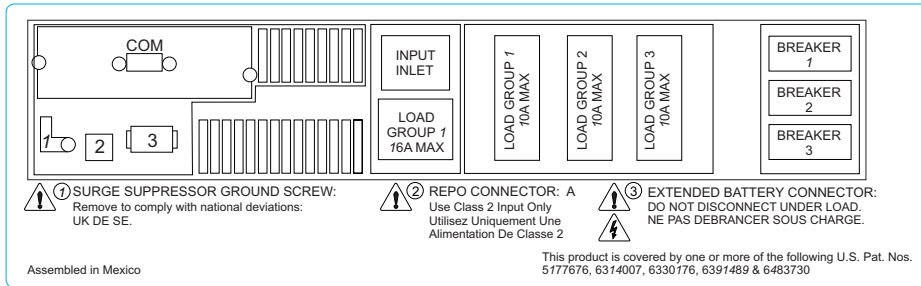
Figure 7. Rear panel configuration label

3. Three-man lift. See Figure 8.
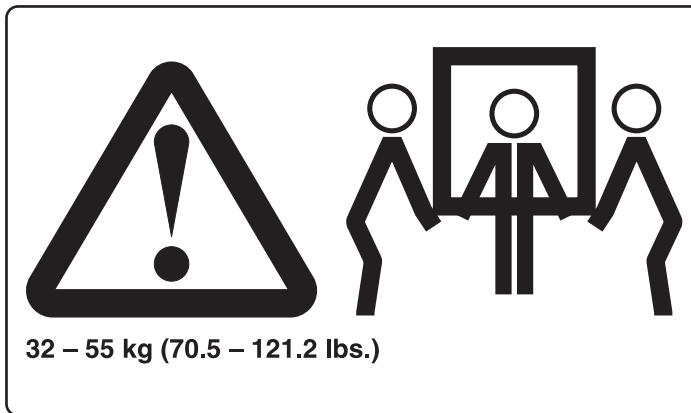
Figure 8. Three-man lift label

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

Figure 9. Weight label for the uninterruptible power supply

5. IT compatible label. See Figure 10.

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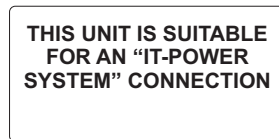
Figure 10. IT compatible label for the uninterruptible power supply

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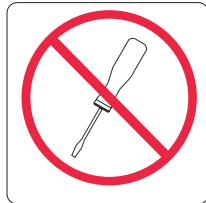
Figure 11. No user access label for the uninterruptible power supply

Checking the labels on the battery of the uninterruptible power supply

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

Steps:

Perform the following label checks:

1. Two-man lift label. See Figure 12 on page xxii.
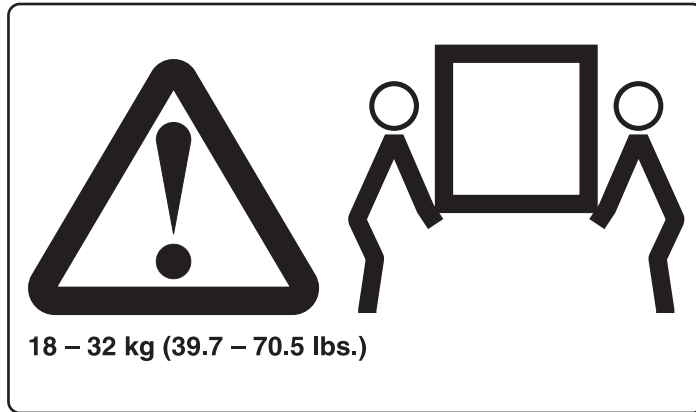
Figure 12. Two-man lift label on battery unit

2. Battery recycle label. See Figure 13.

Pb

Unit contains lead-acid batteries. Do not burn. Recycle or discard the batteries as instructed.

Figure 13. Battery recycle label on battery unit of uninterruptible power supply

3. Weight label. See Figure 14.

21 kg
45 lbs

Figure 14. Weight label on battery unit of uninterruptible power supply

4. Power ratings label. See Figure 15 on page xxiii.

Rating ⎓ :120V, 30A

Figure 15. Power ratings label on battery unit of uninterruptible power supply

5. Battery faceplate label. See Figure 16.

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

تحذير:
- لاستخدام في بيئة تشغيل متحكم فيها
- أكثر من دائرة فعالة
- فقط من مؤهلين للتقديم الخدمة

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

注意:
- 用于受控环境中
- 具有多个带电电路
- 仅限合格的服务人员使用

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

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

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

Varoitus:
- Käytön tulee tapahtua valvotuasa ympäristössä
- Jännitteistä virtapiirejä on enemmän kuin yksi
- VAIN valtuutetulle huoltohenkilöstölle

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

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

ΠΡΟΣΟΧΗ:
- Για χρήση σε ελεγχόμενο περιβάλλον
- Περισσότερα από ένα ηλεκτροφόρα κυκλώματα
- MONO εκπαιδευμένο τεχνικό προσωπικό

זהירות:
- לשימוש בסביבה מבוקרת
- יותר ממעגל אחד עם חשמל
- אנשי שירות מוסמכים בלבד

OPREZ:
- Za upotrebu u kontroliranom oku enju
- Više od jednog ivog strujnog kruga
- SAMO kvalificirano servisno osoblje

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

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

注意:
- 制御された環境での使用
- 複数のライブ回線
- 資格のあるサービス技術員のみ

주의:
- 통제 환경에서 사용
- 하나 이상의 라이브 회로
- 전문 서비스 담당자 전용

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

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

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

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

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

UPOZORNENIE:
- Pre pou tie v riadenom prostredí
- Viac ako jeden ivý obvod
- LEN kvalifikovaný servisný personál

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

注意:
- 於受控環境下使用
- 一個以上的電路開啟中
- 限合格的服務員

Figure 16. Label on the faceplace of the uninterruptible power supply

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

Environmental notices and statements

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

Product recycling

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

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

Battery disposal

This topic identifies 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)

Related topics:
- "Definitions of notices" on page xi

Handling static-sensitive devices

Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static protective bags until you are ready to install them.

To reduce the possibility of electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its anti-static bag, touch it to an unpainted metal part of the system unit for at least 2 seconds. (This action removes static electricity from the package and from your body.)
- Remove the device from its package and install it directly into your SAN Volume Controller, without putting it down. If it is necessary to put the device down, place it onto its static-protective bag. (If your device is an adapter, place it component side up.) Do not place the device onto the cover of the SAN Volume Controller or onto a metal table.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

Chapter 1. Overview of the SAN Volume Controller

This topic describes the SAN Volume Controller.

The IBM® TotalStorage™ SAN Volume Controller is a rack-mounted unit that you can install in a standard Electrical Industries Association (EIA) 19-inch rack. See Figure 17 for an illustration of the SAN Volume Controller.
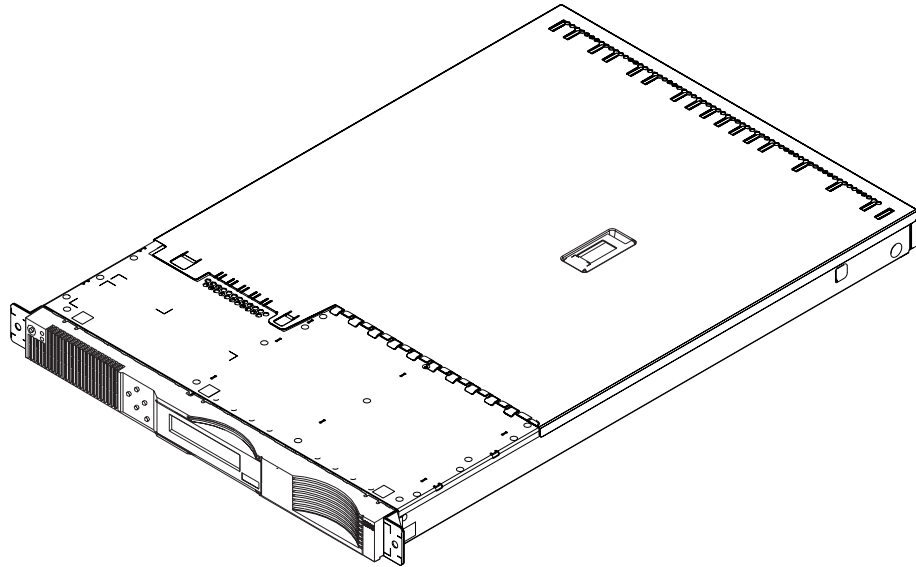
Figure 17. The SAN Volume Controller Node

A Storage Area Network (SAN) is a high-speed fibre-channel network that connects host systems and storage devices. It allows a host system to be connected to a storage device across the network. The connections are made through units such as routers, gateways, and hubs, and switches. The area of the network that contains these units is known as the fabric of the network. For more information about Storage Area Networks, see *IBM Storage Networking Virtualization: What's it all about?*, and *IBM TotalStorage SAN Volume Controller: What is it and how to use it*.

Each SAN Volume Controller is a *node*; that is, it is an end point of a link, or it is a junction that is common to two or more links of the SAN. Nodes are grouped into clusters of up to four nodes. The cluster is managed as a set, and provides a single point of control for the user for configuration and service activities. For I/O operations, the nodes are grouped into pairs. Each pair has the responsibility to serve I/O on a particular virtual disk. If one SAN Volume Controller of a pair fails or is removed, failover occurs to the other SAN Volume Controller. The clusters are attached to the SAN fabric. Also attached to the fabric are RAID controllers and host systems.

You can remove and replace all field replaceable units (FRUs) while the host system is running.

The fabric contains two distinct zones: a host zone and a disk zone. In the host zone, the host systems can see and address the nodes. In the disk zone, the nodes can see the disk drives. Host systems are not allowed to operate on the disk drives

directly; all data transfer occurs through the nodes. Figure 18 shows an example of a storage system that is using a SAN Volume Controller. Several host systems are connected to a SAN fabric. A cluster of SAN Volume Controller is connected to the same fabric and presents virtual disks to the host systems. These virtual disks are created from disks that are presented by the RAID controllers.

Note: You might have more than one host zone in the SAN fabric. For example, you might have a SAN that contains a host that runs on an AIX operating system and another host that runs on a Windows operating system.
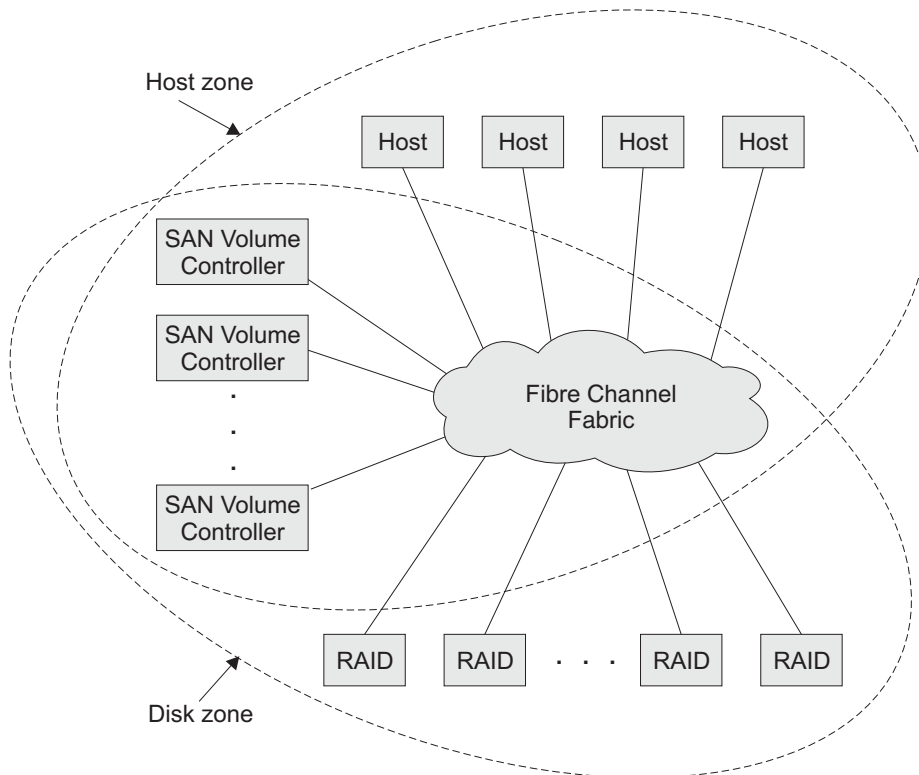
Figure 18. Example of a SAN Volume Controller in a network

You can remove one node in each I/O group from a cluster. 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 the Ethernet network.

Each FRU contains its own vital product data (VPD). Each cluster contains vital product data that is common to all the nodes on the cluster. Any host system connected to the Ethernet network can access this VPD.

Enclosure 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.

Note: To ensure that the configuration is not corrupted or changed, always exchange FRUs one at a time.

The SAN Volume Controller is provided with a master console that allows users to quickly insert the system into their environment and be up and running as quickly as possible. The master console provides the following functions:

- IBM Director
  - SNMP Trap management
  - Call Home capability
- Remote Service capability through VPN
- Browser support for:
  - SAN Volume Controller Console
  - Fibre Channel Switches
- CLI configuration support using Secure Shell (SSH)
- SAN Topology rendering using Tivoli® SAN Manager

For more detailed information about installing, maintaining, and troubleshooting the master console, see the documentation for your specific master console.

Related topics:
- "SAN Volume Controller front panel controls and indicators" on page 24
- "SAN Volume Controller hardware" on page 28
- "SAN Volume Controller connectors" on page 29
- "Preparing your SAN Volume Controller environment" on page 30

Using the SAN Volume Controller Console application on the master console

This topic describes how to use the SAN Volume Controller Console application on the master console.

Context:

The SAN Volume Controller Console is an application that runs on the SAN Volume Controller master console. It can also be installed on any other Windows 2000 Server that meets the requirements. You can access the application directly through the SAN Volume Controller master console, or you can start the application from a Web browser if that browser is connected to the same Ethernet network as the SAN Volume Controller master console. You can access both service and configuration tools using this application.

Steps:

Perform the following steps to start the SAN Volume Controller Console application from the master console.
1. Log on to the master console using the user name and password provided by the customer. Then, double-click the SAN Volume Controller Console icon and the following SAN Volume Controller Console Sign on panel is displayed. See Figure 19 on page 4.
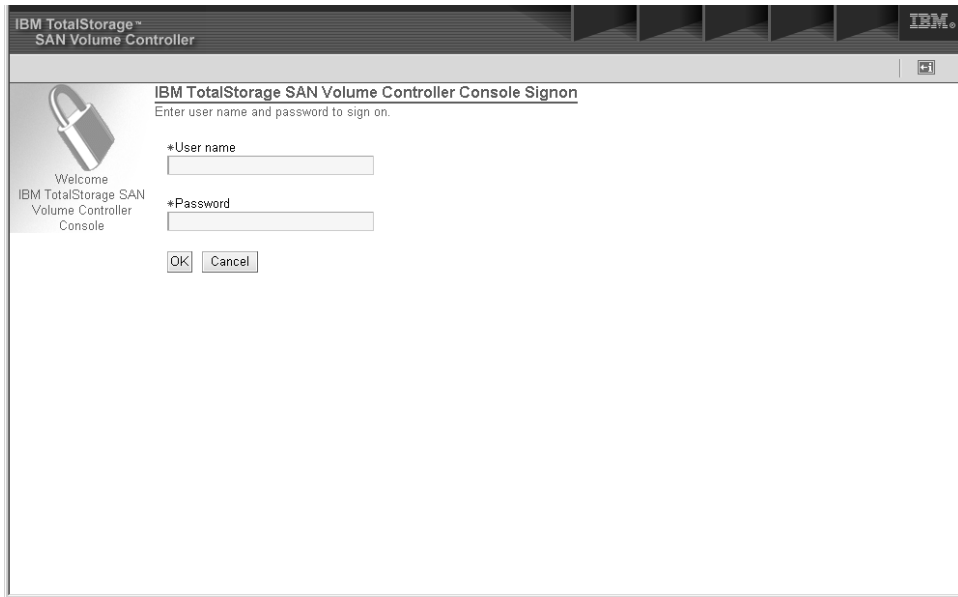
Figure 19. SAN Volume Controller Console sign on panel

2. Enter the SAN Volume Controller Console user name and password provided by the customer; the following Welcome panel is displayed. See Figure 20.
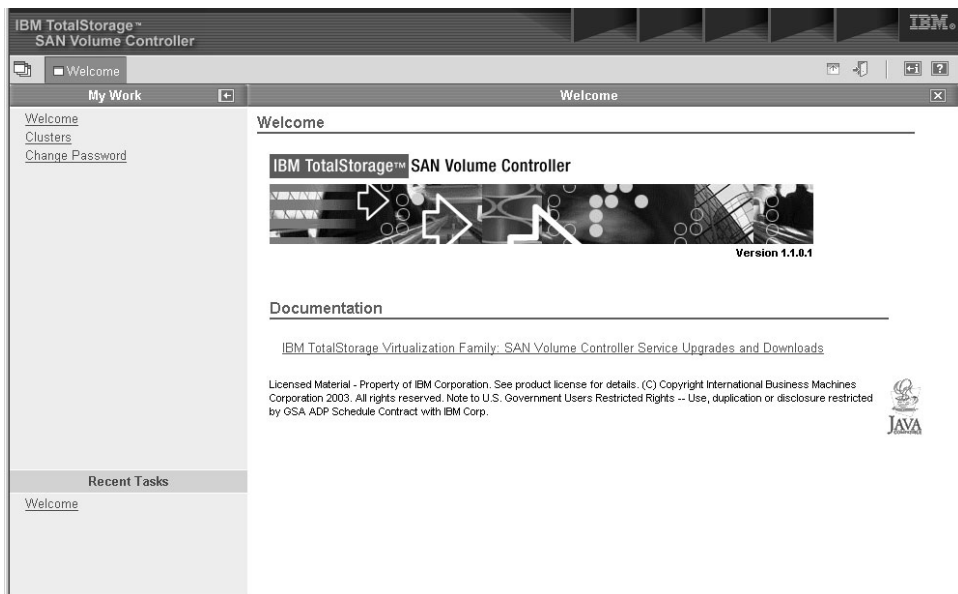
Figure 20. SAN Volume Controller Console Welcome panel

3. Select **Clusters** from the left navigation menu to access the configuration and service tools that you need, and to see what is displayed in Figure 21 on page 5.
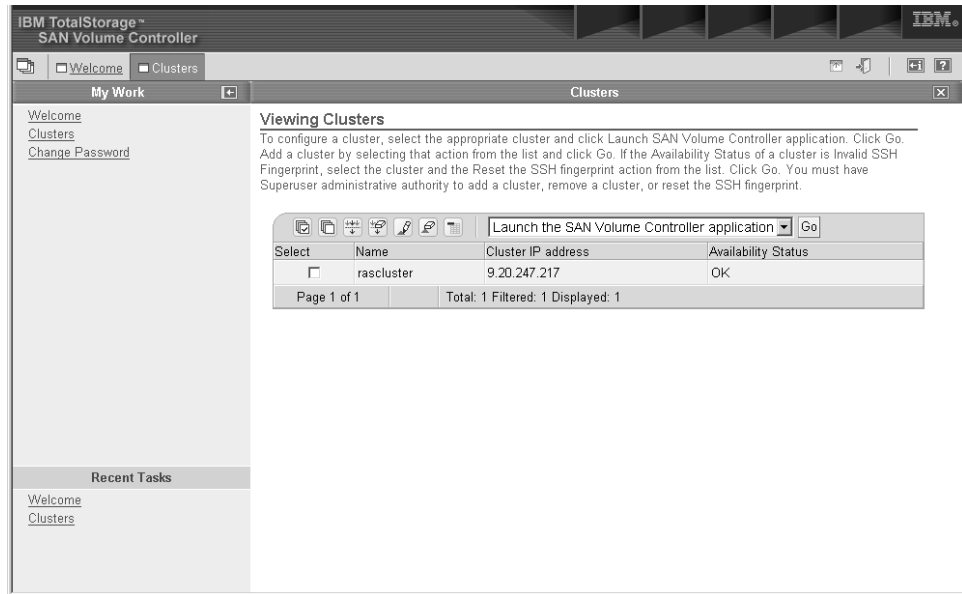
Figure 21. SAN Volume Controller view cluster panel

4. Because the SAN Volume Controller Console can support a number of SAN Volume Controller clusters, you must first select the SAN Volume Controller cluster that you want to service. Then, from the drop down menu, select **Launch the SAN Volume Controller application** as shown in Figure 22.
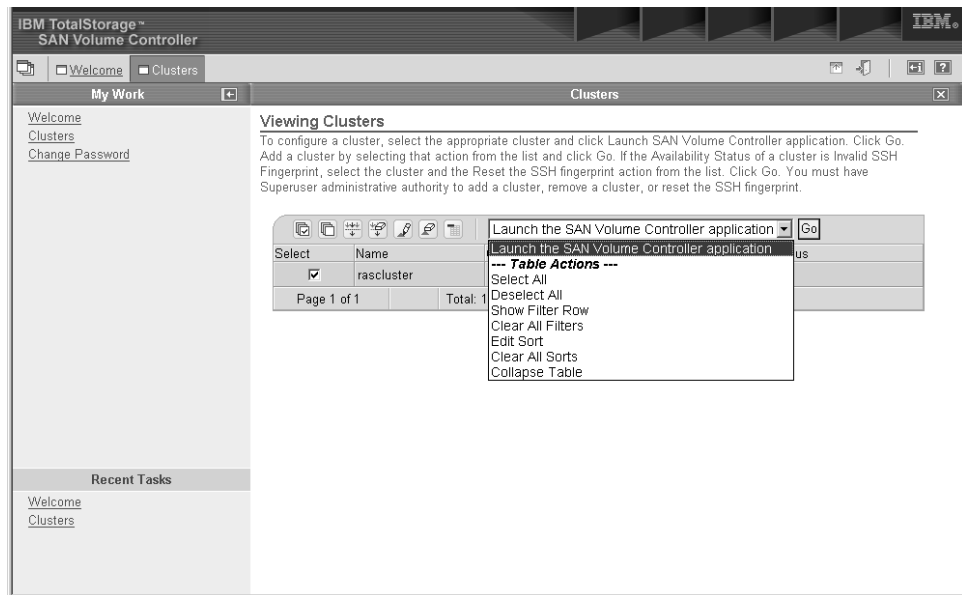
Figure 22. SAN Volume Controller Console view cluster panel with drop down menu selected

5. Click **Go** and the Welcome panel is displayed in a new window. See Figure 23 on page 6.

    If the error message, "The specified cluster is currently unavailable" is displayed, and the Availability Status of the selected cluster is shown as No Contact, go to MAP 5000: Start. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.
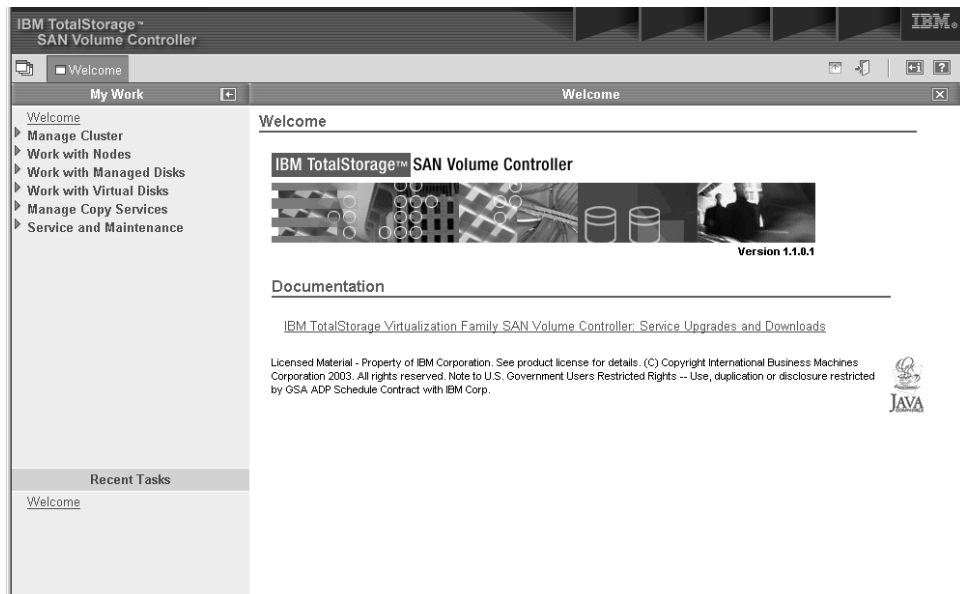
Figure 23. SAN Volume Controller Console Welcome panel

Result:

From this menu, you can start all of the following procedures.
- Viewing node status.
- Delete a node from a cluster.
- Add a node to a cluster.
- Viewing the status of the vdisk.
- Viewing the status of the mdisk.
- Viewing the vital product data.
- Listing and saving dump data.
- Start maintenance.
- Viewing the error log.

Related topics:
- "Viewing the error log using the SAN Volume Controller Console application on the master console" on page 7
- "Starting maintenance using the SAN Volume Controller Console application on the master console" on page 7
- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Deleting a node using the SAN Volume Controller Console application on the master console" on page 8
- "Adding a node to a cluster using the SAN Volume Controller Console application on the master console" on page 9
- "Viewing the vdisk status" on page 10
- "Viewing the vital product data" on page 11
- "Listing and saving dump data" on page 11
- "Viewing the mdisk status" on page 11
- "Viewing the error log" on page 76

- "MAP 5000: Start" on page 118

Viewing the error log using the SAN Volume Controller Console application on the master console

This task describes how to view the error log using the SAN Volume Controller Console application on the master console.

Prerequisites:

Before you begin, you need to access the Welcome panel on SAN Volume Controller Console application from the master console.

Steps:

Perform the following steps to view the error log.

1. Expand the Service and Maintenance option in the left pane.
2. Select the Analyze Error Log option.
3. The Error Log Analysis options are displayed on the right pane. Select the options that you want and press the Process button.

Related topics:

- "Using the SAN Volume Controller Console application on the master console" on page 3

Starting maintenance using the SAN Volume Controller Console application on the master console

This task describes how to start maintenance using the SAN Volume Controller Console application on the master console

Prerequisites:

Before you begin, you need to access the Welcome panel on SAN Volume Controller Console application from the master console.

Steps:

Perform the following steps to start maintenance

1. Expand the Service and Maintenance option in the left pane.
2. Select the Maintenance Procedures option.
3. Press the Start Analysis button in the right pane.
4. Follow the on-screen instructions.

Related topics:

- "Using the SAN Volume Controller Console application on the master console" on page 3

Viewing the node status using the SAN Volume Controller Console application on the master console

This task describes how to view the node status using the SAN Volume Controller Console application on the master console.

Prerequisites:

Before you begin, you need to access the Welcome panel on SAN Volume Controller Console application from the master console.

Steps:

Perform the following steps to view the node status.
1. Expand the Work with Nodes option in the left pane.
2. Select the Nodes option.
3. Node details are displayed in the right pane.

Related topics:
- "Using the SAN Volume Controller Console application on the master console" on page 3.

Deleting a node using the SAN Volume Controller Console application on the master console

This task describes how to delete a node using the SAN Volume Controller Console application on the master console.

Prerequisites:

Before you begin, you need to access the Welcome panel on SAN Volume Controller Console application from the master console.

Context:

You might need to delete a node from a cluster if the node has failed and is being replaced with a new node, or if the repair that has been performed has caused that node to be unrecognizable by the cluster. For example, if the disk drive or the software on the node has been replaced, that node will no longer be known by the cluster.

Steps:

Perform the following steps to delete a node from a cluster.
1. Expand the Work with Nodes option in the left pane
2. Select the Nodes option and the following panel is displayed. See Figure 24 on page 9.
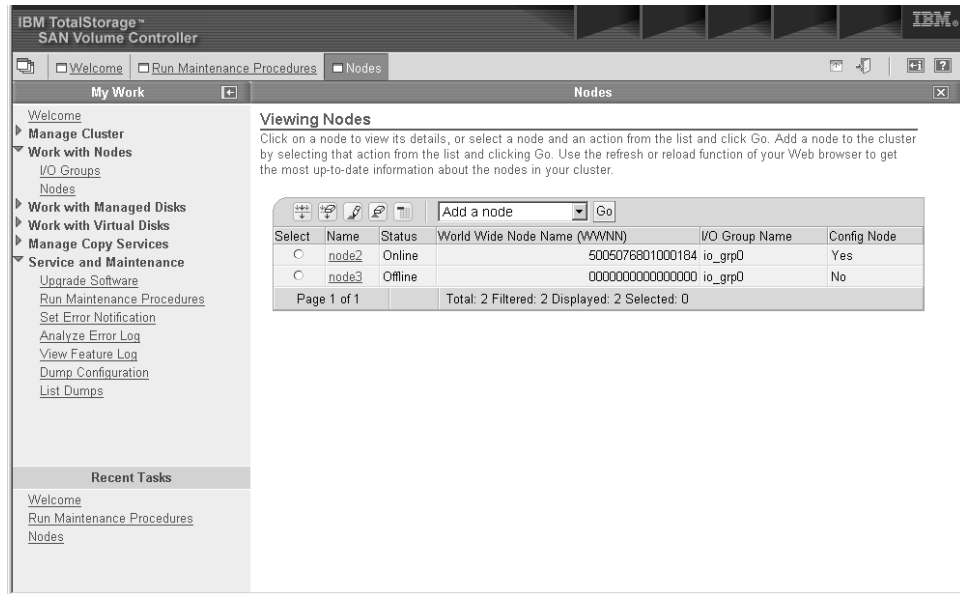
Figure 24. SAN Volume Controller Console Nodes panel

3. Make a note of the Name and the I/O Group Name of the offline node; you will use this information when you add the node back into the cluster.

   Attention: If more than one SAN Volume Controller in this or in other clusters on the same SAN is offline, be aware that you will need to take special precautions when you add the node back into the cluster.

4. Select `Offline node`. Then select the Delete Node option from the drop down menu and press the Go button.

5. At the prompt press the yes button to confirm the delete operation.

Related topics:

• "Using the SAN Volume Controller Console application on the master console" on page 3

Adding a node to a cluster using the SAN Volume Controller Console application on the master console

This task describes how to add a node to a cluster using the SAN Volume Controller Console application on the master console.

Prerequisites:

Before you begin, you need to access the Welcome panel on the SAN Volume Controller Console application from the master console.

Context:

If a node has been either removed or rejected by a cluster, you might need to add it back into the cluster.

Steps:

Perform the following steps to add a node back into a cluster.

1. Expand the Work with Nodes option in the left pane.

2. Select the Nodes option.
3. From the drop down menu, select the Add a node option and press the Go button. The following panel is displayed. See Figure 25.
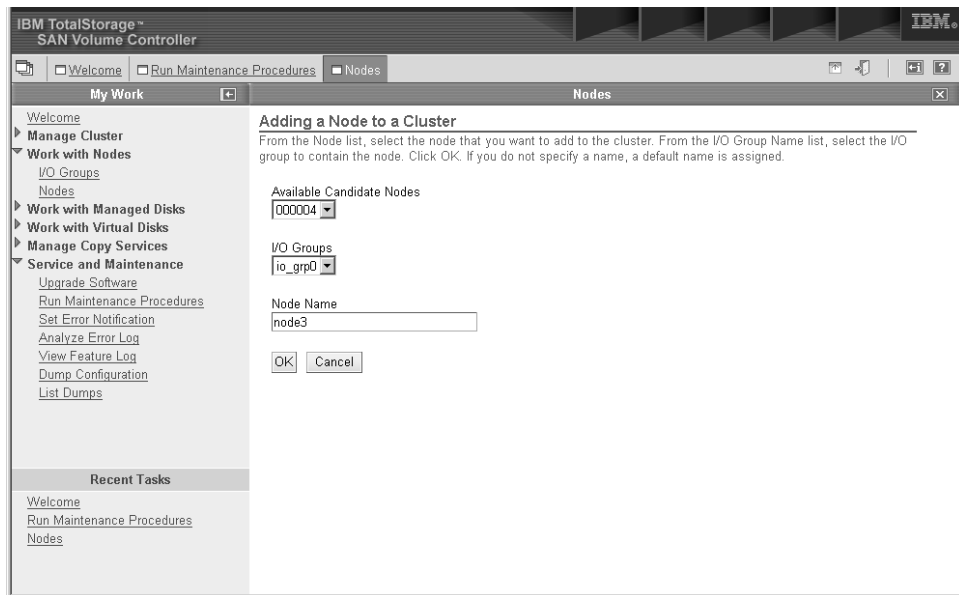
Figure 25. SAN Volume Controller Console Nodes panel

4. From the list of candidate nodes, select the number of the node that you want to add.
5. Select the I/O group that you noted when the previous node was deleted .

   Attention: If more than one candidate node exists, you must ensure that the node that you add into an I/O group is the same node that was deleted from that I/O group. Failure to do so might result in data corruption. If you are uncertain which candidate node belongs to the I/O group, shut down all host systems accessing this cluster before you proceed. Add all the nodes back into the cluster, then reboot each system. For further details see "Special procedures when adding a node to a cluster" in the *IBM TotalStorage SAN Volume Controller: Configuration Guide*.

Related topics:
- "Using the SAN Volume Controller Console application on the master console" on page 3

Viewing the vdisk status

You need to view the status of vdisks as part of the repair verification procedures. When all repair actions are complete all vdisks should be online. If any vdisks remain offline the data on those disks might not be valid and the customer will need to perform remedial actions. See the *IBM TotalStorage SAN Volume Controller: Configuration Guide* for customer actions for an offline vdisk.

Steps:

Perform the following steps to view the status of vdisks:
1. Expand the Work with Virtual Disks option in the left pane.
2. Select Virtual Disks.

3. In the right pane select the filter option that displays the data that you need.

   For example, to select offline vdisks select Offline from the status drop down menu, then click **Go**. To display all the vdisks do *not* select a filter option, just click the **Go** button.

Viewing the mdisk status

You need to view the status of mdisks as part of the repair verification procedures. When all SAN Volume Controller repairs are complete all mdisks should be online. If any mdisks remain offline, degraded, or excluded, those disks might contain errors, or there could be a SAN problem that is preventing access to the mdisks. If problems exist on mdisks when the repair actions have been completed on the SAN Volume Controller, resolve the disk drive or SAN problems and then perform repair verification for the SAN Volume Controller to verify that no other defects exist.

Steps:

Perform the following steps to view the status of mdisks:
1. Expand the Work with Managed Disks option in the left pane.
2. Select Managed Disks.
3. In the right pane select the filter option that will display the data that you need.

   For example, to select excluded mdisks select Excluded from the status drop down menu, then click **Go**. To display all the mdisks do *not* select a filter option, just click the **Go** button.

Viewing the vital product data

Vital product data is available for each node and for the cluster.

Steps:

Perform the following steps to display the vital product data:
1. Expand the Work with Nodes option in the left pane.
2. Select `Nodes`.
3. Click on the node name of any node to display the node details.
4. In the right pane select `Vital Product Data`.

Steps:

Perform the following steps to display the cluster vital product data:
1. Expand the Manage Cluster option in the left pane.
2. Select View Cluster properties.
3. In the right pane select the subsection of the cluster VPD that you want to display.

Listing and saving dump data

Dump data can be saved on any node in the cluster. When you use this procedure to display dump data only the dump files on the configuration node will be displayed. An option is provided on the dumps menu to display data from other nodes. If you choose to display or save data from another node that data will first be copied to the configuration node.

Steps:

Perform the following steps to list and save dump data:

1. Expand the Service and Maintenance option in the left pane.
2. Select the List Dumps option.
3. Follow the instructions in the right pane to display and save the dumps that you need.

Marking errors as fixed

You can use the SAN Volume Controller Console to mark errors as fixed for the cluster error log. This action is only necessary if you fix a error without using the on-line maintenance procedures. The online procedures automatically mark an error as fixed after a successful repair.

Steps:

Perform the following steps to mark errors as fixed:

1. From the SAN Volume Controller Console, select `Analyze Error Log`.
2. View the error log sorted by error priority.
3. Click on the sequence number of the error you have just fixed to display the error log in more detail.
4. Click **mark as fixed** button.

   The error log entry for this error is now marked as fixed, and will not be used as part of future error log analysis.

Errors can also be marked as fixed using the command-line interface. Use the **svctask cherrstate** command.

Related topics:
- "Using the MAPs" on page 117

Accessing the command-line interface from the master console

This task describes how to access the command-line interface from the master console.

Context:

If you need to enter and execute command line instructions, you can access the SAN Volume Controller command-line interface from the master console.

Steps:

Perform the following steps to access the command-line interface from the master console:

1. Start PuTTY by going to the C:\Support Utils\Putty\ directory and double-clicking the putty.exe file.
2. The PuTTY Configuration panel is displayed; see Figure 26 on page 13. Enter the IP address for the device (usually the cluster IP address) in the **Host Name (or IP Address)** field, and select the **SSH** option for the protocol.
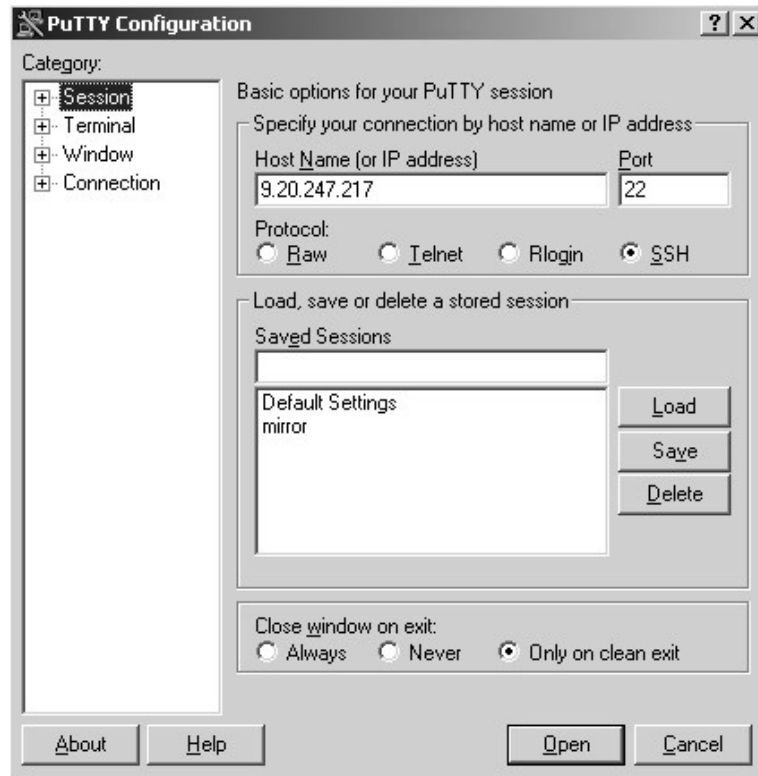
Figure 26. PuTTY Configuration panel –Basic options

3. From the left navigation pane, click **Connection**, and then click **SSH**.

   Click **Auth**. The Options controlling SSH authentication panel is displayed. See Figure 27 on page 14.
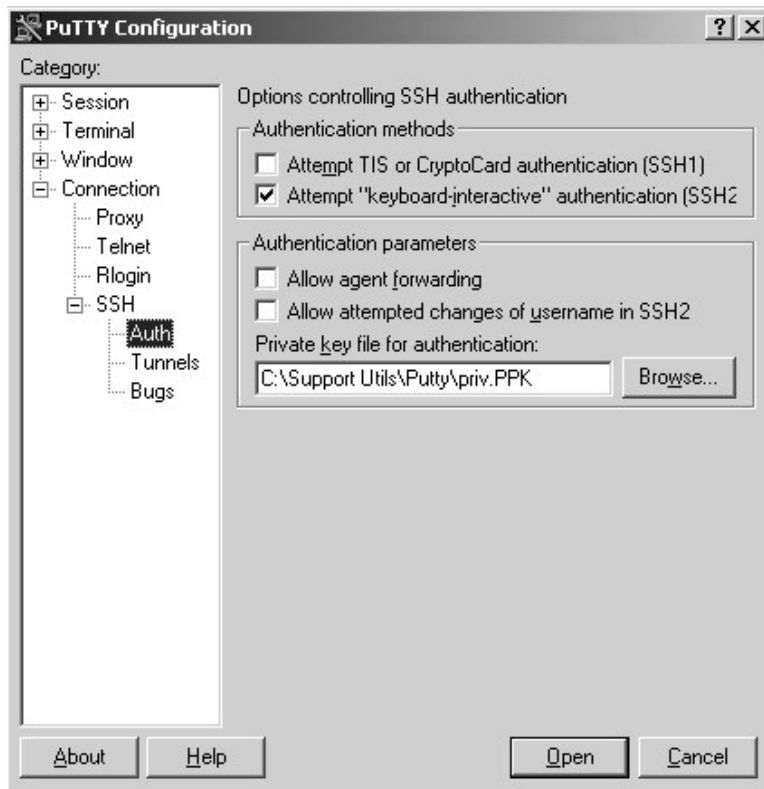
Figure 27. PuTTY Configuration panel–SSH authentication

Type the following path name in the **Private key file for authentication** field, and click **Open**:
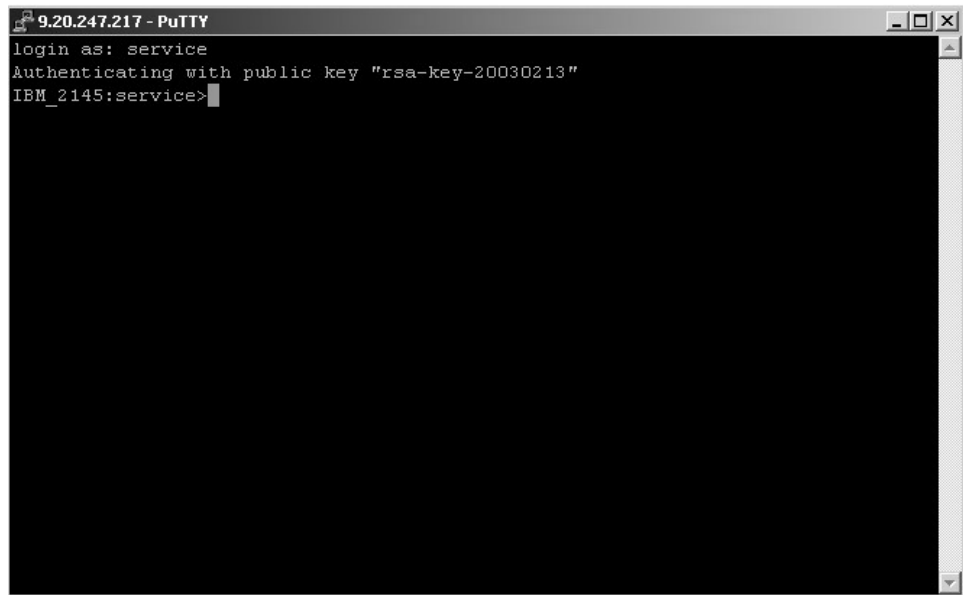
```
C:\Support Utils\Putty\priv.PPK
```

4. If the following PuTTY Security Alert window opens, click **Yes**. See Figure 28.

Figure 28. PuTTY Security Alert window

5. The command-line window for service is displayed. See Figure 29 on page 15.
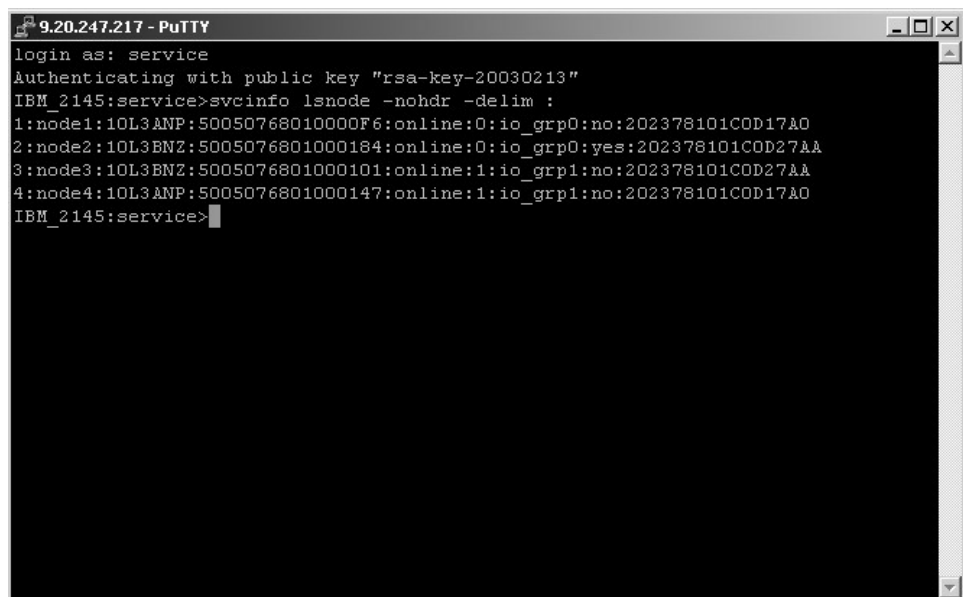
Figure 29. Command-line window for service

At the `login as:` prompt, type the user name `service`. When the service prompt is displayed, you can use the command-line interface to enter commands.

6. Enter a command following the service prompt to display information about the SAN Volume Controller. For example, enter the following command to view the current status of the nodes used by the SAN Volume Controller cluster.

svcinfo lsnode -nohdr -delim :

The current status of the nodes used by the SAN Volume Controller cluster is displayed. See Figure 30.

Figure 30. Command-line window for service

In the command: **svcinfo lscluster** *clustername*, ***clustername***, represents a value you must provide in the command. Replace ***clustername*** with the name of the cluster whose details you want to list

Checking the status of the node

You can check the status of the node by using the SAN Volume Controller user interface or by using the command-line interface.

Figure 31 shows what is displayed when you type the following command:

svcinfo lsnode -delim :

Example:

```
1:node1:10L3ANP:5005076801000013:online:0:io_grp0:yes:202378101C0D17A0
2:node2:10L3BNZ:5005076801000184:online:0:io_grp0:no:202378101C0D27AA
```

Figure 31. Example of what is displayed when you check the node status

The characteristics for each node are listed one line per node. In Figure 31 you can see a node status of online. Other statuses you might see for the node are: offline, adding, and deleting. For more information about what commands you can use, see the *IBM TotalStorage SAN Volume Controller: Configuration Guide*.

Checking the status of the node ports

You can check the status of the node ports by using the SAN Volume Controller user interface or by using the command-line interface.

Figure 32 on page 17 shows what is displayed when you type the following command:

svcinfo lsnode -delim : *nodename*

Example:

```
id:1
name:node1
UPS_serial_number:10L3ANP
WWNN:5005676801000013
status:online
IO group id:0
IO group name:io_grp0
partner node id:2
partner node name:node2
config node:yes
UPS_unique_id:202378101C0D17A0
port id:5005676801100013
port status:active
port id:5005676801200013
port status:active
port id:5005676801300013
port status:active
port id:5005676801400013
port status:active
```

Figure 32. Example of what is displayed when you check the status of the node port

Figure 32 shows information for the named node on line two of the example. You can see the port ID and the status of the port in the last eight lines of the example. In this example, the last eight lines show a port status of active. Other status you might see include not installed, failed, or inactive.

For more information about using the command-line interface, see *IBM TotalStorage Open Software Family SAN Volume Controller Command-line Interface User's Guide*.

Deleting a node from the cluster using the CLI

A node might need to be deleted from a cluster if the node has failed and is being replaced with a new node or if the repair that has been performed has caused that node to be unrecognizable by the cluster. For example, if the disk drive or the software on the node has been replaced, that node will no longer be known by the cluster.

Steps:

Use the command line to identify the node to delete.

1. Type the following command on the command-line interface to list the cluster nodes:

   svcinfo lsnode

   The following is an example of what you might see when you use the **svcinfo lsnode** command.

```
id name   UPS_serial_number WWNN            status  IO_group_id IO_group_name config_node UPS_unique_id
1  node1  10L3ANP           50050768010000F6 online  0           io_grp0       yes         202378101C0D17A0
2  node2  10L3BNZ           5005076801000184 online  0           io_grp0       no          202378101C0D27AA
3  node3  10L3BNZ           0000000000000000 offline 1           io_grp1       no          202378101C0D27AA
4  node4  10L3ANP           5005076801000147 online  1           io_grp1       no          202378101C0D17A0
```

Figure 33. Example of what is displayed when you use the svcinfo lsnode command

Make a note of the Name and the I/O Group Name of the offline node. In the example, node3 is offline and is assigned to io_grp1. You will need this information when you add a node back into the cluster.

Attention: If more than one SAN Volume Controller in this or in other
clusters on the same SAN is offline make a note of that now because you will
need to take special precautions when adding the node back into the cluster.

2. You must use the following command to remove the offline node from the
   cluster:

   svcservicetask rmnode *node,* where *node* is the name of the offline node noted
   in step 1 on page 17.

   In this example the command would be:

   ```
   svcservicetask rmnode node3
   ```
   No output is displayed.

Related topics:
- "Adding a node to the cluster using the CLI"

Adding a node to the cluster using the CLI

A node that has been either removed or rejected by a cluster can be added into the
cluster using the following procedure.

Attention: Before adding a node to a cluster, make sure that the switch zoning is
configured such that the node being added is in the same zone as all other nodes
in the cluster. In particular, if you are replacing a node and the switch is zoned by
worldwide port name (WWPN) rather than by switch port, you must update the
switch configuration.

Steps:

Use the command line to list node candidates:

1. Type the following command on the command-line interface to list the node
   candidates:

   svcinfo lsnodecandidate

   The following example shows what you might see when you use the **svcinfo
   lsnodecandidate** command.

   ```
   id               panel_name    UPS_serial_number    UPS_unique_id
   5005076801000101 000279        10L3BNZ              202378101C0D27AA
   ```

   Figure 34. Example of what is displayed when listing the node candidates

   You can add the node to the cluster by using the **addnode** command.

2. Type the following command:

   svcservicetask addnode -panelname *panel_name* **-name** *new_name_arg* **-iogrp**
   iogroup_name, where *panel_name* is the name noted in step 1 (in this example
   000279). This is the number that is printed on the front panel of the node that
   you are adding back into the cluster; *new_name_arg* is the name of the node
   noted when the previous node was deleted from the cluster; *iogroup_name* is
   the iogroup that was noted when the previous node was deleted from the
   cluster

   The following example shows the command you might use:

   svcservicetask addnode -panelname 000279 -name node3 -iogrp io_grp1

This following example shows that output you might see:

```
Node, id [5], successfully added
```

Figure 35. Example of the output when you use the addnode command

Attention: If more than one candidate node exists you must ensure that the node that you add into an I/O group is the same node that was deleted from that I/O group. Failure to do so might result in data corruption. If you are uncertain about which candidate node belongs to the each I/O group, the user will need to shutdown all host systems accessing this cluster before you can proceed and then reboot each system when all the nodes have been added back into the cluster.

3. To check whether or not you added the node successfully, type the following command:

svcinfo lsnode

The following example shows what you might see when you use the **svcinfo lsnode** command.

```
id name    UPS_serial_number WWNN             status  IO_group_id IO_group_name config_node UPS_unique_id
1  node1  10L3ANP          50050768010000F6 online  0           io_grp0       yes         202378101C0D17A0
2  node2  10L3BNZ          5005076801000184 online  0           io_grp0       no          202378101C0D27AA
5  node3  10L3BNZ          5005076801000101 online  1           io_grp1       no          202378101C0D27AA
4  node4  10L3ANP          5005076801000147 online  1           io_grp1       no          202378101C0D17A0
```

Figure 36. Example of what is displayed when you check to see if you added the node correctly

All nodes are now online.

Related topics:

- "Deleting a node from the cluster using the CLI" on page 17

Listing managed disks

You can list the managed disks by using the SAN Volume Controller console or the command-line interface.

Enter the following command to see information about several managed disks as shown in Figure 37 on page 20.

```
svcinfo lsmdisk -delim :
```

Example:

```
id: name:     status:  mode:          mdisk_grp_id:   mdisk_grp_name          capacity:ctrl_LUN_#:   controller_name:UID
0:  mdisk0:   online:  unmanaged:::   68.4GB:         0000000000000000:       controller0             *
1:  mdisk1:   online:  unmanaged:::   68.4GB:         0000000000000000:       controller1             +
2:  mdisk2:   online:  unmanaged:::   68.4GB:         0000000000000000:       controller2             ++
3:  mdisk3:   online:  unmanaged:::   68.4GB:         0000000000000000:       controller3             §
4:  mdisk4:   online:  unmanaged:::   68.4GB:         0000000000000000:       controller4             #
5:  mdisk5:   online:  unmanaged:::   68.4GB:         0000000000000000:       controller5             **

*600a0b80000f4c920000000b3ef6c3d00000000000000000000000000000000 (This number represents the controller_name:UID)
+0080e52122fa8000000000000000000000000000000000000000000000000000 (This number represents the controller_name:UID)
++600a0b80000c5ae4000000093eca105c00000000000000000000000000000000 (This number represents the controller_name:UID)
§0080a0b80000f6432000000043ef6b4ff00000000000000000000000000000000 (This number represents the controller_name:UID)
#600a0b80000f4c920000000b3ef6c3d00000000000000000000000000000000 (This number represents the controller_name:UID)
**600a0b80000f6c920000000d3er1a7d00000000000000000000000000000000 (This number represents the controller_name:UID)
```

Figure 37. Example of what is displayed when listing several managed disks

Figure 37, shows a list of managed disks. To determine the status of the managed disk, see column three in Figure 37 for `status`. Figure 37 shows that all managed disks have a status of `online`. The following list shows possible statuses for a managed disk.

- Online
- Offline
- Excluded
- Degraded

To determine the mode of the disk, see column four of Figure 37 for `mode`. Figure 37 shows that the mode is `unmanaged`. The following list shows possible modes for a managed disk.

- Managed
- Unmanaged
- Image

You can also list more detailed information about one managed disk. Enter the following command to see detailed information about one managed disk with an id of 3 as shown in Figure 38.

svcinfo lsmdisk -delim : 3

```
id:3
name:mdisk3
status:online
mode:managed
mdisk_grp_id:0
mdisk_grp_name:mdiskgrp0
capacity:68.4GB
quorum_index:
block_size:512
controller_name:controller3
ctrl_type:4
ctrl_WWNN:20000004CF1FD7A0
controller_id:3
path_count:1
max_path_count:1
ctrl_LUN_#:0000000000000000
UID:600a0b80000f6432000000043ef6b4ff00000000000000000000000000000000
```

Figure 38. Example of what is displayed when you check the characteristics of the managed disks

Including managed disks

You can include an excluded managed disk by using the SAN Volume Controller Console, or by using the command-line interface.

Commands:

Type the following command to list the managed disks:

svcinfo lsmdisk -nohdr -delim :

Example:

Figure 39 shows an example of what is displayed when you list the managed disks.

```
0:mdisk0:online:managed:0:Group0:67.8GB:0000000000000000:controller0*
1:mdisk1:excluded:managed:0:Group0:205.0GB:0000000000000000:controller1⁺
2:mdisk2:online:managed:0:Group0:273.3GB:0000000000000000:controller1#
3:mdisk3:online:managed:0:Group0:546.6GB:0000000000000000:controller1§

* 0080e52122fa800000000000000000000000000000000000000000000000 is appended to this line.
⁺ 600a0b80000c5ae4000000093eca105c0000000000000000000000000000 is appended to this line.
# 600a0b80000f6432000000043ef6b4ff0000000000000000000000000000 is appended to this line.
§ 600a0b80000f4c920000000b3ef6c3d0000000000000000000000000000 is appended to this line.
```

Figure 39. Example of what is displayed when you list the managed disks

Line number two in Figure 39 shows the number of the excluded disk. Type the following command to include the excluded managed disk, specifying the number of the excluded managed disk.

svctask includemdisk *mdisk_number*

Related topics:
* "Accessing the command-line interface from the master console" on page 12

Re-scanning the fibre-channel network for new managed disks

The fibre-channel network can be manually re-scanned for any new managed disks that might have been added either by using SAN Volume Controller Console, or using the command-line interface.

Cluster discovery commands:

This is a customer task and is only available to users who are logged on using the admin ID and password. Enter the following command to re-scan the fibre-channel network for any new managed disks:

svctask detectmdisk

This command does not produce any output.

Related topics:
* "Accessing the command-line interface from the master console" on page 12

Checking managed disk group status

You can check the status of a managed disk group by using SAN Volume Controller user interface, or by using the command-line interface.

Type the following command to check the status of a managed disk group:

svcinfo lsmdiskgrp -nohdr -delim :

Example:

You get what is displayed in Figure 40.

```
0:Group0:online:4:4:2.1GB:16:1.9GB
```

Figure 40. Example of what is displayed when you check the status of a managed disk group

The characteristics for each managed disk group is listed one line per group. The status of the managed disk group is shown by the third item. In the example above, Group0 status is online. Managed disk group status can be: offline, online, degraded.

Related topics:
- "Accessing the command-line interface from the master console" on page 12

Checking disk controller status

You can check the status of the disk controllers by using the SAN Volume Controller user interface, or by using the command-line interface.

Type the following command to see what is displayed in Figure 41.

svcinfo lscontroller -delim :

Example:

```
id:controller_name:ctrl_s/n:vendor_id:product_id_low:product_id_high
7:controller7:3EK0J5Y8:SEAGATE :ST373405:FC
8:controller8:3EK0J6CR:SEAGATE :ST373405:FC
9:controller9:3EK0J4YN:SEAGATE :ST373405:FC
10:controller10:3EK0GKGH:SEAGATE :ST373405:FC
11:controller11:3EK0J85C:SEAGATE :ST373405:FC
12:controller12:3EK0JBR2:SEAGATE :ST373405:FC
13:controller13:3EKYNJF8:SEAGATE :ST373405:FC
14:controller14:3EK0HVTM:SEAGATE :ST373405:FC
```

Figure 41. Example of what is displayed when you check the disk controller status

You can also check the status of a specific disk controller by using the SAN Volume Controller user interface, or by using the command-line interface. Type the following command to see what is displayed in Figure 42 on page 23.

svcinfo lscontroller -delim = *controller_id*

```
id=7
controller_name=controller7
WWNN=20000004CF2412AC
mdisk_link_count=1
max_mdisk_link_count=1
degraded=no
vendor_id=SEAGATE
product_id_low=ST373405
product_id_high=FC
product_revision=0003
ctrl_s/n=3EK0J5Y8
WWPN=22000004CF2412AC
path_count=1
max_path_count=1
WWPN=21000004CF2412AC
path_count=0
max_path_count=0
```

Figure 42. Example of what is displayed when you check the status of a specific disk controller

You can see the status of a specific disk controller (id=7) in the sixth line of Figure 42. When you see a status of degraded = no the status is good. When you see a status of degraded = yes, the status is bad.

Related topics:
- "Accessing the command-line interface from the master console" on page 12

Determining the failing enclosure or disk controller

You can determine the failing enclosure or disk controller by using the SAN Volume Controller user interface or the command-line interface.

Type the following command to list all the mdisks:

svcinfo lsmdisk -nohdr -delim :

Example:

Type the **svcinfo lsmdisk -nohdr -delim :** command to see what might display in the following example:

```
0:mdisk0:online:managed:0:mdiskgrp0:273.3GB:0000000000000001:controller0:*
1:mdisk1:excluded:managed:0:mdiskgrp0:546.6GB:0000000000000002:controller0:⁺

* 600a0b80000c5ae4000000093eca105c00000000000000000000000000000000 is appended to this line.
⁺ 600a0b80000f6432000000043ef6b4ff00000000000000000000000000000000 is appended to this line.
```

Figure 43. Example of what is displayed when using the svcinfo lsmdisk –nohdr –delim : command

The mdisks are listed in the object ID order. The first item is the object ID, the third item is the status, and the ninth item is the disk or controller name. In the example above, mdisk1 has an object ID of 1, is failing with the status excluded, and is part of a disk controller named controller0.

To obtain the detailed data for the named enclosure or disk controller, type the following command:

svcinfo lscontroller -delim : *name*

where *name* is the enclosure disk controller name.

Example:

To obtain detailed data for controller0, type the following command:

```
svcinfo lscontroller -delim : controller0
```

The following detailed data is displayed:
```
id:0
controller_name:controller0
WWNN:200200A0B80F5E2C
mdisk_link_count:30
max_mdisk_link_count:30
degraded:no
vendor_id:IBM
product_id_low:1722-600
product_id_high:
product_revision:0520
ctrl_s/n:
WWPN:200200A0B80F5E2D
path_count:30
max_path_count:30
WWPN:200300A0B80F5E2D
path_count:30
max_path_count:30
```

SAN Volume Controller front panel controls and indicators

The controls and indicators for the SAN Volume Controller are contained on the front and back panel assembly. Below is a description of the front panel assembly:

Controls and indicators for the front panel assembly:

The following figure shows the location of the controls and indicators listed below:
- Power button **1**
- Power LED **2**
- Check LED **3**
- Navigation buttons **4**
- Select button **5**
- Front panel display **6**
- Label **7**
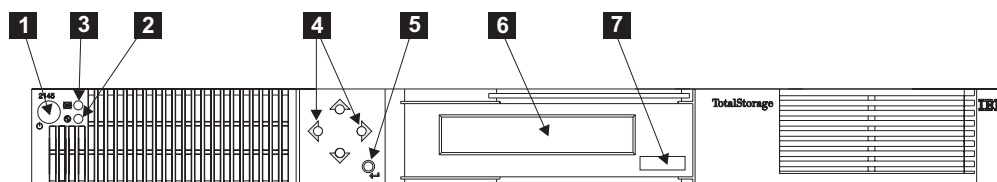
Figure 44. SAN Volume Controller front panel assembly

Related topics:
- "Power button" on page 25
- "Power LED" on page 25
- "Check LED" on page 25

- "Navigation buttons"
- "Select button"
- "Front panel display"

Power button

The power button **1** 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 connected to an uninterruptible power supply, the uninterruptible power supply will also power off. To power on the SAN Volume Controller you must first power on its uninterruptible power supply.

Power LED

The green power LED **2** indicates the power status of the SAN Volume Controller:

Properties:

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

The amber check LED **3** comes on continuously if a critical failure occurs in the service controller. If the check LED is off and the power LED is on, the service controller is working correctly.

The amber check LED also comes on while the service controller code is being re-programmed. For example, when the SAN Volume Controller cluster code is being upgraded, it is normal for the check LED to come on.

Navigation buttons

Four navigational buttons **4** are provided. They are arranged in a circle. You press these directional buttons to move through the menu options. For example, to move up, press the top button in the circle; to move right, press the right button in the circle. The fifth button, which is outside the circle, is the select button.

Select button

The select button **5** enables you to select an item from a menu.

Front panel display

The front panel display **6** shows service, configuration, and navigation information. The information 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. The information you see can be one of 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 **7** is a six-digit node identification number that is printed on a label on the front panel. This number is the same as the six-digit number used in the `addnode` command, is readable by system software, and is used by configuration and service software as a node identifier. The node identifier can also be displayed on the front panel display when node is selected from the menu.

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

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

SAN Volume Controller rear panel indicators

The controls and indicators for the SAN Volume Controller are contained on the front and back panel assembly. Below is a description of the back panel assembly:

Indicators for the back panel assembly:

The following figure shows the location of the controls and indicators listed below:
- System board power LED **1**
- System board fault LED **2**
- Monitor LED (not used) **3**
- Lower Ethernet connection LED **4**
- Upper Ethernet connection LED **5**
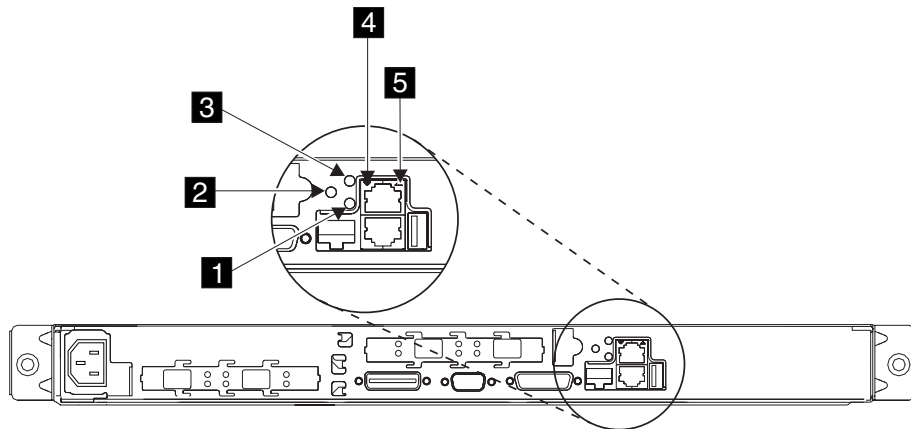
Figure 45. SAN Volume Controller back panel assembly

Related topics:
- "System board power LED"
- "System board fault LED"
- "Monitor LED"
- "Lower Ethernet connection LED"
- "Upper Ethernet connection LED" on page 28

System board power LED

The system board power LED **1** indicates the power supply status 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, the uninterruptible power supply will also power off. To power on the SAN Volume Controller you must first power on its uninterruptible power supply.

Related topics:
- "SAN Volume Controller rear panel indicators" on page 26

System board fault LED

The amber system board fault LED **2** indicates that the system board has detected a critical failure.

Related topics:
- "SAN Volume Controller rear panel indicators" on page 26

Monitor LED

The green monitor LED **3** is not used on the SAN Volume Controller.

Lower Ethernet connection LED

The lower Ethernet connection LED **4** 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

| The upper Ethernet connection LED **5** indicates the operational status of Ethernet
| port 2. Ethernet port 2 is not used on the SAN Volume Controller except during
| Ethernet problem determination.

SAN Volume Controller hardware

This topic shows the locations of, and summarizes, the hardware for the SAN
Volume Controller.

See Figure 46 on page 29 for a breakout view for the parts to the SAN Volume
Controller. Use the reference keys in Table 3 to match the reference keys in
Figure 46 on page 29.

Table 3. Reference key legend for breakout view of the SAN Volume Controller

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)

See Figure 46 on page 29 for a breakout view of the parts for the SAN Volume
Controller.
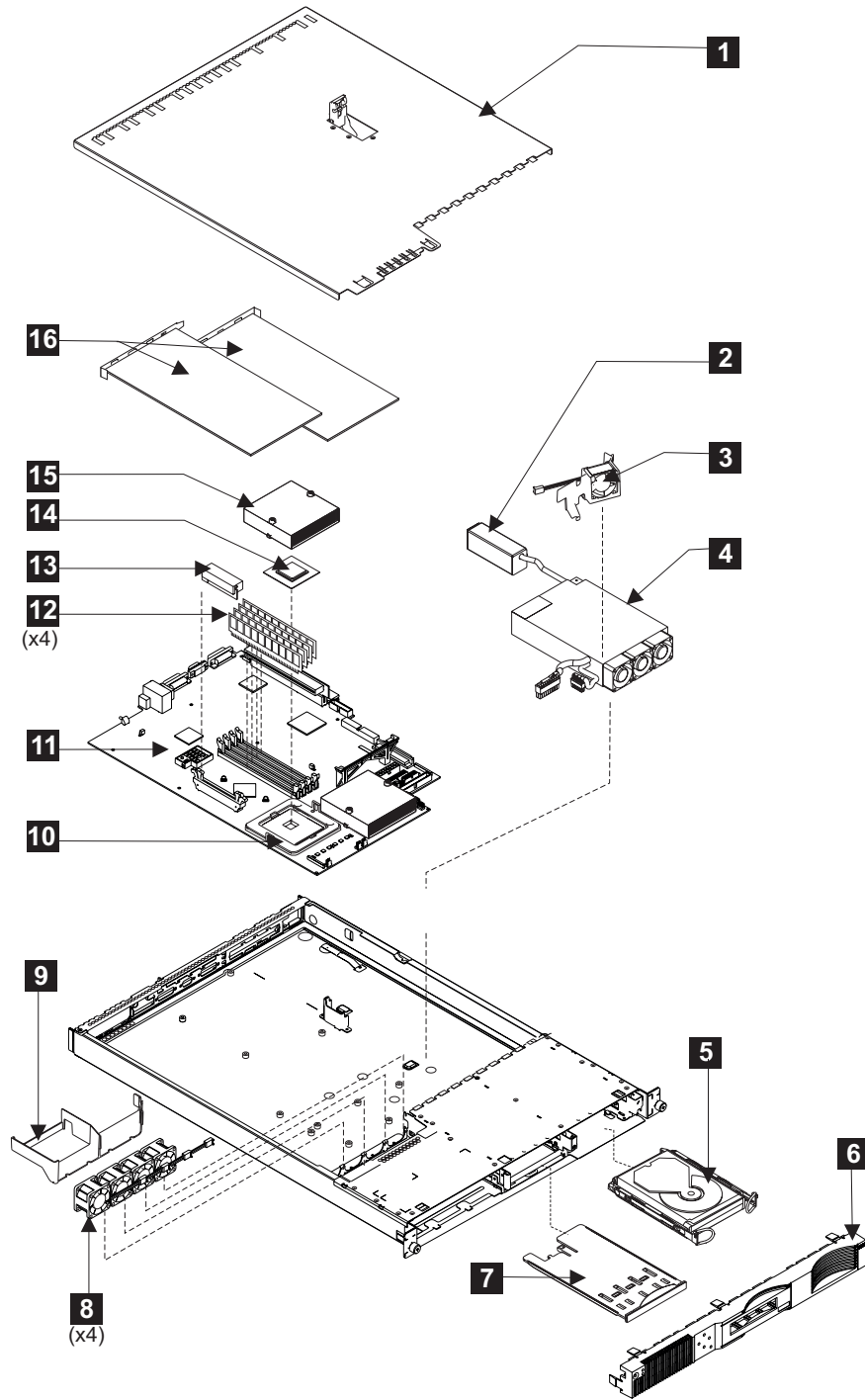
Figure 46. Exploded view of the hardware for the SAN Volume Controller

SAN Volume Controller connectors

This section shows the locations of the external connectors for the SAN Volume Controller.

Context:

See Table 4 for a list of the SAN Volume Controller connectors. Use the reference keys in Table 4 to cross reference the reference keys in Figure 47.

Table 4. Reference key legend for the external power connectors of the SAN Volume Controller

1	Power connector	**5**	Ethernet port 1
2	fibre-channel port 3	**6**	Serial connector
3	fibre-channel port 4	**7**	fibre-channel port 2
4	Ethernet port 2 *(not used on the SAN Volume Controller)*	**8**	fibre-channel port 1
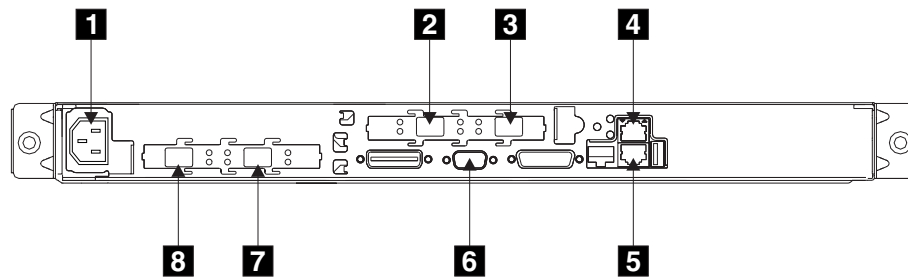
Figure 47. SAN Volume Controller connector locations

Figure 48 shows an illustration of 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.

Neutral
Ground
Live
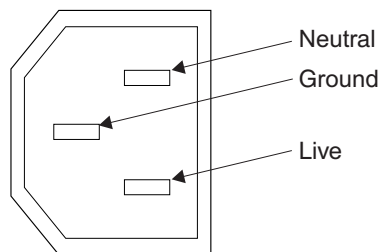
Figure 48. SAN Volume Controller power connector

Preparing your SAN Volume Controller environment

This topic provides information you need to ensure that your physical site meets the installation requirements for the SAN Volume Controller.

Dimensions and weight:

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

Additional space requirements:

Location	Additional space required	Reason
Left- and right-hand sides	50 mm (2 in.)	Cooling air flow
Back	100 mm (4 in.) minimum	Cable exit

AC input-voltage requirements:

Power Supply Assembly Type	Voltage	Frequency
220 V	88 to 264 V ac	47 to 63 Hz

Environment:

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

Heat output (maximum):

350 watts (1195 Btu per hour)

Related topics:
- "Preparing your uninterruptible power supply environment" on page 49

Preparing your master console environment

This topic provides information you need to ensure that your physical site meets the installation requirements for the master console server and console monitor kit.

Server dimensions and weight:

Height	Width	Depth	Approximate Maximum Weight
43 mm	430 mm	424 mm	12.7 kg
(1.7 in.)	(16.69 in.)	(16.54 in.)	(28 lb.)
			(depending on your configuration.)

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

Server acoustical noise emissions:

Sound power, idling	Sound power, operating
6.5 BEL maximum	6.5 BEL maximum

Server AC and input-voltage requirements:

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

Server environment:

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

Server heat output:

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

Monitor console kit dimensions and weight:

Height	Width	Depth	Approximate Maximum Weight
43 mm	483 mm	483 mm	17.0 kg
(1.7 in.)	(19.0 in.)	(19.0 in.)	(37.0 lb.)
			(depending on your configuration.)

Related topics:

Using the power control for the SAN Volume Controller

SAN Volume Controllers are powered by an uninterruptible power supply located in the same rack as the SAN Volume Controller. The power state of the SAN Volume Controller is displayed by a power indicator on the front panel. If the uninterruptible power supply battery is not sufficiently charged to enable the SAN Volume Controller to become fully operational, its charge state is displayed on the front panel display of the SAN Volume Controller.

The power to a SAN Volume Controller is controlled by the power button on the front panel of the SAN Volume Controller or by commands sent by the Ethernet interface. For normal service operations, the SAN Volume Controller should be turned off by pressing the front panel power button. The SAN Volume Controller should never be turned off by removing the power cable from the rear of the SAN Volume Controller because you might lose data.

If the SAN Volume Controller software is running and you press the front panel power button, a signal is sent to the software that a power off request has been made. The SAN Volume Controller starts its power off processing. During this time, it indicates the progress of the power-off operation on the SAN Volume Controller front panel display. Once the power-off processing is complete, the front panel is blank and the front panel power light is extinguished. It is safe for you to remove the power cable from the rear of the SAN Volume Controller. If the power button on the front panel is pressed during power-off processing, the front panel display changes to indicate that the SAN Volume Controller is being restarted, but the power-off process completes before the restart is performed.

If the SAN Volume Controller software is not running when the front panel power button is pressed the SAN Volume Controller is immediately turned off.

If the SAN Volume Controller is powered off and it is the only SAN Volume Controller connected to the uninterruptible power supply, the uninterruptible power supply will also power off within five minutes. The power on button on the uninterruptible power supply must be pressed before the SAN Volume Controller can be powered on.

Turning off a SAN Volume Controller using the power button or by a command puts the SAN Volume Controller into a power-off state. The SAN Volume Controller remains in this state until the power cable is connected to the rear of the SAN Volume Controller and the power button is pressed.

During the SAN Volume Controller startup sequence, the SAN Volume Controller attempts to detect the status of the uninterruptible power supply through the uninterruptible power supply signal cable. If an uninterruptible power supply is not detected, the SAN Volume Controller pauses and an error is shown on the front panel display. If the uninterruptible power supply is detected, the software monitors the operational state of the uninterruptible power supply. If no uninterruptible power supply errors are reported and the uninterruptible power supply battery is sufficiently charged, the SAN Volume Controller becomes operational. If the uninterruptible power supply battery is not sufficiently charged, the charge state is indicated by a progress bar on the front panel display. The first time that a uninterruptible power supply is turned on, it might take up to three hours before the battery is sufficiently charged for the SAN Volume Controller to become operational.

If input power to the uninterruptible power supply is lost, the SAN Volume Controller immediately stops all I/O operations and saves the contents of its DRAM to the internal disk drive. While data is being saved to the disk drive, a `Power Failure` message is shown on the front panel and is accompanied by a descending progress bar that indicates the quantity of data that remains to be saved. Once all the data is saved the SAN Volume Controller is turned off and the power light on the front panel is extinguished.

Note: The SAN Volume Controller is now in standby state. If the input power to the uninterruptible power supply unit is restored, the SAN Volume Controller restarts. If the uninterruptible power supply battery was fully discharged `Charging` is displayed and the boot process waits for the battery to charge. When the battery is sufficiently charged `Booting` is displayed, the node is tested and the software is loaded. When the boot process is complete `Recovering` is displayed while the uniterruptible power supply finalizes its charge. While Recovering is displayed the cluster can function normally. However, when the power is restored after a second power failure, there is a delay (with Charging displayed) before the node can complete its boot process.

Related topics:
- "Powering off" on page 64

Using directed maintenance procedures

Directed maintenance procedures can be used to diagnose and resolve problems with the SAN Volume Controller.

Context:

For example, to repair a SAN Volume Controller cluster, you might perform the following tasks:
- Analyze the error log.
- Replace failed components.
- Verify the status of a repaired device.
- Restore a device to an operational state in the cluster.
- Mark the error as fixed in the error log.

Directed maintenance simplifies these procedures by automating as many of the tasks as possible.

To start the directed maintenance procedure to repair a SAN Volume Controller cluster, see Using the SAN Volume Controller Console application on the master console and Starting maintenance using the SAN Volume Controller Console application on the master console. If you are unable to start the maintenance procedures, see MAP 5000: Start and start the repair action.

The following procedures and panels show an example of what you might see when you use the directed maintenance procedures. The specific directed maintenance procedures and panels you see depend on the procedure you select.

Context:

You can use either the directed maintenance procedures through the SAN Volume Controller Web interface to perform these tasks or use the command–line interface. Using the web interface is preferable since the on-line procedures automatically check for correct status and also mark the error as fixed if the repair is successful.

Steps:

Perform the following steps to start the directed maintenance procedure to repair a SAN Volume Controller cluster using the Web interface.

Note: The following procedures and graphics are an example of what you might see when you use the directed maintenance procedures. The directed maintenance procedures and graphics you see depend on the procedure you select.

1. When directed maintenance procedures start, you will see what is displayed in Figure 49.
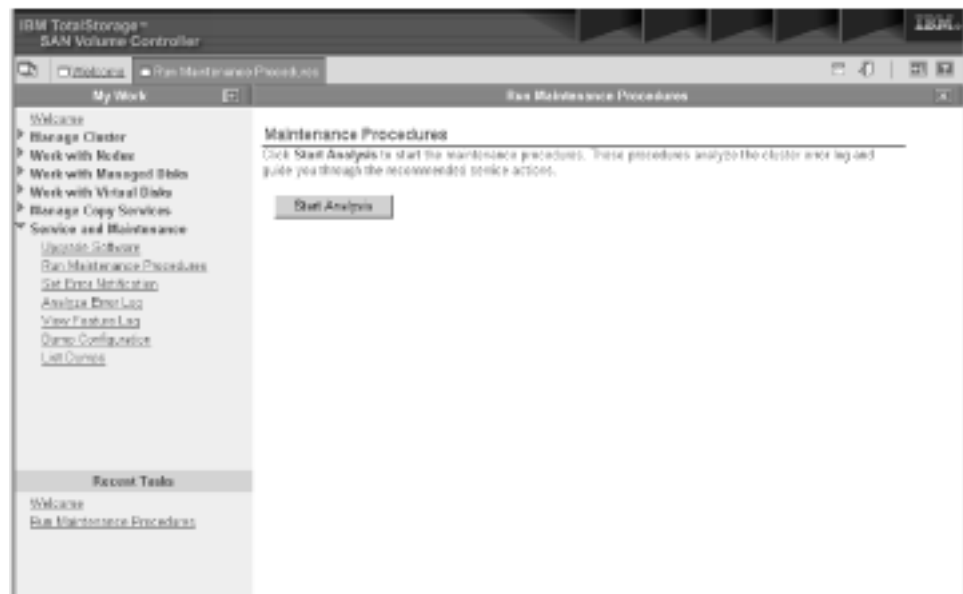
Figure 49. Example of what is displayed when you start the directed maintenance procedures

2. From the panel for Maintenance Procedures, click Start analysis to display what is shown in Figure 50 on page 36.
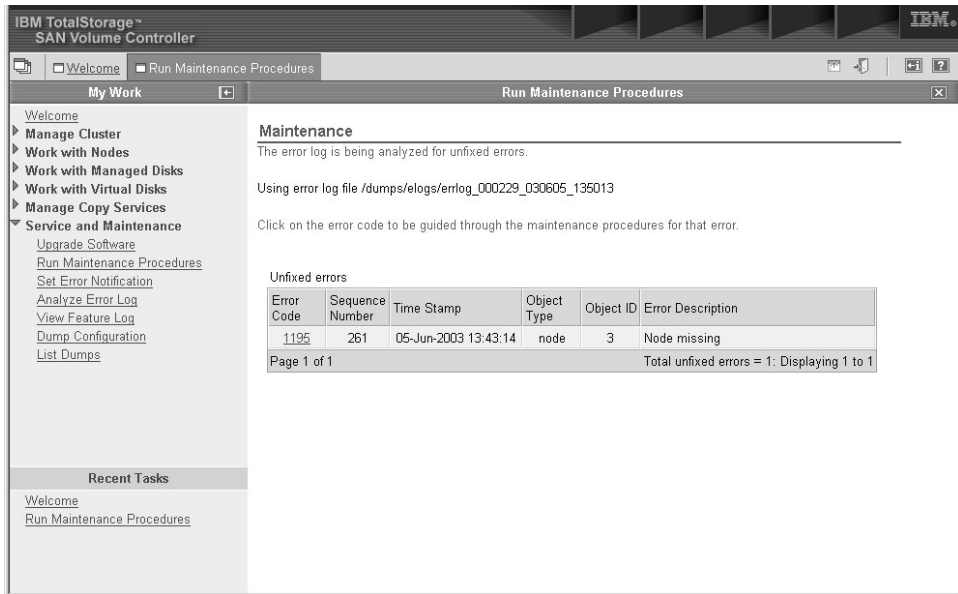
Figure 50. Example of what is dislayed when you start analysis

Figure 50 shows a list of unfixed errors. This example shows that only one error needs to be repaired. The list might contain any number of errors that need to be repaired. The error at the top of the list has the highest priority and should always be fixed first. If you do not fix the higher priority errors first, you might not be able to fix the lower priority errors.

3. Click the hyperlink for the number for the error code at the top of the list to display what is shown in Figure 51.
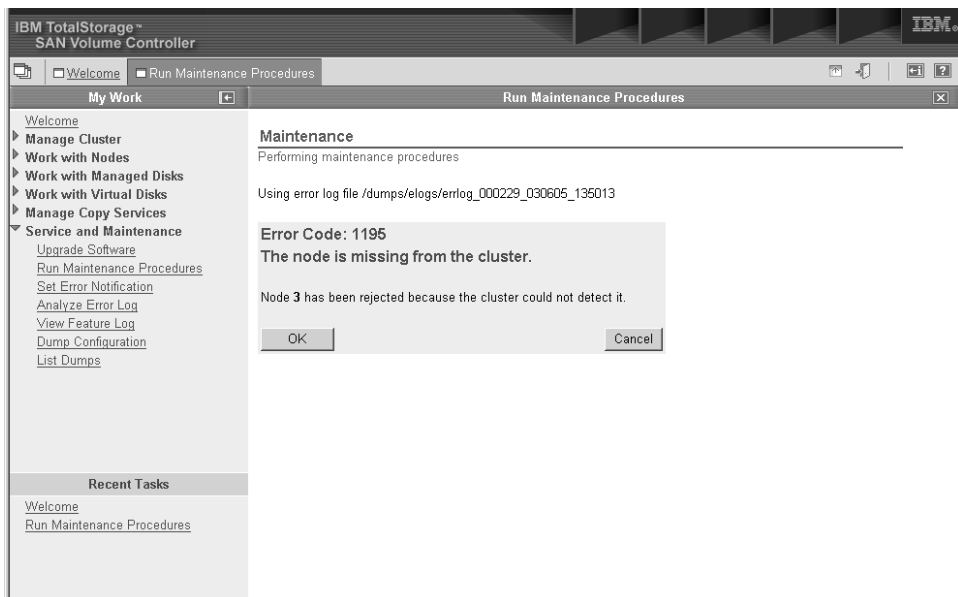
Figure 51. Example of what is displayed when you look for the error code

Figure 51 shows the error code and provides a description of the error condition.

4. Click OK to display what is shown in Figure 52 on page 37.
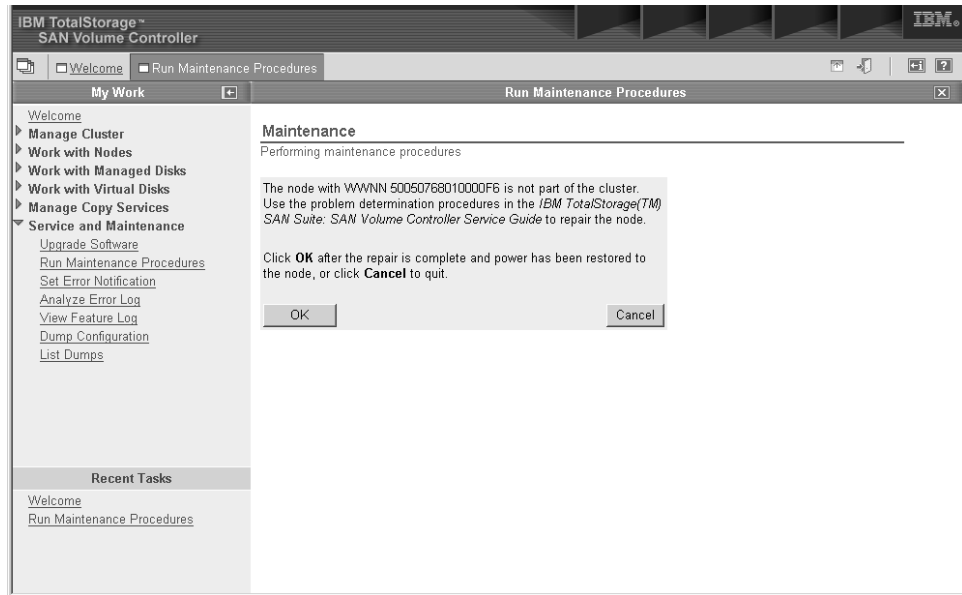
Figure 52. Example of what is displayed for cluster action

5. One or more panels might now be displayed instructing you to replace parts or perform other repair activity. If you are not able to complete the actions at this time, you can click Cancel. When you return to the directed maintenance procedures, the repair can be restarted from the beginning. When the actions that you are instructed to perform are complete, click OK. When the last repair action is completed, the directed maintenance procedures might attempt to restore failed devices to the cluster. Figure 53 shows an example of what might be displayed.
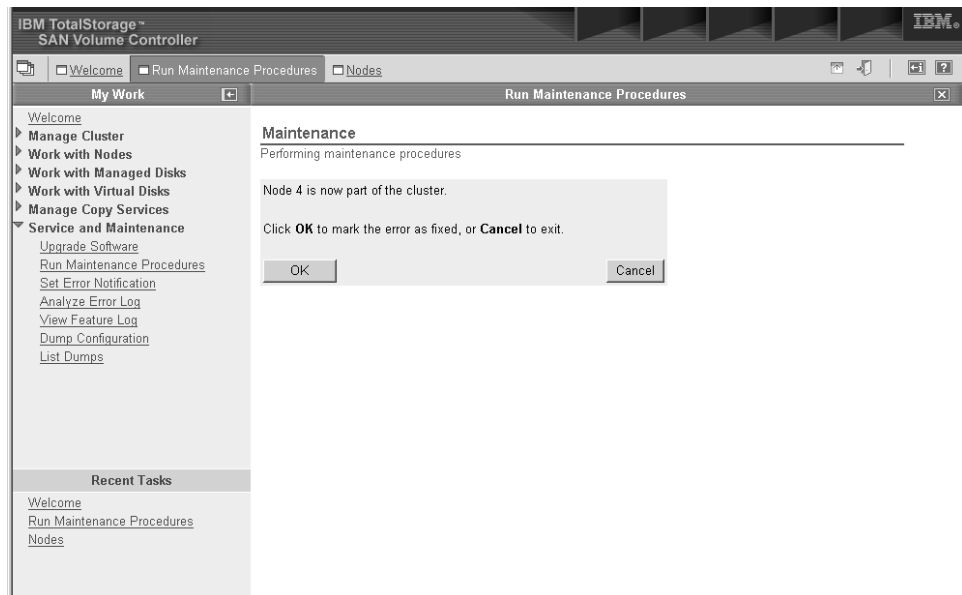
Figure 53. Example of what is displayed for a repair action

6. Click OK to mark the error as fixed in the error log to prevent this instance of the error from being listed again. This action displays message similar to that shown in Figure 54 indicating that the repair has been completed.
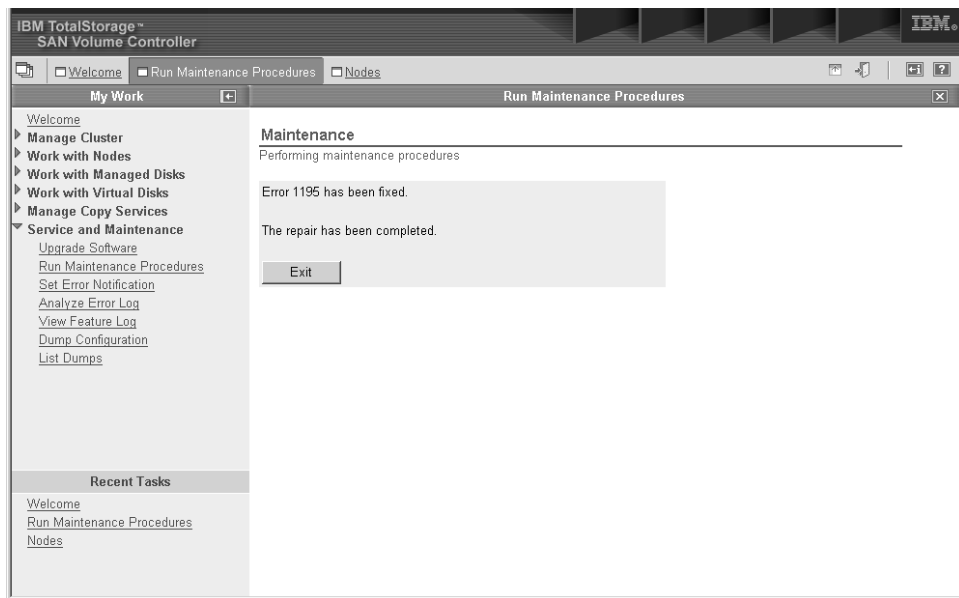
Figure 54. Example of what is displayed when the repair is completed

7. Click Exit. If other errors need to be fixed, these errors are displayed now and the directed maintenance procedures will continue. If no errors remain, you will see what is displayed in Figure 55.
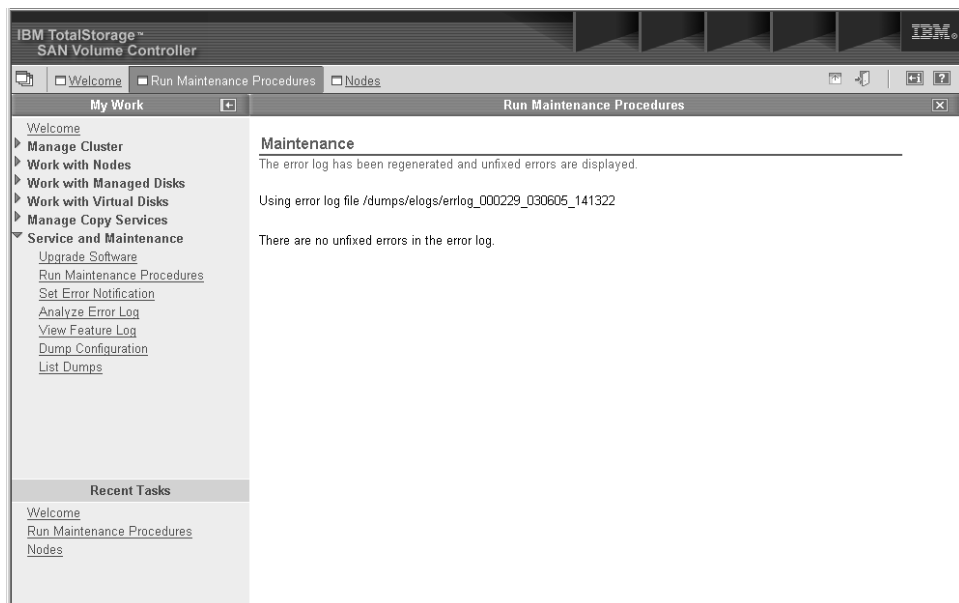
Figure 55. Example of what is displayed when you see no errors

This panel indicates that no further repair procedures are necessary. Verify the repair using the Repair verification MAP.

Related topics:

- "Using the SAN Volume Controller Console application on the master console" on page 3
- "Starting maintenance using the SAN Volume Controller Console application on the master console" on page 7
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

Power-on self-tests (POSTs)

When you turn on the SAN Volume Controller, the system board performs self tests. During the initial tests the hardware boot symbol displays.

Overview of POSTs:

If a critical failure is detected during the tests, the SAN Volume Controller software is not loaded and no additional fault information is provided. When the SAN Volume Controller software is loaded, additional testing is performed. This testing ensures that all the required hardware and software components are installed and functioning correctly. During this portion of the testing, the word `Booting` displays on the front panel along with a boot progress code and a progress bar.

If a test fails the word `Failed` displays on the front panel. You can use the progress code to isolate the cause of the problem. If the `Booting` progress bar fails to move to the right for two minutes, the test process is hung. Use the boot progress code to isolate the failure.

The service controller performs internal checks. The service controller is vital to the operation of the SAN Volume Controller. When an internal check fails, the SAN Volume Controller does not operate. Ignore other front panel indicators when you see that the Check LED is illuminated.

Note: The check LED stays lit when you program the microcode on the service controller, so it is not an indication that there is a problem.

The uninterruptible power supply also performs internal tests. If the uninterruptible power supply is capable of reporting the failure condition, the SAN Volume Controller displays critical failure information on the front panel display or sends noncritical failure information to the SAN Volume Controller cluster error log. If the SAN Volume Controller cannot communicate with the uninterruptible power supply, it displays a boot failure error message on the front panel display. Further problem determination information might also be displayed on the front panel of the uninterruptible power supply.

Shutting down the cluster in the SAN Volume Controller

If all input power to a SAN Volume Controller cluster is to be removed, for example, if the machine room power is to be shutdown for maintenance, you must shut down the cluster before the power is removed. If you do not shut down the cluster before turning off input power to the uninterruptible power supply, the SAN Volume Controller will detect the loss of power and continue to run on battery power until all data held in memory is saved to the internal disk drive. This will increase the time required to make the cluster operational when input power is restored and will severely increase the time required to recover from an unexpected loss of power that might occur before the uninterruptible power supply batteries have fully recharged.

A cluster can be shutdown by stopping I/O activity and either pressing the power buttons on the front of each node or by issuing a shutdown command to the cluster.

When input power is restored it will be necessary to press the power button on the uninterruptible power supply units before pressing the power buttons on the SAN Volume Controller.

Related topics:
- *IBM TotalStorage SAN Volume Controller: Configuration Guide*

Fibre-channel network speed

You can change the speed of the fibre-channel ports on a SAN Volume Controller through the front panel on the SAN Volume Controller node or by a command sent to a SAN Volume Controller cluster using the Ethernet interface.

All fibre-channel ports and nodes on a SAN Volume Controller must operate at the same speed. The default for the port speed is 2Gb per second. If the fibre-channel fabric is using fibre-channel switches that are unable to operate at 2Gb per second, set the SAN Volume Controller fibre-channel port speed to 1Gb per second during the installation procedure. If you must replace a 2Gb per second fibre-channel switch with a 1Gb fibre-channel switch, you must manually switch the SAN Volume Controller fibre-channel port speed before you can use the SAN Volume Controller at 1Gb per second.

If a new SAN Volume Controller node is being added to an existing SAN Volume Controller configuration you only need to change the speed setting if the switch is only capable of running at 1Gb per second. If the SAN Volume Controller internal disk drive fails, the fibre-channel speed setting is lost, but the Node Rescue Procedure that you use to restore the SAN Volume Controller software automatically selects the correct speed. If a 1Gb per second fibre-channel switch is being replaced by a 2Gb per second fibre-channel switch, the existing SAN Volume Controller clusters operate at 1Gb per second. You can switch to 2Gb per second any time using the command-line interface.

Determining the fibre-channel port speed

This topic describes how to determine the fibre-channel port speed.

Steps:

The following procedure tells you how to determine the fibre-channel port speed:
1. From the front panel select any fibre-channel port.
2. Press and hold `Down`, then press and release `Select`, then release `Down` to display the fibre-channel speed.
3. Press `Select` again to cancel the text display or wait 60 seconds and the text display will cancel by itself.

If the node is in a cluster that is operational, you can also determine the fibre-channel port speed from the cluster VPD by using the following command:

svcinfo lscluster *clustername*

The port speed is also displayed in the console under Cluster Properties.

Changing the fibre-channel port speed for a node not in a cluster

The following topic describes how to change the fibre-channel port speed.

Steps:

The following task describes how to change the fibre-channel port speed for a node not in a cluster:

1. From the front panel select any fibre channel port.
2. Press and hold `Down` then press and release `Select`, then release `Down`.
3. Press `Up` or `Down` until the required speed is displayed.
4. Press `Select` to activate the new speed.

Changing the fibre-channel port speed for a node in a cluster

The fibre channel port speed of all nodes in the cluster can be changed by using the `svctask chcluster` command. This is a customer task and is only available to users who are logged on using the admin ID and password

Note: Changing the fibre-channel port speed causes all nodes in the cluster to simultaneously perform a warmstart. This causes any I/O activity through the cluster to fail and consequently might cause applications running on hosts to fail.

Node identification

The SAN Volume Controller contains a six-digit node identification number that is printed on a label on the front panel. This number is also readable by system software and is used by configuration and service software as a node identifier. The node identifier can also be displayed on the front panel display when node is selected from the menu.

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

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

Cluster identification

A SAN Volume Controller cluster is identified by its IP address.

This address is used to access the cluster when using the SAN Volume Controller graphical user interface or the command-line interface. When a node has been assigned to a cluster, the cluster IP address can be displayed on the front panel display by selecting `Cluster` from the menu.

Service mode overview

The service mode allows you to access VPD, logs, and dump data on the node. It also provides you with a method of forcing the installation of a different version of software.

A SAN Volume Controller is assigned two IP addresses. The first address is the cluster IP address used for all normal configuration and service activity. The second address is not normally active; you can activate the second address for a single SAN Volume Controller by setting it into service mode.

The cluster can only be accessed through its IP address when the SAN Volume Controller nodes have formed into a cluster. If not enough nodes can access each other through the fibre channel fabric, the cluster will not form and the cluster IP address will be inaccessible. The normal repair procedure for this condition is to repair any faults on the fibre channel fabric and repair any nodes that are indicating failure conditions on their front panel displays. If, after performing these repair actions, the cluster does not form, it might be necessary to enable service mode to help isolate the problem.

Note: Use service mode only under the direction of your support center. Setting service mode for a node that is in an active cluster might cause data to be lost.

Service mode can only be reset through the web browser or by turning the power to the node off and on.

Related topics:
- "Recover cluster navigation" on page 69

Chapter 2. Overview of the uninterruptible power supply

This section describes the uninterruptible power supply.

Two external uninterruptible power supply units provide power to the SAN Volume Controller. Unlike the traditional uninterruptible power supply that enables continued operation of the devices that they supply when power is lost, these uninterruptible power supply units are used exclusively to maintain the data held in the SAN Volume Controller DRAM in the event of an unexpected loss of external power. The uninterruptible power supply units are required to power the SAN Volume Controllers even if the input power source is itself uninterruptible.

The uninterruptible power supply is connected to the SAN Volume Controllers with a power cable and a signal cable. To avoid the possibility of power and signal cables being connected to different uninterruptible power supply units these cables are wrapped together and supplied as a single field replaceable unit. The signal cables enable the SAN Volume Controllers to read status and identification information from the uninterruptible power supply.

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

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

The following figure shows a picture of the uninterruptible power supply.
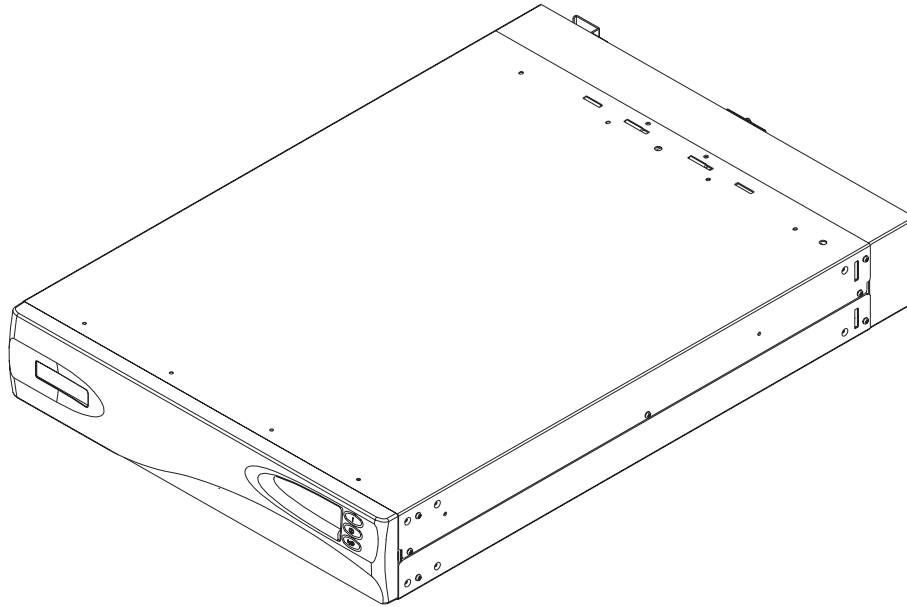
Figure 56. Uninterruptible power supply

Note: The SAN Volume Controller uninterruptible power supply is an integral part of the SAN Volume Controller solution and maintains continuous, SAN Volume Controller-specific communications with its attached SAN Volume Controller nodes. The SAN Volume Controller uninterruptible power supply must be used in accordance with documented guidelines and procedures and must not be used for any other purpose.

Related topics:
- "Connecting the uninterruptible power supply to the SAN Volume Controller"

Connecting the uninterruptible power supply to the SAN Volume Controller

To provide redundancy and concurrent maintenance, the SAN Volume Controllers must be installed in pairs.

Each SAN Volume Controller of a pair must be connected to a different uninterruptible power supply. Each uninterruptible power supply can support four SAN Volume Controllers.

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

The uninterruptible power supply requires a dedicated branch circuit that meets the following specifications:
- A 15A circuit breaker must be installed in each branch circuit that supplies the power to a uninterruptible power supply.
- Single-phase.
- 200 - 240 V.

The SAN Volume Controller software determines whether the input voltage to the uninterruptible power supply is within range and sets an appropriate voltage alarm range on the uninterruptible power supply. The software continues to re-check the input voltage every few minutes; if it changes substantially but remains within the permitted range, the alarm limits are readjusted.

Controls and indicators for the uninterruptible power supply

All the controls for the uninterruptible power supply are contained on the front panel assembly. See Figure 57.
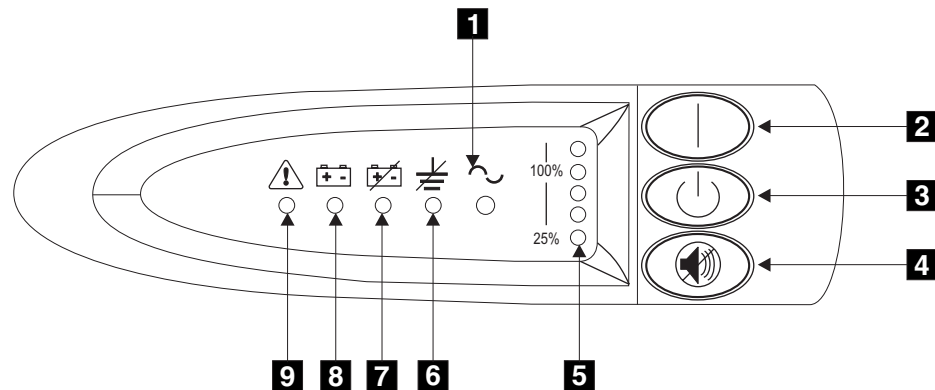
Figure 57. Uninterruptible power supply front panel assembly

1 Mode indicator
2 On button
3 Off button
4 Test and alarm reset button
5 Load-level indicators
6 Site wiring fault indicators
7 Battery service indicator
8 Battery mode indicator
9 General alarm indicator

Related topics:
- "On button" on page 46
- "Off button" on page 46
- "Test and alarm reset button" on page 47
- "Load-level indicators" on page 47
- "Site wiring fault indicators" on page 47
- "Battery service indicator" on page 47
- "Battery mode indicator" on page 47
- "General alarm indicator" on page 47

Mode indicator

The mode indicator 1 shows the mode of the uninterruptible power supply.

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

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

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

When the mode indicator is flashing red and the alarm is sounding, the voltage range alarm setting might not be correct. When a SAN Volume Controller is connected to the uninterruptible power supply, the SAN Volume Controller automatically adjusts the voltage range settings. Take no action for this alarm condition unless it persists for more than five minutes after a SAN Volume Controller has been connected to this uninterruptible power supply and powered on.

Related topics:
- "Controls and indicators for the uninterruptible power supply" on page 45

On button

Use the on button **2** to turn on the main power to the uninterruptible power supply.

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

Related topics:
- "Controls and indicators for the uninterruptible power supply" on page 45

Off button

Use the off button **3** to turn off the main power to the uninterruptible power supply.

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 uninterruptible power supply fails.

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

Test and alarm reset button

Use the test and alarm reset button **4** to start the self-test. To start the self-test, press and hold the button for three seconds. This button also resets the alarm.

Load-level indicators

The load-level indicators **5** show the percentage of uninterruptible power supply capacity that the SAN Volume Controller are using. When all the indicators are lit, the power requirements of the SAN Volume Controller have exceeded the capacity of the uninterruptible power supply.

Site wiring fault indicators

The site wiring fault indicator **6** shows that ether a ground wire connection does not exist or the live and neutral wires are reversed in the input power connection.

Battery service indicator

The battery service indicator **7** shows that the charge in the battery has become low while the uninterruptible power supply is in battery mode. The alarm continues to beep once every five seconds. The application programs immediately complete and save the work to prevent loss of data. If the uninterruptible power supply shuts down, it automatically restarts when the main power returns.

Battery mode indicator

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

General alarm indicator

The general alarm indicator **9** , when accompanied by the audio alarm beeping every 5 seconds, shows that the battery is low. When accompanied by a continuous

audio alarm, it shows that the internal temperature of the uninterruptible power supply is too high, or there has been a momentary output overload.

Related topics:
- "Controls and indicators for the uninterruptible power supply" on page 45

Hardware for the uninterruptible power supply

This section includes diagrams of the hardware for the uninterruptible power supply.

Hardware locations for the uninterruptible power supply:

Figure 58 shows the locations of the hardware for the uninterruptible power supply. Table 5 shows the the reference key legend for Figure 58. Use the reference key legend to match the reference keys in Figure 58.

Table 5. Reference key legend for the uninterruptible power supply

1	Battery assembly	**3**	Electronics assembly
2	Frame assembly	**4**	Front panel assembly
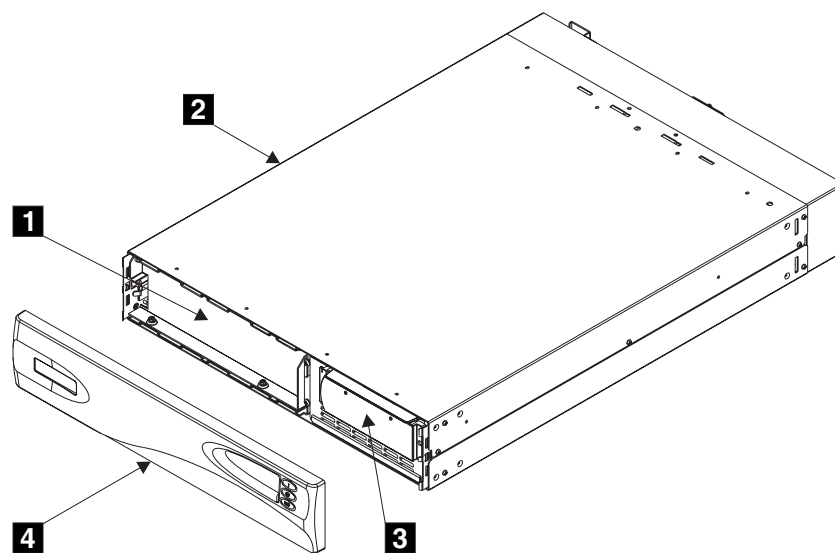
Figure 58. Hardware locations for the uninterruptible power supply

Locations for the uninterruptible power supply connectors and circuit breakers:

Figure 59 on page 49 shows the location of the uninterruptible power supply connectors and circuit breakers. Table 6 shows the reference key legend for Figure 59 on page 49. Use the reference key legend to match the reference keys in Figure 59 on page 49.

Table 6. Reference key legend for the connectors and circuit breakers

1	Signal cable connectors	**3**	Output connectors
2	Main power connector	**4**	Circuit breakers
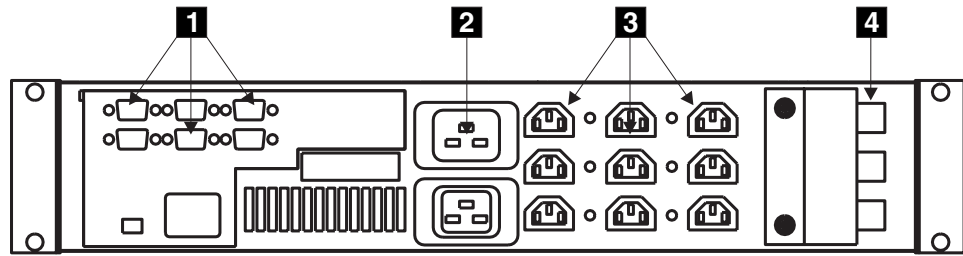
Figure 59. Uninterruptible power supply connectors

Uninterruptible power supply power connector:

Figure 60 shows the details of the uninterruptible power supply connector.

Neutral
Ground
Live
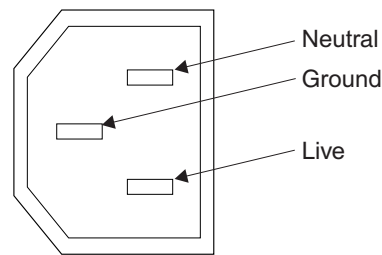
Figure 60. Uninterruptible power supply connector

Related topics:
- Appendix A, "Parts catalog," on page 189

Preparing your uninterruptible power supply environment

This topic provides information you need to ensure that your physical site meets the installation requirements for the uninterruptible power supply.

Attention: Ensure that you comply with the following requirements for uninterruptible power supplies:
- Each uninterruptible power supply should be connected to a separate branch circuit.
- A UL listed 15 A circuit breaker must be installed in each branch circuit that supplies power to the uninterruptible power supply.
- If a rack power distribution unit is used, each uninterruptible power supply must be connected to a separate power distribution unit.
- The voltage supplied to the uninterruptible power supply must be 200–240 V single phase.
- The frequency supplied must be between 50 and 60 Hz.

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

Dimensions and weight:

Height	Width	Depth	Maximum weight
89 mm	483 mm	622 mm	39 kg
(3.5 in.)	(19 in.)	(24.5 in.)	(86 lb.)

AC input-voltage requirements:

Power supply assembly type	Voltage	Frequency
220 V	160 to 288 V ac	46 to 64 Hz

Environment:

	Operating environment	Nonoperating environment	Storing environment	Shipping environment
Air temperature	0°C to 40°C (32°F to 104°F)	0°C to 40°C (32°F to 104°F)	0°C to 25°C (32°F to 77°F)	–25°C to 55°C (–13°F to 131°F)
Relative humidity	5% to 95% noncondensing	5% to 95% noncondensing	5% to 95% noncondensing	5% to 95% noncondensing

Altitude:

	Operating environment	Nonoperating environment	Storing environment	Shipping environment
Altitude (from sea level)	0 to 2000 m (0 to 6560 ft.)	0 to 2000 m (0 to 6560 ft.)	0 to 2000 m (0 to 6560 ft.)	0 to 15 000 m (0 to 49 212 ft.)

Heat output (maximum):

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

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

Related topics:
- "Preparing your SAN Volume Controller environment" on page 30

Chapter 3. Installing and maintaining the software for the SAN Volume Controller

The software for the SAN Volume Controller is pre-installed on all nodes. This software includes the following items:

- Operating system
- Application software

Introduction:

Because the software is pre-installed, it is not normally necessary to replace the software on a node. However, 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.

To allow nodes to operate as a cluster, you must run all nodes at the same version of software. This rule is enforced by the cluster software itself. When you attempt to add a node to a cluster its software version is examined, and if it is not running the same version of the software as the other nodes in the cluster, the software revisions are automatically copied from one of the other nodes in the cluster before the add operation is completed. If for some reason it is not possible to update the software on the node that you are adding, the operation fails and the cluster logs an error to explain the cause of the failure.

If the SAN Volume Controller detects software errors an error code is generated. The additional data logged with the error will indicate the source of the software error. The additional data might look like this:

Assert File /build/lodestone/030129_nd/src/user/vg/vgagentevt.c Line 1234

To view the additional data you will need to access the SAN Volume Controller web pages and select the Analyze error log option for the software error that you are investigating. Report the error code and the additional data to your IBM Product Support Center.

If this problem is known for your version of software, the customer will be advised to upgrade to the latest software level. If the problem is not known to the Support Center you might be asked to provide additional information for this error. In most cases a dump will automatically be taken when the software error is detected.

If requested to do so by your Support Center, you can use the SAN Volume Controller Console application on the master console to list and save dump data. If more than one dump file exists, select the dump file with a time stamp closest to the time stamp on the software error report and save this file for use by the Support Center.

Or, you can use the command-line interface to perform these tasks. You can list dumps using the following commands:

- **svcinfo lserrlogdumps**

- **svcinfo lsconfigdumps**
- **svcinfo lsiostatsdumps**
- **svcinfo lsiotracedumps**
- **svcinfo lsfeaturedumps**
- **svcinfo ls2145dumps**

Secure copy can be used to copy a dump file to the master console.

Related topics:

For information about related topics, see the following:
- "Obtaining the software packages"
- "Determining the version of the software" on page 54
- "Recovering from software installation failures" on page 55
- "Accessing the command-line interface from the master console" on page 12

Obtaining the software packages

You can obtain revised software packages from the SAN Volume Controller web site.

Prerequisites:

Before you request the software package, determine the type of packs and format you need.

The software packages are available as full packages and as upgrade packages in TAR format and in compact disc image format. The upgrade package contains only the software components that have been replaced since the previous software version. The full package contains all the software packages for that software version.

It may be necessary to replace the operating system software as well as the SAN Volume Controller application software for some upgrades. When both packages have to be installed, they will be supplied separately. Both packages must be copied to the SAN Volume Controller before the application software is applied.

The TAR files can be installed directly on the SAN Volume Controller, the compact disc image format is suitable for creating a standard ISO format compact disc if it should be necessary to deliver a compact disc to the customer site. Software upgrades can only be performed in a strict order. The rules for upgrading from any given version to the latest version are also provided on the Web site.

Steps:

Perform the following steps to obtain a revised software package:
1. Open your browser and enter the following to access the SAN Volume Controller web site:

   `www.ibm.com/storage/support/2145`
2. Download the type of software package you need.

Related topics:

Installing the software

The software is delivered to you as a single package.

Software package:

Cluster software versions comprise a number of software components that are delivered as a single package. The size of the software update package depends on the number of components that are being replaced by that upgrade package. The software installation procedure involves copying the new software version to the cluster and then starting an automatic installation process. This installation process might take up to an hour to complete and during the process each of the nodes is restarted in turn. Once all the nodes in the cluster have been successfully restarted with the new software the new software version is automatically committed. While each node is being restarted there might be some degradation in the maximum input/output rate that can be sustained by the cluster.

Installation operation:

The installation operation can normally be performed concurrently with normal user I/O operations. If any restrictions apply to the operations that can be performed during the upgrade, then these restrictions will be documented on the SAN Volume Controller web site from where the upgrade package was obtained. During the upgrade operation, only the following SAN Volume Controller commands will be operational from the time the install process starts to the time that the new software is committed or until the process has been backed-out. All other commands will fail with a message indicating that a software upgrade is in progress. In the following commands, xxxx is the object type.

- **svcinfo lsxxxx**
- **svcinfo lsxxxxcandidate**
- **svcinfo lsxxxxprogress**
- **svcinfo lsxxxxmember**
- **svcinfo lsxxxxextent**
- **svcinfo lsxxxxdumps**
- **svcinfo caterrlog**
- **svcinfo lserrlogbyxxxx**
- **svcinfo caterrlogbyseqnum**
- **svctask rmnode**
- **svcservicetask rmnode**

Because of the operational limitations that occur during the upgrade process the software installation is a customer task.

Related topics:

For details about the software upgrade procedure, see the following information.

Determining the version of the software

There are two methods you can use to determine the version of the software installed on you SAN Volume Controller.

Prerequisites:

The software version number is in the format x.y.z where x is a version release number, y is a major number, and z is a minor number. For example, version number 1.2.3 has a major number of 2 and a minor number of 3. The significance of this number is that it indicates whether software versions can or cannot be backed-off to the previous version. It is not possible to back-off a version of software to a version that has a lower major number. For example, if version 1.2.3 is running on the cluster it can be replaced with version 1.2.2 or 1.2.1 but it cannot be replaced with version 1.1.6.

During a software upgrade, the version number of each node is updated when the software has been installed and that node has been restarted. The cluster software version number is updated when the new version of software is committed.

The current software version can be obtained from the node or cluster VPD.

Steps:

Perform the following steps to determine the version of the software installed using the command-line interface.

1. Enter the following command on the command line interface to determine the version of the software that is currently running on the cluster::

   svcinfo lscluster <cluster_name>

   where *<cluster_name>* is the name of the cluster. The cluster code level is listed in the code level field. In the following example, cluster rc-cluster-8 is running at code level 1.1.1.0, for example:

   IBM_2145:admin>svcinfo lscluster rc-cluster-8
   id 000002006160EDCC
   name rc-cluster-8
   location local
   partnership
   bandwidth
   cluster_IP_address 9.20.168.48
   cluster_service_IP_address 0.0.0.0
   total_mdisk_capacity 9.1GB
   space_in_mdisk_grps 0
   space_allocated_to_vdisks 0
   total_free_space 9.1GB
   statistics_status off
   statistics_frequency 15
   required_memory 4096

```
cluster_locale  en_US
SNMP_setting  none
SNMP_community
SNMP_server_IP_address  0.0.0.0
subnet_mask  255.255.255.0
default_gateway  9.20.168.1
time_zone  522  UTC
email_setting  none
email_id
code_level  1.1.1.0  (build  0.28.0310210000)
FC_port_speed  2Gb
console_IP  9.20.247.77:9080
id_alias  000002005FC0EDCC
```

Related topics:
- Chapter 3, "Installing and maintaining the software for the SAN Volume Controller," on page 51
- "Obtaining the software packages" on page 52
- "Recovering from software installation failures"

Recovering from software installation failures

During the automatic software installation process, the installation process is automatically terminated if certain conditions occur.

Context:

If any node failure is detected or if there is a loss of power to the cluster, the installation process is automatically terminated. Once the cluster is fully operational again, an automatic cleanup process is started that will return the cluster software to the state that it was in before the installation process started.

The cluster will automatically terminate the upgrade process if any of the nodes fail to upgrade to the new software level. In this case, any nodes that have already upgraded to the new software level will downgrade back to the original code level. You should check the error log to determine the reason for the failure before attempting to upgrade the cluster again.

Steps:

Perform the following steps to recover from software installation failures:
1. Resolve any hardware errors in the cluster.
2. Wait for the cleanup process to complete, which is signalled by a message in the event log.
3. Restart the software installation.

Related topics:
- Chapter 3, "Installing and maintaining the software for the SAN Volume Controller," on page 51
- "Obtaining the software packages" on page 52
- "Determining the version of the software" on page 54

Removing a version of the software

In some cases, you might need to remove a version of software before you can replace the current version of your software with a previous version.

Context:

You can only replace versions of software by previous versions if the major number in the software version has not changed. If the major number in the software version has changed, you will need to remove the current version of the software before you can replace it.

Steps:

Perform the following steps to replace the current version of your software with a previous version.

1. Determine the current level of the software.
2. Determine whether the major number in the current level of the software has changed.
3. If the major number in the current level of the software has not changed, you can replace it with a previous version of the software using the normal software upgrade procedures.
4. If the major number in the current level of the software has changed (has a lower major number), contact your IBM support center.

Related topics:

- Chapter 3, "Installing and maintaining the software for the SAN Volume Controller," on page 51
- "Obtaining the software packages" on page 52
- "Determining the version of the software" on page 54
- "Recovering from software installation failures" on page 55

Chapter 4. Introducing the Vital Product Data (VPD)

This topic provides information about Vital Product Data (VPD). VPD is information that uniquely defines each element in the SAN Volume Controller. The VPD for the SAN Volume Controller is maintained at the cluster level. For each SAN Volume Controller node, the VPD includes the following items:

- Installed software version
- Details of the hardware configuration
- Levels of the hardware
- FRU part numbers
- FRU microcode levels
- Firmware and software component levels
- VPD for the uninterruptible power supply that is powering the node
- Committed software level
- Details of the cluster configuration

You can view the VPD through the SAN Volume Controller graphical user interface or command-line interface. VPD is updated when a cluster is initialized (powered on), a new node is added to the cluster, or a missing node is reconfigured into the cluster.

See "Understanding the fields for the node VPD" for information about the fields for the system board, processor, processor cache, memory module, fibre-channel adapter card, SCSI and IDE devices, software, front panel assembly, and uninterruptible power supply. See "Understanding the fields for the cluster VPD" on page 60 for information about the fields for the cluster.

Displaying the VPD

You can use the graphical user interface to display the SAN Volume Controller cluster or node VPD. See "Viewing the vital product data" on page 11 in "Using the SAN Volume Controller Console application on the master console" on page 3.

Or, you can use the command line interface to display the VPD. See "Accessing the command-line interface from the master console" on page 12 for details of how to run command line instructions. You can use the following commands to display the vital product data:

svcinfo lsnodevpd *nodename*

svcinfo lscluster *clustername*

For more information about the commands, see the *IBM TotalStorage SAN Volume Controller: Command-Line Interface User's Guide*.

Understanding the fields for the node VPD

This section shows a description of the fields for the node vital product data.

Table 7 shows the fields you see for the system board.

Table 7. Fields for the system board

Item	Field name
System board	Part number
	System serial number
	Number of processors
	Number of memory slots
	Number of fans
	Number of fibre-channel cards
	Number of SCSI or IDE devices **Note:** The service controller is an IDE device.
	BIOS manufacturer
	BIOS version
	BIOS release date
	System manufacturer
	System product
	Planar manufacturer
	Power supply part number
	CMOS battery part number
	Power cable assembly part number
	Service processor FW

Table 8 shows the fields you see for each processor that is installed.

Table 8. Fields for the processors

Item	Field name
Processor	Processor location
	Number of caches
	Manufacturer
	Version
	Speed
	Status

Table 9 shows the fields that are repeated for each cache installed on each processor.

Table 9. Fields that are repeated for cache installed on each processor

Item	Field name
Processor cache	Type of cache
	Size of cache (KB)

Table 10 shows the fields that you see for each fan that is installed.

Table 10. Fields for the fans

Item	Field name
Fan	Part Number
	Location

Table 11 shows the fields that are repeated for each installed memory module.

Table 11. Fields that are repeated for each installed memory module

Item	Field name
Memory module	Part number
	Device location
	Bank location
	Size (MB)

Table 12 shows the fields that are repeated for each installed fibre-channel adapter card.

Table 12. Fields that are repeated for each fibre-channel adapter card that is installed

Item	Field name
Fibre adapter card	Part number
	Port numbers
	Device serial number
	Manufacturer
	Device

Table 13 shows the fields that are repeated for each SCSI and IDE device that is installed.

Table 13. Fields that are repeated for each SCSI and IDE device that is installed

Item	Field name
Device	Part number
	Bus
	Device
	Device vendor **Note:** Not provided for the service controller.
	Model
	Revision
	Serial number
	Approximate capacity

Table 14 shows the fields that are specific to the node software.

Table 14. Fields that are specific to the node software

Item	Field name
Software	Code level
	Node name
	Ethernet status
	World Wide Node Name
	ID

Table 15 shows the fields that are provided for the front panel.

Table 15. Fields that are provided for the front panel

Item	Field name
Front panel	Part number
	Front panel ID
	Front panel locale

Table 16 shows the fields that are provided for the uninterruptible power supply assembly that is powering the node.

Table 16. Fields that are provided for the uninterruptible power supply assembly that is powering the node

Item	Field name
Uninterruptible power supply	Electronics assembly part number
	Battery part number
	Uninterruptible power supply assembly part number
	Input power cable part number
	Uninterruptible power supply serial number
	Uninterruptible power supply type
	Uninterruptible power supply internal part number
	Uninterruptible power supply unique ID
	Uninterruptible power supply main firmware
	Uninterruptible power supply communications firmware

Related topics:
- "Understanding the fields for the cluster VPD"

Understanding the fields for the cluster VPD

This section provides a description of the fields for the cluster vital product data.

Table 17 shows the fields that are provided for the cluster.

Table 17. Fields that are provided for the cluster

Item	Field name
Cluster	ID **Note:** This is the unique identifier for the cluster.
	Name
	Location
	Partnership
	Bandwidth
	Cluster IP address
	Cluster service IP address
	Total mdisk capacity
	Space in mdisk_grps
	Space allocated to VDisks
	Total free space
	Statistics status
	Statistics frequency
	Required memory
	Cluster locale
	SNMP setting
	SNMP community
	SNMP service IP address
	Subnet mask
	Default gateway
	Time zone
	Email Setting
	Email ID
	Code level
	Fibre-channel port speed
	Console IP
	ID Alias

Related topics:

- "Understanding the fields for the node VPD" on page 57

Chapter 5. Using the front panel of the SAN Volume Controller

This section provides information for the following topics:
- Describing the displays on the front panel
- Default menu navigation
- Service access menu navigation
- Create cluster menu navigation
- Change language menu navigation

Descriptions for the front panel of the SAN Volume Controller

The front panel displays configuration and service information about the SAN Volume Controller and the SAN Volume Controller cluster. The information you see can be one of the following items:
- Hardware boot
- Node rescue request
- Boot progress
- Boot failed
- Powering off
- Restarting
- Shutting down
- Power failure
- Error codes

Hardware boot

Figure 61 shows the what is displayed when you first power on the node while the node searches for a disk drive to boot.

Figure 61. Hardware-boot display

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

Node rescue request

Figure 62 on page 64 shows that a request has been made to exchange the software on this node. The SAN Volume Controller software is pre-installed on all SAN Volume Controller nodes. This software includes the operating system, the application software, and the SAN Volume Controller publications. It is not normally necessary to replace the software on a node but if the software is lost for some reason, for example if the hard disk drive in the node fails, it is possible to copy all the software from another node connected to the same Fibre Channel fabric. This process is known as node rescue.

Figure 62. Node-rescue-request display

Boot progress indicator

Figure 63 shows that the node is starting.

Booting   130

Figure 63. 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

Figure 64 shows that the boot operation has failed.

Failed   180

Figure 64. Boot failed display

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

See the boot codes in the appropriate section of the service documentation for a description of the failure and the appropriate steps you must perform to correct the failure.

Powering off

Figure 65 shows that the power button has been pressed and the node is powering off.

Powering Off

Figure 65. Powering-off display

The progress bar moves backward when the power is removed. The power-off operation might take several minutes.

Restarting

Figure 66 shows that the software on a node is restarting.

```
Restarting
   ▭▭▭▭▭▭▭▭▭▭▭▭  ▬▬▬▬
```

Figure 66. Restarting display

The software is restarting either because:

- An internal error was detected
- A power-off operation was ended when the power button was pressed again while the node was powering off

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

Shutting down

Figure 67 is an example of what the front panel indicator shows when you issue a shutdown command to a SAN Volume Controller cluster or a SAN Volume Controller node. The progress bar continues to move left until it is safe to be powered off. When the shutdown operation is complete, all power will be removed from the node. When power has been removed from the last node connected to the uninterruptible power supply, the uninterruptible power supply also will be shut down.

```
Shutting Down
   ▭▭▭▭▭▭▭▭▭▭  ▬▬▬▬▬▬
```

Figure 67. Shutting down display

Power failure

Figure 68 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.

```
Power Failure
   ▭▭▭▭▭▭▭▭▭▭▭  ▬▬▬▬▬
```

Figure 68. Power failure display

Error codes

If more than one error occurs during an operation, the highest priority error code displays on the front panel. The lower the number for the error code, the higher the priority. For example cluster error code 1020 has a higher priority than cluster error code 1370.

Related topics:
- "Understanding the error codes" on page 82
- "Understanding the node error codes" on page 108

SAN Volume Controller menu options

During normal node operation, the default menu sequence is operational. This menu sequence enables you to review the operational status of the cluster, the node, and the external interfaces. It also provides access to the tools that you need to install and service the node.

Menu sequence:

The figure that follows shows the default menu sequence. Only one field at a time can be displayed on the menu screen.
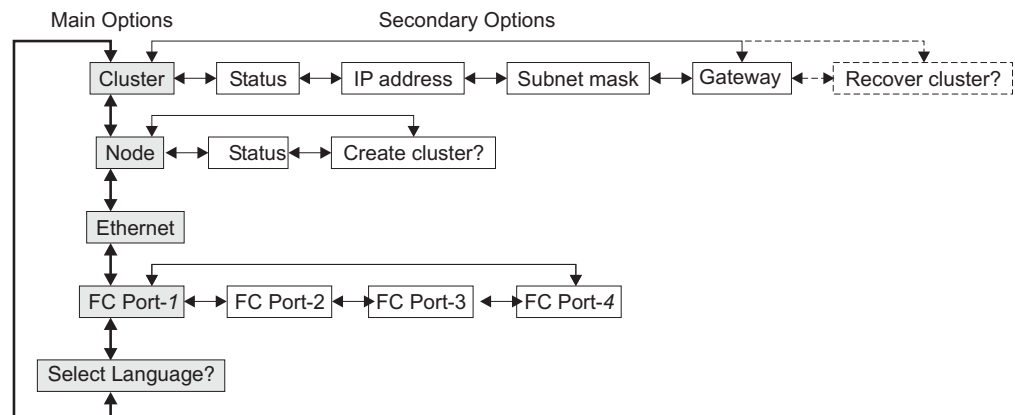

Figure 69. Default menu sequence

Use the Up and Down buttons to navigate through the main fields in this menu:
- Cluster
- Node
- Ethernet
- Fibre-channel port-1
- Select language

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.

Related topics:
- "Cluster"
- "Node" on page 68
- "Ethernet option" on page 68
- "Fibre channel port–1 through 4 option" on page 69
- "Selecting the Language" on page 69
- "Create cluster menu navigation" on page 70
- "Navigating through the change language menu" on page 73

Cluster

This field contains the cluster name that the user has assigned.

Status:

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:

This field contains the existing Ethernet IP address of the cluster. 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:

This field contains the existing Ethernet IP address of the cluster. 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.

Gateway:

This field is set during the create-cluster operation.

Recover Cluster:

This field allows you to select two cluster recovery options. One is to recover from a lost administrator password and the other is to make the node accessible via the service password. Press `select` to go to the Recover cluster menu.

Related topics:
- "Recover cluster navigation" on page 69

Node

This field contains the identification number of the SAN Volume Controller or the name of the SAN Volume Controller if the user has assigned a name. See "Node identification" and "Cluster identification."

Status:

This field helps you to isolate failures that cause a cluster to be unavailable. It indicates the operational state of the node, as follows:

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:

This field allows you to create a new SAN Volume Controller cluster. Press `select` to go to the create cluster menu. See "Hardware boot."

Related topics:
- "Create cluster menu navigation" on page 70
- "Node identification" on page 41
- "Cluster identification" on page 41

Ethernet option

This option displays the operational states of the Ethernet port. When a cluster is created, only one IP address and one Ethernet port in the cluster gain configuration and service access to that cluster. If a loss of access through one port occurs, an alternative port is assigned to manage the configuration and service interface.

The possible states of the Ethernet port are as follows:

Properties:

Active The cluster is accessible through this port.

Inactive
The port is operational, but it is not being used to access the cluster. This port can be used to access the cluster if the cluster 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 as follows:

Properties:

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.

Selecting the Language

The field for `Select Language?` allows you to use the select language feature to install an alternative national language onto the front panel. Press `Select` to go to the `Change language` menu.

Related topics:
- "Navigating through the change language menu" on page 73

Recover cluster navigation

The Recover cluster menu is accessed via the SAN Volume Controller default menu.

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

Select Service Access? by pressing the select button after you access the Recover Cluster? menu (refer to SAN Volume Controller menu options).
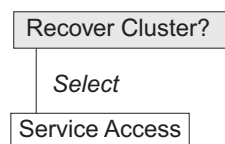
```
 ┌─────────────────┐
 │ Recover Cluster? │
 └─────────────────┘
        │
      Select
        │
 ┌───────────────┐
 │ Service Access │
 └───────────────┘
```

Figure 70. Recover cluster navigation

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

1. Press and hold the up button.

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

If the user's password security policy permits password recovery, the administrator password is reset and a new password is displayed for 60 seconds. If the user's password security policy does not permit password recovery, completing these steps has no effect.

Setting service mode:

Notes:

1. This function is capable of degrading the operation of a working cluster. It should only be used to recover from a problem that is making the cluster inaccessible.
2. All SAN Volume Controllers share the same Service IP address. Only one SAN Volume Controller at a time on the LAN should be set in service mode. Setting more than one SAN Volume Controller in service mode might result in a LAN failure.

To set service mode, complete the following steps from the Service Access? menu:

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

The node restarts and service mode is enabled. The service IP address is displayed and the node can be accessed using this address. All other buttons on the front panel are disabled while service mode is active. The service address continues to be displayed on the front panel until service mode is reset by a command sent to the service IP address, or until the power to the node is turned off and on.

Note: If you are using the service mode you need to do this on each node one at a time. Be sure to exit before continuing on to the next node.

Service IP address: You can access the service mode with the SAN Volume Controller application using the following web address, where serviceipaddress is the IP address on the front panel display:

```
https://serviceipaddress
```

The service IP address displays while service access is enabled. All other buttons on the front panel are disabled. You can disable service access through the web browser, or by power cycling the node.

Related topics:

- "Using the SAN Volume Controller Console application on the master console" on page 3

Create cluster menu navigation

The Create cluster menu is accessed via the SAN Volume Controller default menu.

The following figure shows the create cluster menu sequence. Only one field at a time can be displayed on the menu screen. The arrows show the sequences that wrap automatically.
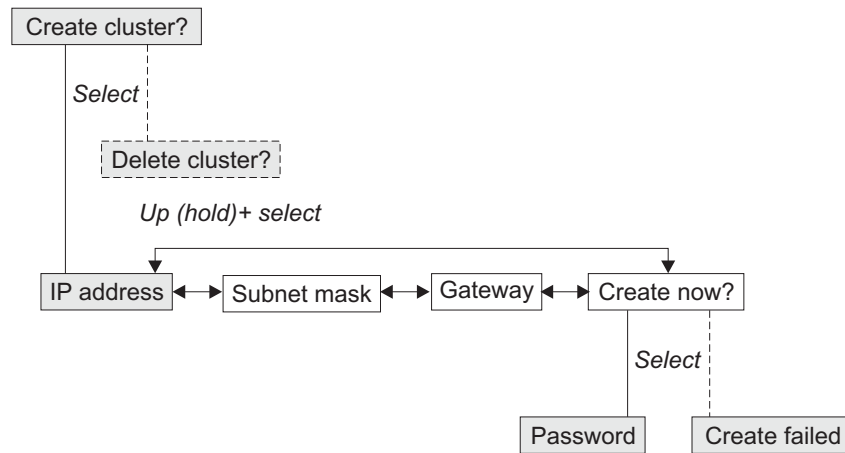
Create cluster?

Select

Delete cluster?

Up (hold)+ select

IP address ←→ Subnet mask ←→ Gateway ←→ Create now?

Select

Password   Create failed

Figure 71. Create-cluster navigation menu sequence

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

Related topics:
- "SAN Volume Controller menu options" on page 66

Deleting the 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 use the command line or the graphical user interface to delete a cluster. However, if you cannot use the command line or graphical user interface, you can use `Delete Cluster` to force the deletion of a node from a cluster. To delete the 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 and Down buttons to return to the Default menu

IP address

This task describes how to display and change the IP address of the cluster during the initial process that creates the cluster.

Steps:

Perform the following steps to set the IP address of the new cluster, during the initial cluster creation process:
1. Press the Select button. The first IP address number field is highlighted. You should have reached this position because you are following the Create cluster menu navigation steps. At this stage, you will be presented with a panel that allows you to set the cluster IP address.
2. Use the `Up` Button if you want to increase the value that is displayed in the highlighted field. Use the `Down` button if you want to decrease that value. Hold the `Up` or `Down` buttons pressed if you want a fast increase or decrease of the value.
3. Use the `Right` and `Left` buttons to move to the number field that you want to update.

4. Repeat steps 2 on page 71 and 3 on page 71 for each number field that you want to update.
5. Press the Select button to complete the change.

You can now use the `Left` and `Right` buttons to navigate between the other fields.

Subnet mask

This task describes how to change the subnet mask.

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

Steps:

Perform the following steps to change the subnet mask:
1. Press the Select button. The first subnet mask number field is highlighted.
2. Use the Up button if you want to increase the value that is displayed in the highlighted field. Use the Down button if you want to decrease that value. Hold the Up or Down buttons pressed if you want a fast increase or decrease of the value.
3. Use the Right and 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.

Related topics:
- "Gateway"

Gateway

This task describes how to change the gateway address.

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

Steps:

Perform the following steps to change the gateway address:
1. Press the Select button. The first gateway address number field is highlighted.
2. Use the Up button if you want to increase the value that is displayed in the highlighted field. Use the Down button if you want to decrease that value. Hold the Up or Down buttons pressed if you want a fast increase or decrease of the value.
3. Use the Right and 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.

Related topics:
- "Subnet mask"

Create now

`Create Now` allows you start an operation to create a cluster. Press `Select` to start the operation. Use the `Up` and `Down` buttons to return to the Default menu.

Password:

If the create operation is successful, **Password** is displayed in line 1 of the menu screen. The password that you can use to access the cluster is displayed in line 2.

Note: Record the password because you will need the password when you access the cluster through the web browser. You cannot access the cluster through the web browser while the password is being displayed.

Create Failed:

If the create operation fails, **Create Failed** is displayed in line 1 of the menu screen. An error code is displayed in line 2.

Related topics:
- "Subnet mask" on page 72
- "Gateway" on page 72

Password

The password is displayed for only 60 seconds, or until you select the up, down, left, or right arrow button. You need this password when you first attempt to access the cluster.

Create failed

The create operation has failed. Line 2 of the menu screen contains an error code that you can use to isolate the cause of the failure.

Related topics:
- "Understanding the create cluster error codes" on page 112

Navigating through the change language menu

The Change language menu is accessed via the SAN Volume Controller default menu.

Use the Left and Right buttons to select the national language that you want. When the required language is displayed, press the Select button. The following figure shows an illustration of what is displayed on the front panel when you want to select a language.
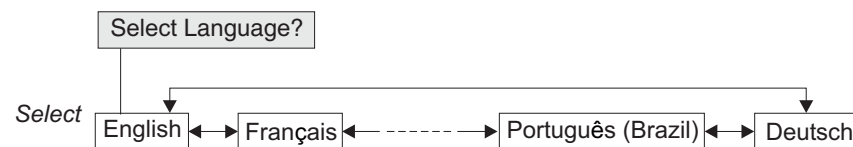

Figure 72. Change language navigation sequence

The following languages are available:
- English

- French
- German
- Italian
- Japanese
- Korean
- Brazilian Portuguese
- Spanish
- Chinese (simplified)
- Chinese (traditional)

If you do not understand the language that is displayed on the menu screen, wait for at least 60 seconds until the default menu is displayed.

Steps:

Perform the following steps to select the required language:
1. Press the Up button once.
2. Press the Select button once. If the display changes go to step 5.
3. Press the Up button once.
4. Press the Select button once.
5. Press the Right button until your selected language displays.
6. Press Select.

Chapter 6. Diagnosing problems with the SAN Volume Controller, the uninterruptible power supply, and the master console

You can diagnose problems with SAN Volume Controller, the uninterruptible power supply, and the master console using either the command-line interface (CLI) or the SAN Volume Controller Console.

Error logs:

By understanding the error log, you can:
- Manage the error log
- View the error log
- Describe the fields in the error log

Error codes:

By understanding the error codes, you can:
- Use the error code tables
- Define the FRU names
- Understand the cluster error codes
- Determine a hardware boot failure
- Understand the boot error codes
- Perform the node rescue
- Understand the node rescue error codes
- Understand the create cluster error codes
- Check the status of the node
- Mark errors as fixed
- Check the status of the node port
- List managed disks
- Understand managed disk status
- Include managed disks
- Understand managed disks mode
- Perform cluster discovery
- Understand managed disk group status
- Determine disk controller status

Related topics:
- "MAP 5000: Start" on page 118
- "Using the SAN Volume Controller Console application on the master console" on page 3
- "Accessing the command-line interface from the master console" on page 12

Understanding the error log

The SAN Volume Controller contains both error and event data.

Error data:

Error data is logged when a failure condition has been detected. When error data is logged, an error log analysis is performed to determine if the user should be notified of the condition.

Event data:

Event data is logged when a configuration event has occurred.

Managing the error log

The error log has a limited size and once it is full, newer entries replace the oldest entries. If the old entry has not been fixed it will not be replaced by newer entries.

To avoid the possibility of an error condition causing the log to be flooded by a single error, some errors of the same type are recorded in the same space in the error log. When error log entries are coalesced in this way the time stamp of the first occurrence and the last occurrence of the problem is saved in the log entry. A count of the number of times the error condition has occurred is also saved in the log entry. If a new entry is the same as the type you made more than 25 hours after the first entry, then a new error record is opened.

Related topics:
- "Marking errors as fixed" on page 12
- "MAP 5000: Start" on page 118

Viewing the error log

You can view the error log by using the SAN Volume Controller command-line interface or the SAN Volume Controller Console.

Steps:

To view the full contents of each error log entry it is necessary to perform the following steps:
1. Use the `svctask dumperrlog` command to create dump file that contains the current error log data.
2. Use `svcinfo lserrlogdumps` to determine the the name of the dump file that you have just created.
3. Use `Secure copy` to copy the dump file to the master console.

Result:

The file can then be displayed with a text viewer.

Example:

Figure 73 on page 77 shows an example of an error log entry that might be displayed:

```
Error Log Entry 21
  Node Identifier       : node3
  Object Type           : adaptor
  Object ID             : 1
  Sequence Number       : 174
  Root Sequence Number  : 174
  First Error Timestamp : Tue Apr 22 16:02:18 2003
                        : Epoch + 1051027338
  Last Error Timestamp  : Tue Apr 22 16:02:18 2003
                        : Epoch + 1051027338
  Error Count           : 1
  Error ID              : 73003 : More/Less fibre channel ports operational
  Error Code            : 1060 : Fibre Channel ports not operational
  Status Flag           : UNFIXED
  Type Flag             : ERROR CAT 1

02 02 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Figure 73. Example of an error log entry when you use the command-line interface

You can also view the error log using the SAN Volume Controller console. The error log contains a large number of entries but by using this method of viewing the log you can select only the type of information that you need. For example, if you are repairing a fault, you might only want to select Show unfixed errors.

shows an example of an error log summary that is displayed when you select the type of information that you want.
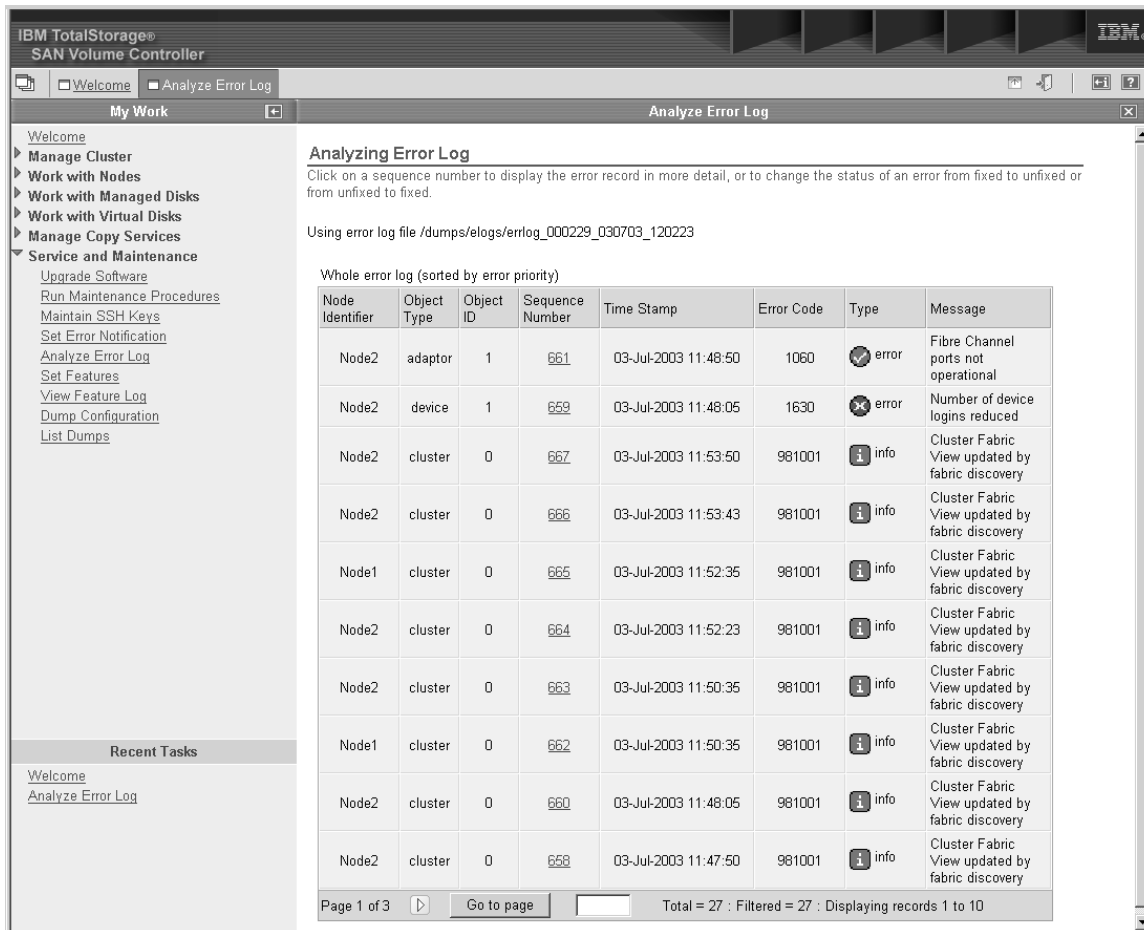
Figure 74. Example of an Error Log Summary

Details of each listed error can be displayed by clicking on the sequence number of any record. The Type field contains an icon and a text message to indicate the cause of the log entry. Table 18 describes the meaning of the information in the type field.

Table 18. Descriptions of Log Entry Icons

Icon	Description
	The Error icon indicates that this log entry requires service activity. You should select Run Maintenance Procedures from the Service and Maintenance menu to start the repair activity,
	The Fixed icon indicates that a problem existed but has now been resolved. It might have been resolved as a result of service activity or it might have been resolved as a result of some other action, for example powering on a missing node.

Table 18. Descriptions of Log Entry Icons (continued)

Icon	Description
⚠	The Warn icon indicates that some condition has occurred that might have been caused by a temporary problem or by a problem that is external to the SAN Volume Controller, such as an error in a RAID controller. If a specified number of these events occurs in 25 hours the warning converts to an error. No service action is required on the SAN Volume Controller for this log entry.
ℹ	The Info icon indicates that the log entry provides information about a configuration change or the state of a command. In some cases the SAN Volume Controller user might need to take some action based on this information.

Figure 75 shows an example of an error log entry you see when you use the SAN Volume Controller Web interface.
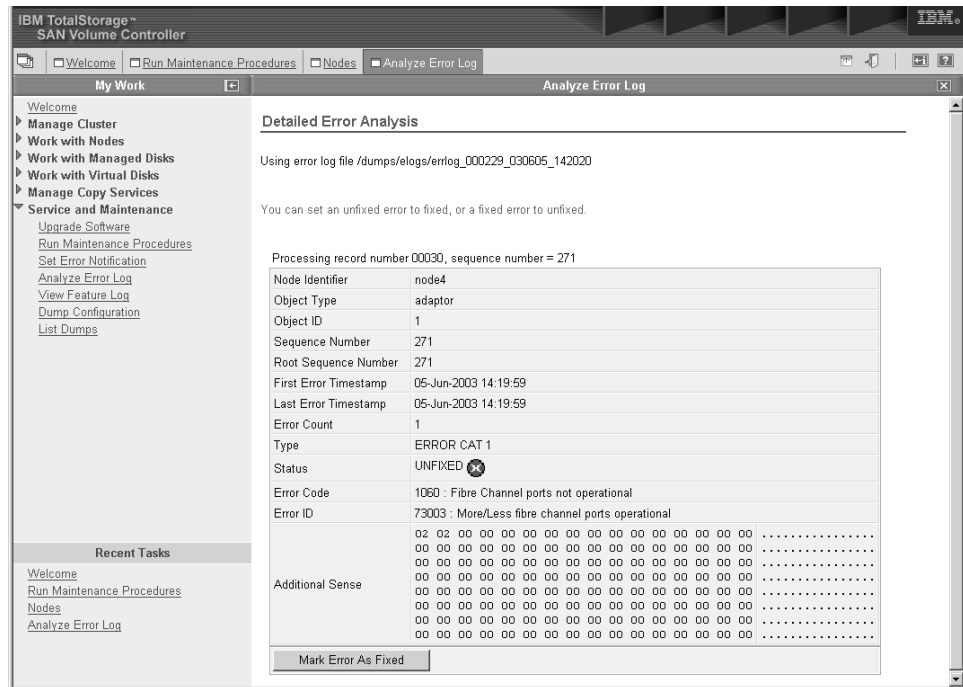
Figure 75. Example of an error log entry when you use the Web interface

Related topics:
- "Using the SAN Volume Controller Console application on the master console" on page 3
- "Starting maintenance using the SAN Volume Controller Console application on the master console" on page 7
- "Accessing the command-line interface from the master console" on page 12

Describing the fields in the error log

The error log includes fields with information you can use to diagnose problems.

Table 19 describes the fields you see in Figure 73 on page 77 and Figure 75 on page 79.

Table 19. Description of data fields for the error log

Data field	Description
Node identifier	The name of the node that created the error report.
Object type	The object type that error log relates to. See Table 20.
Object ID	A number that uniquely identifies the object on this node.
Sequence number	A sequentially assigned number that can be used to provide a cross reference to sense data returned to host systems.
Root Sequence Number	The sequence number of another log entry that enables all errors that have a single source to be marked as fixed by a single action.
First Error Timestamp	The time when the first instance of this error code was reported by this object type in the last 25 hours.
Last error timestamp	The time when the last instance of this error code was reported by this object type in the last 25 hours.
Error count	The number of times that this error code has been reported by this object in the last 25 hours.
Error ID	This number is a unique identifier for the error or event.
Error code	This number is used as the starting point for service procedures.
Status flag	For details of the status flag. See Table 21 on page 81.
Type flag	For details of the type flag. See Table 23 on page 81.
Additional sense data	Data specific to this error or event code. This is a binary data record and when the error log is viewed via the command line tools this data is shown in hex. When the data is viewed via the web interface this data is translated to ASCII characters on the right hand side of the page. You will not normally be required to interpret this data as part of the service procedures. However, any procedures that do refer to the this data will describe the ASCII format.

Table 20 describes the types of error log objects.

Table 20. Description of object types and object IDs for the error log

Object type	Object ID
Node	The six character node ID
Fcgrp	Flash Copy consistency group number
Rcgrp	Remote Copy consistency group number
Fcmap	Flash Copy map number
Rcmap	Remote Copy Map number
Cluster	Cluster Name as displayed on the front panel.
Device	Device number
Mdisk	Managed disk number
Mdiskgrp	Managed disk group number
Uninterruptible power supply	Uninterruptible power supply serial number

Table 21 on page 81 shows the types of error log flags.

Note: Configuration Events have nothing in the flag field. Information Events only have the SNMP trap-raised flag on when configured to do so.

Table 21. Description of flags for the error log

Flag	Description
Unfixed	This log entry requires a service action.
Fixed	This entry has been marked as fixed. It will remain in the error log until it becomes the oldest record in the log at which point it will be overwritten by the next log entry.
Expired	The error log entry is over 25 hours old. Any new log entries of this error/event code for this object type will produce a new log entry.
SNMP trap raised	An SNMP trap has been raised. SNMP traps are raised for unfixed errors and for information events.

Table 22 shows the various combinations of flags that may be logged and the resulting status that is reported by the user interfaces.

Note: SNMP_TRAP_RAISED is independent of the other flags.

Table 22. Reported status for combinations of error-log status flags

UNFIXED	ERROR_FIXED	ERROR_EXPIRED	Reported Status
0	0	0	BELOW_THRESHOLD
0	0	1	EXPIRED
0	1	0	FIXED
0	1	1	*not possible*
1	0	0	UNFIXED
1	0	1	*not possible*
1	1	0	FIXED
1	1	1	*not possible*

Table 23 shows the types of error log flags.

Table 23. Description of types of error log flags

Flag	Description
Unknown error	This flag should never be seen. This flag can only result from a software defect.
Error Cat 1	These errors require a service action. A FRU or list of FRUs will be included with the trap data or e-mail sent with the error record.
Error Cat 2	These errors require a service action but more analysis is required before the service action or FRU can be identified.
Related error	These are errors that have a root cause that has been reported in another log entry. Marking the source error as fixed will also mark this error as fixed.
Transient error	Errors flagged as transient have been recovered by an error recovery procedure.
Configuration event	This entry is from the Configuration Event log. This flag is useful when displaying both logs in a seamless display as an aid to relating logged error conditions to configuration events.
Information	This entry indicates that the log entry is an Information Event. Information events can be used to warn the user about an unexpected configuration result or prompt a user to initiate further configuration actions. This type of log entry will cause an SNMP trap to be raised if requested by the user.

Error reporting

Errors detected by the SAN Volume Controller are saved in an error log

Error reporting process:

As soon as an entry is made in this error log, the error condition is analyzed and if any service activity is required an attempt is made to notify the user of the error. You can use the following methods to notify the user and IBM service:

- An SNMP trap is sent to an SNMP manager that is configured by the customer.
  This might be IBM Director on the master console or the SNMP manager that was selected by the customer.

  Note: If Call Home is required, SNMP reports must be enabled. You can send the reports to the IP address of the IBM director configured to manage Call Home.
- The most serious cluster code is displayed on the front panel of each node in the cluster.
- If you enabled call home, critical faults are reported directly to IBM and a PMH report will be raised in RETAIN. In the PMH report, the ClusterName is the name of the cluster where you start his problem determination.

Related topics:

- "Using directed maintenance procedures" on page 34
- "Defining cluster error codes" on page 84

Understanding the error codes

Error codes help you to diagnose problems.

Error codes:

Error codes are generated for the SAN Volume Controller by the system error-log analysis and system configuration code. Error codes help you to identify the cause of a problem, the failing field-replaceable units (FRUs), and the service actions that might be needed to solve the problem.

Note: If more than one error occurs during an operation, the highest priority error code displays on the front panel. The lower the number for the error code, the higher the priority. For example, cluster error code 1020 has a higher priority than cluster error code 1370.

Using the error code tables

The error code tables list the various error codes and describe the actions you should do.

Steps:

Perform the following steps to use the error code tables.

1. Locate the error code in one of the tables. If you cannot find a particular code in any table, call your support center for assistance.

2. Read carefully the action you must do for the problem. Do not exchange FRUs unless you are instructed to do so.
3. Normally exchange only one FRU at a time, starting from the top of the FRU list for that error code.

Related topics:
- "MAP 5700: Repair verification" on page 137
- Chapter 8, "Removing and replacing parts," on page 139
- "MAP 5000: Start" on page 118

Definitions of the FRU names for the SAN Volume Controller

See Table 24 for a glossary for the FRU names for the SAN Volume Controller.

Table 24. Glossary of FRU names for the SAN Volume Controller

Name of FRU	Definition
Frame assembly	The frame of the SAN Volume Controller and the cables that it contains.
Disk drive assembly	The disk drive of the SAN Volume Controller.
Disk drive cables	The SCSI and power cable which connect the disk drive to the SAN Volume Controller system board.
Fibre Channel cable	A cable that connects the SAN Volume Controller to a fibre-channel network.
Ethernet cable	A cable that connects the SAN Volume Controller to an Ethernet network.
Power supply assembly	An assembly that provides dc power to the SAN Volume Controller. It also contains three fans.
Power cable assembly	The power cable and signal cable that connect the SAN Volume Controller to the uninterruptible power supply. This FRU consists of a power cable and a signal cable.
Fan assembly	An assembly that contains a dc cooling fan. The SAN Volume Controller has two types of fan assemblies, excluding those that are in the power supply assembly.
System board assembly	This FRU consists of the system board, two processors, VRM, riser card, voltage regulator, and CMOS battery.
Fibre Channel adapter assembly	The means by which the SAN Volume Controller is connected to the fibre-channel fabric.
Service controller	The FRU that provides the service functions of the SAN Volume Controller. This FRU consists of an electronics card, the flash module, and three connecting cables.
CMOS battery	The battery that maintains power to backup the system BIOS settings for time and date.
Front panel assembly	The front cover of the SAN Volume Controller. This FRU includes the front panel, controls, and display.

Related topics:
- "Definitions of the FRU names for the uninterruptible power supply"

Definitions of the FRU names for the uninterruptible power supply

See Table 25 on page 84 for a glossary for the FRU names for the uninterruptible power supply.

Table 25. Glossary of FRU names for the uninterruptible power supply

Name of FRU	Description
Uninterruptible power supply battery assembly	The battery that provides backup power to the SAN Volume Controller if a power failure occurs. This FRU is part of the uninterruptible power supply.
Uninterruptible power supply electronics assembly	The unit that controls the functions of the uninterruptible power supply. This FRU is part of the uninterruptible power supply.
Uninterruptible power supply	This FRU includes the frame of the uninterruptible power supply and all the FRUs contained within that frame.

Related topics:

- "Definitions of the FRU names for the SAN Volume Controller" on page 83

Defining cluster error codes

Every cluster error code includes an error code number, a description, action, and possible FRUs.

1002

Explanation: Error log full.

Action: To fix the errors in the error log, go to the start map.

Possible Cause-FRUs or other:

Unfixed errors in the log.

Related Topics:

- "MAP 5000: Start" on page 118

1010

Explanation: A fibre-channel adapter was reported missing.

Action:

1. In the sequence shown, exchange the FRUs for new FRUs. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.
3. Go to repair verification map.

Possible Cause-FRUs or other:

Fibre Channel adapter assembly (90%)

System board assembly (10%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the system board" on page 163
- "Removing an adapter" on page 161

1012

Explanation: A fibre-channel adapter reported PCI bus errors.

Action:

1. In the sequence shown, exchange the FRUs for new FRUs. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.
3. Go to repair verification map.

Possible Cause-FRUs or other:

Fibre Channel adapter assembly (90%)

System board assembly (10%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the system board" on page 163
- "Removing an adapter" on page 161

1020

Explanation: The SAN Volume Controller system board is failing.

Action:

1. In the sequence shown, exchange the FRUs for new FRUs. See "Possible Cause-FRUs or other" after the last action in this section.

2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.

3. Go to repair verification map.

Possible Cause-FRUs or other:

System board assembly (100%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the system board" on page 163

1040

Explanation: A flash module error has occurred after a successful boot of a SAN Volume Controller.

Action:

1. Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.

2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status

of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.

3. Go to repair verification map.

Possible Cause-FRUs or other:

Service controller (100%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the service controller from the SAN Volume Controller" on page 147

1044

Explanation: A service controller read failure occurred.

Action:

1. In the sequence shown, exchange the FRUs for new FRUs. See "Possible Cause-FRUs or other" after the last action in this section.

2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.

3. Go to repair verification map.

Possible Cause-FRUs or other:

Service controller (100%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the service controller from the SAN Volume Controller" on page 147

1050

Explanation: A SAN Volume Controller fibre-channel adapter has failed a loop back, or similar, test.

Action:

1. In the sequence shown, exchange the FRUs for new FRUs. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.
3. Go to repair verification map.

Possible Cause-FRUs or other:

Fibre Channel adapter assembly (90%)

System board assembly (10%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the system board" on page 163
- "Removing an adapter" on page 161

1060

Explanation: One or more fibre-channel ports on the SAN Volume Controller are not operational.

Action: Go to MAP 5600: Fibre-channel.

Possible Cause-FRUs or other:

Fibre-channel cable (80%)

Fibre-channel adapter assembly (10%)

Other:

Fibre-channel network fabric (10%)

Related Topics:

- "MAP 5600: Fibre-channel" on page 134

1070

Explanation: One of the four fan assemblies that cool the processors has returned a status of `Failed` status through the service processor.

Action:

1. Check the error log and verify which fan failed.
2. In the sequence shown, exchange the FRUs for new FRUs. See "Possible Cause-FRUs or other" after the last action in this section.

3. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.
4. Go to repair verification map.

Possible Cause-FRUs or other:

Fan assembly (90%)

System board assembly (10%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the system board" on page 163
- "Removing the microprocessor fan" on page 156

1071

Explanation: The fan assembly that cools the disk drive assembly has returned a Failed status via the service processor.

Action:

1. In the sequence shown, exchange the FRUs for new FRUs. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.
3. Go to repair verification map.

Possible Cause-FRUs or other:

Fan assembly (90%)

System board assembly (10%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118

- "MAP 5700: Repair verification" on page 137
- "Removing the disk drive fan" on page 155
- "Removing the system board" on page 163

1075

Explanation: The ambient temperature threshold of the SAN Volume Controller has been exceeded.

Action:

1. Check that the room temperature is within the limits allowed.
2. Check for obstructions in the air flow.
3. Mark the error you have just repaired fixed.
4. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

System environment (100%).

Related Topics:

- "Preparing your SAN Volume Controller environment" on page 30
- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

1076

Explanation: The internal temperature sensor of the SAN Volume Controller has reported that the temperature warning threshold has been exceeded.

Action:

1. Check whether the internal airflow of the SAN Volume Controller has been obstructed. Clear any obstructions. If you cannot find an obstruction, exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.
3. Go to repair verification map.

Possible Cause-FRUs or other:

System board assembly (100%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the system board" on page 163

1077

Explanation: The temperature soft or hard shutdown threshold of the SAN Volume Controller has been exceeded. The SAN Volume Controller has powered off automatically.

Action:

1. In the sequence shown, exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.
3. Go to repair verification map.

Possible Cause-FRUs or other:

System board assembly (100%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the system board" on page 163

1080

Explanation: One of the voltages that is monitored on the system board, but generated elsewhere, is outside the set thresholds.

Action:

1. In the sequence shown, exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a

status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.

3. Go to repair verification map.

Possible Cause-FRUs or other:

Power supply assembly (98%)

System board assembly (2%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the system board" on page 163
- "Removing the SAN Volume Controller power supply" on page 157

1081

Explanation: One of the voltages that is generated and monitored on the system board is outside the set thresholds.

Action:

1. Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.

2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.

3. Go to repair verification map.

Possible Cause-FRUs or other:

System board assembly (100%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the system board" on page 163

1135

Explanation: The uninterruptible power supply has reported an ambient over temperature. The uninterruptible power supply switches to Bypass mode to allow the uninterruptible power supply to cool.

Action:

1. Power off the nodes attached to the uninterruptible power supply.

2. Turn off the uninterruptible power supply, and then unplug the uninterruptible power supply from the main power source.

3. Ensure that the air vents of the uninterruptible power supply are not obstructed.

4. Ensure that the air flow round the uninterruptible power supply is not restricted.

5. Wait for at least five minutes, then restart the uninterruptible power supply. If the problem remains, check the ambient temperature. Correct if necessary. Otherwise, exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.

6. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the uninterruptible power supply.

7. Go to repair verification map.

Possible Cause-FRUs or other:

Uninterruptible power supply electronics unit (50%)

Other:

The system ambient temperature is outside the specification (50%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the uninterruptible power supply electronics" on page 169

1140

Explanation: The uninterruptible power supply has reported that it has a problem with the input AC power.

Action:

1. The power supply to this uninterruptible power supply is faulty or not connected correctly. Ask the customer to check the site power connection to this uninterruptible power supply. If the input power connection is OK, exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.

2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the uninterruptible power supply.

3. Go to repair verification map.

Possible Cause-FRUs or other:

Uninterruptible power supply input power cable (20%)

Other:

The input AC power is missing (40%).

The input AC power is not in specification (40%).

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

1145

Explanation: The signal connection between a SAN Volume Controller and its uninterruptible power supply is failing.

Action:

1. If other SAN Volume Controllers that are using this uninterruptible power supply are reporting this error, exchange the uninterruptible power supply electronics unit for a new one.

2. If only this SAN Volume Controller is reporting the problem, check that the signal cable, which is part of the power cable assembly, is secure at both ends. If signal cable is secure, exchange the FRUs for new FRUs in the sequence shown. See "Possible Cause-FRUs or other" after the last action in this section.

3. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just

repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the uninterruptible power supply.

4. Go to repair verification map.

Possible Cause-FRUs or other:

Power cable assembly (60%)

Uninterruptible power supply electronics unit (20%)

System board assembly (20%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the system board" on page 163
- "Removing the uninterruptible power supply electronics" on page 169

1150

Explanation: Data that the SAN Volume Controller has received from the uninterruptible power supply suggests the uninterruptible power supply power cable, the signal cable, or both, are not connected correctly.

Action:

1. Connect the cables correctly. See the *IBM TotalStorage SAN Volume Controller: Installation Guide*.

2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the uninterruptible power supply.

3. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Configuration error.

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

1155

Explanation: A power domain error has occurred. Both SAN Volume Controllers of a pair are powered by the same uninterruptible power supply.

Action:

1. Display the node VPD. (see "Viewing the vital product data") Note the I/O group and uninterruptible power supply serial number of each node in the cluster.
2. Nodes in the same I/O group must be connected to different uninterruptible power supply assemblies. Reconnect the uninterruptible power supply assemblies as necessary.
3. Mark the error you have just repaired fixed.
4. Go to repair verification map.

Possible Cause-FRUs or other:

   None

Other:

   Configuration error.

Related Topics:

- "Viewing the vital product data" on page 11
- "Checking the status of the node" on page 16
- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "MAP 5700: Repair verification" on page 137

1160

Explanation: A problem with too much load current has occurred in the uninterruptible power supply (reported by uninterruptible power supply alarm bits).

Action:

1. Ensure that only SAN Volume Controllers are receiving power from the uninterruptible power supply. Ensure that there are no switches or disk controllers that are connected to the uninterruptible power supply.
2. Disconnect the SAN Volume Controllers one at a time from the uninterruptible power supply until the problem with too much load current is removed; that is, you have disconnected the SAN Volume Controller that is causing too much load current. On that SAN Volume Controller, exchange in the sequence shown, the FRUs for new FRUs. See "Possible Cause-FRUs or other" after the last action in this section.
3. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just

repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the uninterruptible power supply.
4. Go to repair verification map.

Possible Cause-FRUs or other:

   FRU: SAN Volume Controller power cable assembly (50%)

   FRU: Power supply assembly (50%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the SAN Volume Controller power supply" on page 157

1165

Explanation: The uninterruptible power supply output load is unexpectedly high. The uninterruptible power supply output is possibly connected to an extra non-SAN Volume Controller load.

Action:

1. Ensure that only SAN Volume Controllers are receiving power from the uninterruptible power supply. Ensure that there are no switches or disk controllers that are connected to the uninterruptible power supply.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the uninterruptible power supply.
3. Go to repair verification map.

Possible Cause-FRUs or other:

   None

Other:

   Configuration error.

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118

- "MAP 5700: Repair verification" on page 137

1170

Explanation: A problem has occurred with the uninterruptible power supply electronics (reported by uninterruptible power supply alarm bits).

Action:

1. Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the uninterruptible power supply.
3. Go to repair verification map.

Possible Cause-FRUs or other:

Uninterruptible power supply electronics assembly (100%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the uninterruptible power supply electronics" on page 169

1175

Explanation: A problem has occurred with the uninterruptible power supply (reported by uninterruptible power supply alarm bits).

Action:

1. Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the uninterruptible power supply.
3. Go to repair verification map.

Possible Cause-FRUs or other:

Uninterruptible power supply (100%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the uninterruptible power supply" on page 166

1180

Explanation: A problem has occurred with the uninterruptible power supply battery (reported by uninterruptible power supply alarm bits).

Action:

1. Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the uninterruptible power supply.
3. Go to repair verification map.

Possible Cause-FRUs or other:

Uninterruptible power supply battery assembly (100%)

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the uninterruptible power supply battery" on page 171

1185

Explanation: A problem has occurred in the uninterruptible power supply (reported by uninterruptible power supply alarm bits). No specific FRU has been identified.

Action:

1. In the sequence shown, exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the uninterruptible power supply.
3. Go to repair verification map.

Possible Cause-FRUs or other:

Uninterruptible power supply electronics assembly (60%)

Uninterruptible power supply battery assembly (20%)

Uninterruptible power supply (20%)

Related Topics:
- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the uninterruptible power supply" on page 166
- "Removing the uninterruptible power supply battery" on page 171
- "Removing the uninterruptible power supply electronics" on page 169

1190

Explanation: The uninterruptible power supply battery has reached its end of life. (The maximum available capacity can no longer support four SAN Volume Controllers.

Action:
1. Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.
2. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the uninterruptible power supply.
3. Go to repair verification map.

Possible Cause-FRUs or other:

Uninterruptible power supply battery assembly (100%)

Related Topics:
- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Removing the uninterruptible power supply battery" on page 171

1195

Explanation: A SAN Volume Controller is missing from the cluster. You can resolve this problem by repairing the failure on the missing SAN Volume Controller.

Action:
1. If it is not obvious which node in the cluster has failed, check the status of the nodes and find the SAN Volume Controller with a status of offline.
2. Go to the Start MAP and perform the repair on the failing node.
3. When the repair has been completed, this error will automatically be marked as fixed.
4. Check node status (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface). If all nodes show a status of "online," but the error in the log has not been marked as fixed, manually mark the error you have just repaired "fixed." If any nodes do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the SAN Volume Controller.
5. Go to repair verification map.

Possible Cause-FRUs or other:

Node failure

Related Topics:
- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

1200

Explanation: The configuration is not valid. Too many devices have been presented to the cluster or SAN Volume Controller.

Action:

1. Remove unwanted devices from the fibre-channel network fabric.
2. Start a cluster discovery operation to find devices.
3. List all connected managed disks. Check with the customer that the configuration is as expected. Mark the error you have just repaired fixed.
4. Go to repair verification map.

Possible Cause-FRUs or other:

> None

Other:

> Fibre Channel network fabric (100%).

Related Topics:

- "Re-scanning the fibre-channel network for new managed disks" on page 21
- "Listing managed disks" on page 19
- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

1210

Explanation: A local fibre-channel port has been excluded.

Action: Go to MAP 5600: Fibre-channel.

Possible Cause-FRUs or other:

> Fibre-channel cable (80%).
> Fibre-channel adapter assembly (10%)

Other:

> Fibre Channel network fabric (10%).

Related Topics:

- "MAP 5600: Fibre-channel" on page 134

1220

Explanation: A remote fibre-channel port has been excluded.

Action:

1. View the error log. Note the mdisk ID associated with the error code.
2. Using the mdisk ID, determine the failing disk controller.
3. Refer to the service documentation for the disk enclosure or disk controller and the fibre-channel network fabric to resolve the reported problem.

4. After the disk drive is repaired, start a cluster discovery operation to recover the excluded fibre-channel port.
5. Include the managed disk that you noted in step 1.
6. Check the status of the disk controller (refer to "Viewing general details for controllers" for the user interface or "Disk controller status" for the command line interface). If all disk controllers show a "good" status, mark the error you have just repaired "fixed."
7. If all disk controllers do not show a good status, contact the IBM support center to resolve the problem with the disk controller.
8. Go to repair verification map.

Possible Cause-FRUs or other:

> None

Other:

> Disk drive enclosure, or disk controller, that is connected to the SAN Volume Controller (50%).
> Fibre Channel network fabric (50%).

Related Topics:

- "Checking disk controller status" on page 22
- "Viewing the error log" on page 76
- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137
- "Listing managed disks" on page 19
- "Re-scanning the fibre-channel network for new managed disks" on page 21
- "Checking disk controller status" on page 22
- "Determining the failing enclosure or disk controller" on page 23

1230

Explanation: Login has been excluded.

Action:

1. In the sequence shown, exchange the FRUs for new FRUs. See "Possible Cause-FRUs or other" after the last action in this section.
2. Start a cluster discovery operation to recover the login.
3. Check the status of the disk controller (refer to "Viewing general details for controllers" for the user interface or "Disk controller status" for the command line interface). If all disk controllers show a "good" status, mark the error you have just repaired "fixed." If any disk controllers do not show "good" status, go to start map. If you return to this step, contact the IBM support center to resolve the problem with the disk controller.
4. Go to repair verification map.

Possible Cause-FRUs or other:

Fibre Channel cable, switch to remote port, (50%)

Fibre Channel cable, local port to switch (50%)

Related Topics:

- "Checking disk controller status" on page 22
- "Re-scanning the fibre-channel network for new managed disks" on page 21
- "Marking errors as fixed" on page 12
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

1310

Explanation: A managed disk is reporting excessive errors.

Action:

1. Repair the enclosure or disk controller.
2. Check the managed disk status. If all managed disks show a status of "online," mark the error you have just repaired as "fixed." If any managed disks show a status of "excluded," include the excluded managed disks and then mark the error as "fixed."
3. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Disk drive enclosure, or disk controller, that is connected to the SAN Volume Controller (100%).

Related Topics:

- "Listing managed disks" on page 19
- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

1320

Explanation: A disk I/O medium error has occurred.

Action:

1. Ask the customer to rewrite the bad data to the block LBA reported in the host systems SCSI sense data.

   Note: If this error has occurred during a migration, the host system will not notice the error until the target device is accessed.

2. Check managed disk status. If all managed disks show a status of "online, " mark the error you have just repaired as "fixed." If any managed disks do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the disk controller.
3. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Disk drive enclosure, or disk controller, that is connected to the SAN Volume Controller (100%).

Related Topics:

- "Listing managed disks" on page 19
- "Marking errors as fixed" on page 12
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

1330

Explanation: No Mdisk is suitable for use as a quorum disk. When a cluster is created three disks are automatically selected as quorum disks. A quorum disk is needed to enable a tie-break when some cluster members are missing. To become a quorum disk:

- The Mdisk must be accessible by all nodes in the cluster.
- The Mdisk must have free extents

This error code is produced when at least one quorum disk is not accessible by all nodes in the cluster.

A quorum disk might not be available because of a fibre-channel network failure or because of a fibre-channel switch zoning problem.

Action:

1. Resolve any known fibre-channel network problems.
2. Ask the customer to confirm that Mdisks have been created and that those mdisks have free extents. If at least one managed disk shows a mode of managed, mark the error you have just repaired as fixed.
3. If the customer is unable to make the appropriate changes, ask IBM Software Support for assistance.
4. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Configuration error (100%).

Related Topics:

- "SAN problem determination" on page 115
- "Listing managed disks" on page 19
- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

1335

Explanation: Quorum disk not available.

Action:

1. View the error log entry and determine the managed disk, being used as a quorum disk, that is no longer available.
2. Perform the disk controller problem determination and repair procedures for the mdisk identified in step 1.
3. Include the managed disk into the cluster.
4. Check the managed disk status. If the managed disk identified in step 1 shows a status of "online," mark the error you have just repaired as " fixed." If the managed disk does not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the disk controller.
5. Go to repair verification map.

Possible Cause-FRUs or other:

> None

Other:

> Disk drive enclosure, or disk controller, that is connected to the SAN Volume Controller (100%).

Related Topics:

- "Determining the failing enclosure or disk controller" on page 23
- "Listing managed disks" on page 19
- "Marking errors as fixed" on page 12
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

1340

Explanation: A managed disk has timed out. This error was reported because a large number of disk timeout conditions have been detected. The problem is probably caused by a failure of some other component on the SAN.

Action:

1. Repair problems on all disk controllers and switches on the same SAN as this SAN Volume Controller cluster.
2. If problems are found, mark this error as "fixed."
3. If no switch or disk controller failures can be found, take an error log dump and call your hardware support center.

Possible Cause-FRUs or other:

> None

Other:

> Disk controller.

Fibre-channel switch.

Related Topics:

- "MAP 5700: Repair verification" on page 137
- "Marking errors as fixed" on page 12

1370

Explanation: A managed disk error recovery procedure (ERP) has occurred. This error was reported because a large number of disk error recovery procedures have been performed by the disk controller. The problem is probably caused by a failure of some other component on the SAN.

Action:

1. View the error log entry and determine the managed disk that was being accessed when the problem was detected.
2. Perform the disk controller problem determination and repair procedures for the mdisk determined in step 1.
3. Perform problem determination and repair procedures for the fibre channel switches connected to the SAN Volume Controller, the disk controller that is managing the mdisk, and the fibre channel path between those switches.
4. If any problems are found and resolved in steps 2 and 3, mark this error as "fixed."
5. If no switch or disk controller failures were found in steps 2 and 3, take an error log dump. Call your hardware support center.
6. Go to repair verification map.

Possible Cause-FRUs or other:

> None

Other:

> Disk controller.

> Fibre-channel switch.

Related Topics:

- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

1400

Explanation: The SAN Volume Controller cannot detect the Ethernet connection.

Action: Go to "MAP 5500: Ethernet" on page 132.

Possible Cause-FRUs or other:

> Ethernet cable (25%)

> SAN Volume Controller system board assembly (25%)

Other:

> Ethernet cable is disconnected (25%).

Ethernet hub (25%).

Related Topics:

- "Removing the system board" on page 163

1550

Explanation: A cluster path has failed. One of the SAN Volume Controller fibre-channel ports is unable to communicate with all the other SAN Volume Controllers in the cluster.

Action:

1. Repair the fibre-channel network fabric.
2. Check the status of the node ports (refer to "Checking the status of the node ports" for the command line interface). If the status of the node ports shows as active, mark the error you have just repaired as fixed. If any node ports do not show a status of active, go to start map. If you return to this step contact the IBM support center to resolve the problem with the SAN Volume Controller.
3. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Fibre Channel network fabric (100%).

Related Topics:

- "Marking errors as fixed" on page 12
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

1610

Explanation: Media errors on backend managed disk.

Action:

1. Repair the enclosure or disk controller.
2. Include the managed disk into the cluster.
3. Check managed disk status. If all managed disks show a status of "online," mark the error you have just repaired as "fixed." If any managed disks do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the disk controller.
4. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Disk drive enclosure, or disk controller, that is connected to the SAN Volume Controller (100%).

Related Topics:

- "Determining the failing enclosure or disk controller" on page 23
- "Listing managed disks" on page 19
- "Marking errors as fixed" on page 12
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

1620

Explanation: An Mdisk group is offline.

Action:

1. Repair the enclosure or disk controller.
2. Start a cluster discovery operation.
3. Check managed disk status. If all managed disks show a status of "online," mark the error you have just repaired as "fixed." If any managed disks do not show a status of "online," go to start map. If you return to this step, contact the IBM support center to resolve the problem with the disk controller.
4. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Fibre Channel network fabric (50%).

Disk drive enclosure, or disk controller, that is connected to the SAN Volume Controller (50%).

Related Topics:

- "Determining the failing enclosure or disk controller" on page 23
- "Re-scanning the fibre-channel network for new managed disks" on page 21
- "Listing managed disks" on page 19
- "Marking errors as fixed" on page 12
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

1625

Explanation: Incorrect disk controller configuration.

Action:

1. Using service documentation for the disk controller, check that the correct configuration is set up for the disk controller. See also the *IBM TotalStorage SAN Volume Controller: Configuration Guide*.
2. Mark the error you have just repaired as "fixed."
3. Start a cluster discovery operation.
4. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other: Disk drive enclosure, or disk controller, that is connected to the SAN Volume Controller

Related Topics:

- "Marking errors as fixed" on page 12
- "Re-scanning the fibre-channel network for new managed disks" on page 21
- "MAP 5700: Repair verification" on page 137

1630

Explanation: The number of device logins was reduced. One possible cause is that the user intentionally reconfigured the system.

Action:

1. Check the error in the cluster error log to identify the object ID associated with the error.
2. Check the availability of the failing device using the following command line: `svcinfo lscontroller object_ID`. If the command fails with the message "CMMVC6014E The command failed because the requested object is either unavailable or does not exist," ask the customer if this device was removed from the system.
   - If "yes," mark the error as fixed in the cluster error log and continue with the repair verification map
   - If "no" or if the command lists details of the failing controller, continue with step 3.
3. Check whether the device has regained connectivity. If it has not, check the cable connection to the remote-device port.
4. If all logins to a remote-device port have failed and you cannot solve the problem by changing cables, check the condition of the remote-device port and the condition of the remote device.
5. Start a cluster discovery operation.
6. Check the status of the disk controller (refer to "Viewing general details for controllers" for the user interface or Disk controller status for the command line interface). If all disk controllers show a "good" status, mark the error you have just repaired as "fixed." If any disk controllers do not show "good" status, go to start map. If you return to this step, contact the IBM support center to resolve the problem with the disk controller.
7. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Fibre Channel network fabric (50%).

Disk drive enclosure, or disk controller, that is connected to the SAN Volume Controller (50%).

Related Topics:

- "Checking disk controller status" on page 22
- "Re-scanning the fibre-channel network for new managed disks" on page 21
- "Marking errors as fixed" on page 12
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

1660

Explanation: The initialization of the managed disk has failed.

Action:

1. View the error log entry and determine the managed disk that was being accessed when the problem was detected.
2. Perform the disk controller problem determination and repair procedures for the mdisk identified in step 1.
3. Include the managed disk into the cluster.
4. Check the managed disk status. If all managed disks show a status of "online," mark the error you have just repaired as "fixed." If any managed disks do not show a status of "online," go to the start MAP. If you return to this step, contact the IBM support center to resolve the problem with the disk controller.
5. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Disk drive enclosure, or disk controller, that is connected to the SAN Volume Controller (100%).

Related Topics:

- "Determining the failing enclosure or disk controller" on page 23
- "Re-scanning the fibre-channel network for new managed disks" on page 21
- "Marking errors as fixed" on page 12
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137
- "Listing managed disks" on page 19

1670

Explanation: The CMOS battery on the SAN Volume Controller system board failed.

Action:

1. Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other" after the last action in this section.
2. Mark the error you have just repaired as "fixed."
3. Go to repair verification map.

Possible Cause-FRUs or other:

CMOS battery (100%)

Related Topics:

- "Removing and replacing the system board CMOS battery" on page 159
- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

1720

Explanation: In a peer-to-peer remote copy (PPRC) operation, the relationship has stopped and lost synchronization, for a reason other than a continuous I/O error.

Action:

1. Correct higher priority errors, then restart the PPRC.
2. Mark the error you have just repaired as "fixed."
3. Go to repair verification map.

Possible Cause-FRUs or other:

Unknown.

Related Topics:

- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

1900

Explanation: A Flash Copy prepare task has failed because a cache flush has failed.

Action:

1. Correct higher priority errors, then retry the prepare tasks.
2. Mark the error you have just repaired as "fixed."
3. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Cache flush error (100%).

Related Topics:

- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

1910

Explanation: A Flash Copy mapping task was stopped because of the error that is indicated in the data. A stopped flash copy may affect the status of other VDisks in the same I/O group. Preparing the stopped flash copies as soon as possible is advised.

Action:

1. Correct higher priority errors, then retry the prepare task.
2. Mark the error you have just repaired as "fixed."
3. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Data error (100%).

Related Topics:

- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

1920

Explanation: A peer-to-peer remote copy (PPRC) relationship was stopped because of a continuous I/O error.

Action:

1. Correct the higher priority errors, then retry the prepare task.
2. Mark the error you have just repaired as "fixed."
3. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

Data error (100%).

Related Topics:

- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

1930

Explanation: Migration suspended.

Action:

1. Ensure that all error codes of a higher priority have already been fixed.
2. Ask the customer to ensure that all mdisk groups that are the destination of suspended migrate operations have free extents available.
3. Mark this error as "fixed." This will cause the migrate operation to be restarted. If the restart fails, a new error will be logged.
4. Go to repair verification map.

Possible Cause-FRUs or other:

Unknown.

Related Topics:

- "MAP 5700: Repair verification" on page 137
- "Marking errors as fixed" on page 12

2010

Explanation: A software upgrade has failed. This might be caused by a hardware error or it might be from a failure in the new version of the software. An automatic software downgrade is performed to restore the SAN Volume Controllers to their previous software version. If the downgrade operation fails to downgrade a SAN Volume Controller (for example because it is offline), the download operation will stop and wait for the offline SAN Volume Controller to be repaired or deleted from the cluster. While the downgrade operation is in progress, configuration commands sent to the cluster will fail with a message indicating that a software upgrade operation is still in progress. The downgrade operation might take up to three hours.

Action:

1. Display the status of the nodes on the cluster (refer to "Viewing the node status using the SAN Volume Controller Console application on the master console" for the user interface or "Checking the status of the node" for the command line interface).

2. If any node is offline, delete the offline node from the cluster. See cluster diagnostic and service-aid commands in the *IBM TotalStorage SAN Volume Controller: Command-Line Interface User's Guide* for detailed information about deleting a node from a cluster. If the delete fails with a message indicating that a software upgrade is in progress, this means that the downgrade process is still active. Wait for this operation to either complete or stop on the offline node and then retry the delete. If the downgrade operation had stopped, it will now continue.

3. Solve all logged hardware problems.

4. Ask the user to retry the software install.

5. If the installation fails again, report the problem to your software support center.

6. Mark the error you have just repaired as "fixed."

7. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

SAN Volume Controller software (100%).

Related Topics:

- "Viewing the node status using the SAN Volume Controller Console application on the master console" on page 7
- "Checking the status of the node" on page 16
- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

2030

Explanation: The error that is logged in the cluster error log indicates a software problem either in the SAN Volume Controller cluster, or in a disk enclosure or disk controller that is connected to the SAN Volume Controller.

Action:

1. Ensure that the software is at the latest level on the cluster and on the disk controllers.

2. Run a configuration dump and a logged data dump. Save the dump data.

3. Ask IBM Product Support for assistance.

4. Mark the error you have just repaired as "fixed."

5. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

SAN Volume Controller software (50%).

Disk drive enclosure or disk controller software (50%).

Related Topics:

- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

2040

Explanation: A software upgrade is required. The software cannot determine the VPD for a FRU. Probably, a new FRU was installed and the software does not recognize that FRU.

Action:

1. Ensure that the software is at the latest level on the cluster and on the disk controllers.

2. Run a configuration dump and a logged data dump. Save the dump data.

3. Ask IBM Product Support for assistance.

4. Mark the error you have just repaired as "fixed."

5. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

SAN Volume Controller software (100%).

Related Topics:

- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

Explanation: A software error has occurred. One of the SAN Volume Controller server software components (sshd, crond, or httpd) has failed and reported an error.

Action:

1. Ensure that the software is at the latest level on the cluster and on the disk controllers.
2. Run a configuration dump and a logged data dump. Save the dump data.
3. Ask IBM Product Support for assistance.
4. Mark the error you have just repaired as "fixed."

5. Go to repair verification map.

Possible Cause-FRUs or other:

None

Other:

SAN Volume Controller software (100%).

Related Topics:

- "MAP 5000: Start" on page 118
- "Marking errors as fixed" on page 12
- "MAP 5700: Repair verification" on page 137

Determining a hardware boot failure

If you see the hardware boot display on the front panel stay for more than three minutes, the node cannot boot.

Context:

The cause might be a hardware failure or the software on the hard disk drive is missing or damaged.

Steps:

Perform the following steps to determine a hardware boot failure.

1. If you have just installed the box or you have just replaced a FRU inside the SAN Volume Controller, check to see that the cables between the system board, service controller and disk drive are installed correctly.
2. Attempt to restore the software by using the node rescue procedure.
3. If node rescue fails, replace the field replaceable units in the following sequence:
   a. Hard disk drive
   b. Service controller
   c. System board

Related topics:

- "Performing the node rescue" on page 104
- "Hardware boot" on page 63

Understanding the boot codes

These codes are displayed on the display screen when a node is booting. The codes indicate the progress of the boot operation or the condition that has caused the node to fail to boot. They are used to isolate failures when boot hangs or when boot detects an unrecoverable error. Line 1 of the menu screen displays the message Booting followed by the boot code. Line 2 of the display displays a boot progress indicator. If the boot hangs, the progress bar stops and the code displayed is used to isolate the fault. If the boot code detects a hardware error, Failed is displayed, and the error code is used to isolate the failure. See Figure 63 on page 64 for an illustration of the boot progress indicator.

100

Explanation: Boot is running.

Action: If the progress bar has not advanced for two minutes, the boot process has hung. In the sequence shown, remove the following FRUs. Each time you remove a FRU or a group of FRUs, try the boot operation again. If you return to this error code put back the removed FRU and remove the next FRU in the list. If after removing a FRU you get a new boot code, perform the actions described for that boot code.

1. All fibre-channel adapter cards. (A fibre-channel Adapter missing error occurs when adapters are removed.)
2. Bank 1 memory modules. (A memory bank 1 error occurs when the modules are removed.)
3. Bank 2 memory modules. (A memory bank 2 error occurs when the modules are removed.)
4. Disk drive assembly. (A disk drive hardware error occurs when the disk drive assembly is removed.)

If the problem remains, exchange, in the sequence shown, the FRUs for new FRUs. After *each* FRU exchange, try the boot operation again. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

SAN Volume Controller system board assembly (75%)

Service controller (25%).

Related Topics:

- "Removing the system board" on page 163

110

Explanation: The SAN Volume Controller is loading kernel code.

Action: If the progress bar has been stopped for two minutes, run the node rescue procedure.

Possible Cause-FRUs or other:

None

Related Topics:

- "Performing the node rescue" on page 104

120

Explanation: A disk drive hardware error has occurred.

Action: Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Disk drive assembly (100%)

Related Topics:

- "Replacing a disk drive and a service controller" on page 152

130

Explanation: The SAN Volume Controller is checking the file systems.

Action: If the progress bar has been stopped for at least 90 seconds, run the node rescue procedure.

Possible Cause-FRUs or other:

None

Related Topics:

- "Performing the node rescue" on page 104

135

Explanation: The SAN Volume Controller is verifying the software.

Action: This process may take up to 1 hour, no action is required.

Possible Cause-FRUs or other:

None

Related Topics:

137

Explanation: Updating service processor firmware.

Action: If the progress bar has been stopped for at least 90 seconds, run the node rescue procedure.

Possible Cause-FRUs or other:

None.

Related Topics:

- "Performing the node rescue" on page 104

140

Explanation: The SAN Volume Controller software is corrupted.

Action: Run the node rescue procedure.

Possible Cause-FRUs or other:

None.

Related Topics:

- "Performing the node rescue" on page 104

150

Explanation: The SAN Volume Controller is loading the cluster code.

Action: If the progress bar has been stopped for at least 90 seconds, run the node rescue procedure.

Possible Cause-FRUs or other:

None

Related Topics:

- "Performing the node rescue" on page 104

155

Explanation: The SAN Volume Controller is loading the cluster data.

Action: If the progress bar has been stopped for at least 90 seconds, run the node rescue procedure.

Possible Cause-FRUs or other:

None

Related Topics:

- "Performing the node rescue" on page 104

160

Explanation: The SAN Volume Controller is recovering flash disk.

Action: If the progress bar has been stopped for at least five minutes, exchange the FRU for a new FRU. See Possible Cause-FRUs or other at the end of this section.

Possible Cause-FRUs or other:

Service Controller (100%)

Related Topics:

- "Removing the service controller from the SAN Volume Controller" on page 147

170

Explanation: A flash module hardware error has occurred.

Action: Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Service controller (100%)

Related Topics:

- "Removing the service controller from the SAN Volume Controller" on page 147

174

Explanation: The service processor on the system board has failed.

Action: Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

System board assembly (100%)

Related Topics:

- "Removing the system board" on page 163

175

Explanation: The service processor has indicated an over temperature. The SAN Volume Controller temperature soft or hard shutdown threshold has been exceeded. The SAN Volume Controller will be powered off after 10 seconds.

Action: Clear vents and remove any heat sources. Ensure the airflow around the SAN Volume Controller is not restricted. Check that the operating environment is as required. If these actions do not fix the problem, replace the FRU.

Possible Cause-FRUs or other:

System board assembly (100%)

Related Topics:

- "Preparing your SAN Volume Controller environment" on page 30
- "Removing the system board" on page 163

180

Explanation: There is a fault in the communications cable, the serial interface in the uninterruptible power supply, or SAN Volume Controller.

Action: Check that the communications cable is correctly plugged in to the SAN Volume Controller and the uninterruptible power supply. If the cable is plugged in correctly, replace the FRUs in the order shown.

Possible Cause-FRUs or other:

SAN Volume Controller power cable assembly (40%)

Uninterruptible power supply electronics assembly (30%)

SAN Volume Controller system board assembly (30%)

Related Topics:

- "Removing the service controller cables" on page 150
- "Removing the uninterruptible power supply electronics" on page 169
- "Removing the system board" on page 163

185

Explanation: The uninterruptible power supply battery has reached its end of life. (The maximum available capacity can no longer support four SAN Volume Controllers.

Action: Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Uninterruptible power supply battery assembly (100%)

Related Topics:

- "Removing the uninterruptible power supply battery" on page 171

190

Explanation: A problem has occurred with the uninterruptible power supply battery.

Action: Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Uninterruptible power supply battery assembly (100%)

Related Topics:
- "Removing the uninterruptible power supply battery" on page 171

195

Explanation: A problem has occurred with the uninterruptible power supply electronics.

Action: Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Uninterruptible power supply electronics assembly (100%)

Related Topics:
- "Removing the uninterruptible power supply electronics" on page 169

200

Explanation: A problem has occurred with the uninterruptible power supply.

Action: Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Uninterruptible power supply (100%).

Related Topics:
- "Removing the uninterruptible power supply" on page 166

205

Explanation: An problem with output overload has been reported by the uninterruptible power supply.

Action: Identify the uninterruptible power supply output cable that caused the output overload by disconnecting one at a time. Identify the cable on the SAN Volume Controller that caused the output overload and exchange the FRUs for new FRUs in the sequence shown. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

SAN Volume Controller power cable assembly (50%)

Power supply assembly (50%)

Related Topics:
- "Removing the SAN Volume Controller power supply" on page 157
- "Replacing the uninterruptible power supply" on page 173

210

Explanation: A problem has occurred in the uninterruptible power supply. No specific FRU has been identified.

Action: In the sequence shown, exchange the FRUs for new FRUs. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Uninterruptible power supply electronics assembly (40%)

Uninterruptible power supply battery assembly (40%)

Uninterruptible power supply (20%)

Other:

None.

Related Topics:
- "Removing the uninterruptible power supply electronics" on page 169
- "Removing the uninterruptible power supply battery" on page 171
- "Removing the uninterruptible power supply" on page 166

215

Explanation: A problem has occurred with the uninterruptible power supply load (the SAN Volume Controller has detected that the uninterruptible power supply current exceeds the current that four SAN Volume Controllers need).

Action: Ensure that both SAN Volume Controllers of a pair are not connected to the same uninterruptible power supply. Ensure also that only SAN Volume Controllers are receiving power from the uninterruptible power supply; that is, no switches or disk controllers are connected to the uninterruptible power supply.

Possible Cause-FRUs or other:

None

220

Explanation: The uninterruptible power supply is receiving input power that may be unstable or in low voltage conditions.

Action: Ask the customer to check the site power to the uninterruptible power supply providing power to

this SAN Volume Controller. Check the connection, voltage and frequency. If the input power is okay, exchange the FRUs for new FRUs. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Uninterruptible power supply input power cable (10%)

Uninterruptible power supply electronics assembly (10%)

Other:

AC input power (80%).

Related Topics:

- "Removing the uninterruptible power supply electronics" on page 169

225

Explanation: An incorrect type of uninterruptible power supply has been installed.

Action: Exchange the uninterruptible power supply for one of the correct type.

Possible Cause-FRUs or other:

Uninterruptible power supply (100%)

Related Topics:

- "Removing the uninterruptible power supply" on page 166

230

Explanation: An uninterruptible power supply is not configured correctly. Probably, the signal cable or the SAN Volume Controller power cables are not connected correctly.

Action: Connect the cables correctly.

Possible Cause-FRUs or other:

None

Other:

Cabling error (100%).

235

Explanation: A SAN Volume Controller is powered on, but the uninterruptible power supply has been

instructed by another SAN Volume Controller to power off because a loss of AC input power has occurred. Although the AC input power has now returned, the SAN Volume Controller still powers off. It then powers on again.

Action: Wait for the SAN Volume Controller to power off.

Possible Cause-FRUs or other:

None

240

Explanation: The ambient temperature threshold for the uninterruptible power supply has been exceeded. The uninterruptible power supply shows a red warning light, and an alarm sounds. The uninterruptible power supply switches to bypass mode to cool.

Action:

1. Turn off the uninterruptible power supply and unplug it from the power source.
2. Clear the vents and remove any heat sources.
3. Ensure that the air flow around the uninterruptible power supply is not restricted.
4. Wait at least five minutes, then restart the uninterruptible power supply.
5. If the problem remains, exchange, in the sequence shown, the FRUs for new FRUs. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Uninterruptible power supply electronics assembly (60%)

Uninterruptible power supply battery assembly (20%)

Uninterruptible power supply (20%)

Related Topics:

- "Removing the uninterruptible power supply electronics" on page 169
- "Removing the uninterruptible power supply battery" on page 171
- "Removing the uninterruptible power supply" on page 166

Performing the node rescue

If it is necessary to replace the hard disk drive or the software on the hard disk drive has become corrupted, you can reinstall the software on the SAN Volume Controller by using the node rescue procedure.

Context:

To provide an alternate boot device, a minimal operating system is also available in nonvolatile memory on the service controller. If it is necessary to replace the

hard disk drive or the software on the hard disk drive has become corrupted, the SAN Volume Controller cannot boot and the Hardware Boot indicator remains on the front panel display or the boot operation hangs.

If this occurs, you can reinstall the software on the SAN Volume Controller by using the node rescue procedure. Node rescue works by booting the operating system from the service controller and running a program that will copy all the node software from any other SAN Volume Controller that can be found on the fibre-channel fabric. The following procedure tells you how to run the node rescue procedure.

Steps:

Perform the following steps to complete the node rescue:
1. Ensure that the fibre-channel cables are connected.
2. Ensure that at least one other SAN Volume Controller node is connected to the fibre-channel fabric.
3. Turn off the SAN Volume Controller.
4. Press and hold the left and right buttons on the front panel.
5. Press the power button.
6. Continue to hold the left and right buttons until the Node Rescue Request symbol is displayed on the front panel.

Figure 76. Node-rescue-request display

Result:

The node rescue request symbol displays on the front panel display until the SAN Volume Controller starts to boot from the service controller. If the node rescue request symbol displays for more than two minutes, check the connection between the service controller and the system board. The service display shows the progress or failure of the node rescue operation.

Note: If the recovered node was part of a cluster, the node will now be offline. Delete the offline node from the cluster and then add the node back into the cluster. If node recovery was used to recover a node that failed during a software upgrade process, the automatic software downgrade process will start but may not continue until the failed node is deleted from the cluster. After the failed node is deleted, it is not possible to add the node back into the cluster until the downgrade process has completed. This may take up to two hours.

Post-processing requirements:

If the cables are correctly located and the node rescue request symbol still displays, replace the FRUs in the following sequence:
1. System board assembly
2. Service controller

Related topics:
- "Deleting a node using the SAN Volume Controller Console application on the master console" on page 8
- "Adding a node to a cluster using the SAN Volume Controller Console application on the master console" on page 9

Understanding the node rescue codes

These codes are displayed on the menu screen during node rescue. The user starts node rescue if the boot image on the hard disk is missing or corrupted. Corrupted code is indicated during the boot process either by the display of an error code, or by a hang condition.

To start node rescue, press the Left and Right buttons on the front panel during a power-on cycle. The menu screen displays the Node rescue request. See "Node rescue request." The hard disk is formatted and, if the format completes without error, the software image is downloaded from any available node. During node recovery. Line 1 of the menu screen displays the message Booting followed by one of the node rescue codes. Line 2 of the menu screen displays a boot progress indicator. See Figure 77.

```
 Booting            300

 ▭▭▭▭▭▭▭▭▭▭▭▭▭
```

Figure 77. Example of a displayed node rescue code

The three-digit code that is shown in Figure 77 represents a node rescue code.

Attention: If the uninterruptible power supply is only connected to this SAN Volume Controller, the uninterruptible power supply powers off within five minutes of a node-rescue process failure. (An example of a node rescue-process failure would be because a donor node cannot be found.) When the problem that is preventing node rescue has been resolved the uninterruptible power supply must be powered on before powering on the SAN Volume Controller.

Related topics:
- "Node rescue request" on page 63

300

Explanation: The SAN Volume Controller is running node rescue.

Action: If the progress bar has been stopped for at least two minutes, exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:
   Service controller (100%)

Related Topics:
- "Removing the service controller from the SAN Volume Controller" on page 147

310

Explanation: The SAN Volume Controller is running a format operation.

Action: If the progress bar has been stopped for two minutes, exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:
   Disk drive assembly (100%)

Related Topics:
- "Removing the disk drive" on page 152

320

Explanation: A SAN Volume Controller format operation has failed.

Action: Exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Disk drive assembly (100%)

Related Topics:

- "Removing the disk drive" on page 152

330

Explanation: The SAN Volume Controller is partitioning its disk drive.

Action: If the progress bar has been stopped for two minutes, exchange the FRU for a new FRU.

Possible Cause-FRUs or other:

Disk drive assembly (100%)

Other:

Configuration problem.
Software error.

Related Topics:

- "Removing the disk drive" on page 152

340

Explanation: The SAN Volume Controller is searching for donor node at 2Gb.

Action: If the progress bar has been stopped for more than two minutes, exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Fibre-channel adapter (100%)

Related Topics:

- "Removing an adapter" on page 161

345

Explanation: The SAN Volume Controller is searching for donor node at 1 GB.

Action: If the progress bar has stopped for more than two minutes, exchange the FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Fibre-channel adapter (100%)

Related Topics:

- "Removing an adapter" on page 161

350

Explanation: The SAN Volume Controller cannot find a donor node.

Action: If the progress bar has been stopped for more than two minutes, perform the following steps:

1. At least one Fibre Channel port must be operational to enable the node to be recovered. From the front panel, display the status of the fibre-channel Ports. If none of the ports have a status of Active, see MAP 5600: Fibre-channel.

2. Ensure that at least one other node is operational and connected to the same fibre-channel network.

3. Do the problem determination procedures for the network.

Possible Cause-FRUs or other:

None

Other:

Fibre-channel network problem.

Related Topics:

- "MAP 5600: Fibre-channel" on page 134

360

Explanation: The SAN Volume Controller is loading software from the donor.

Action: If the progress bar has been stopped for at least two minutes, restart the node rescue procedure.

Possible Cause-FRUs or other:

None

Related Topics:

370

Explanation: The SAN Volume Controller is installing software.

Action:

1. If this code is displayed and the progress bar has been stopped for at least ten minutes the software install process has failed with an unexpected software error.

2. Power off the SAN Volume Controller and wait for 60 seconds.

3. Power on the SAN Volume Controller. The software upgrade operation will continue.

4. Report this problem immediately to your Software Support Center.

Possible Cause-FRUs or other:

None

Understanding the node error codes

Node error codes are displayed on the display screen by node software. Each code indicates that a critical error has been detected that prevents the node from becoming a member of a cluster. Line 1 of the menu screen contains the message Node Error. Line 2 contains either the error code, or the error code and additional data. See Figure 78) for an example of a node error code. This data might exceed the maximum width of the menu screen. You can press the Right navigation to scroll the display.

```
Node Error:
550   000125
```

Figure 78. Example of a displayed node error code

The additional data is unique for any error code. It provides necessary information that enables you to isolate the problem in an offline environment. Examples of additional data are disk serial numbers and FRU location codes. When these codes are displayed, you can do additional fault isolation by navigating the default menu to determine the node and fibre-channel port status.

510

Explanation: The detected memory size for this SAN Volume Controller does not match the expected memory size for the cluster. The detected memory size, in MB, is the first number following the error code. The expected memory size for the cluster is the second number following the error code. This problem might have occurred because you have exchanged failing memory modules and have installed the wrong size modules.

Action: Check the memory size of another SAN Volume Controller that is in the same cluster, then exchange the memory modules in this SAN Volume Controller for modules of the correct size.

Possible Cause-FRUs or other:

Memory module (100%)

Related Topics:

• "Removing the memory modules" on page 160

511

Explanation: Memory bank 1 of the SAN Volume Controller is failing.

Action: Exchange both memory modules of bank 1 for new modules.

Possible Cause-FRUs or other:

Memory module (100%)

Related Topics:

• "Removing the memory modules" on page 160

513

Explanation: Memory bank 2 of the SAN Volume Controller is failing.

Action: Exchange both memory modules of bank 2 for new modules.

Possible Cause-FRUs or other:

Memory module (100%)

Related Topics:

• "Removing the memory modules" on page 160

520

Explanation: The failing fibre-channel adapter port is shown by the number following the displayed error code. Port number 1 or 2 indicates adapter one. Port number 3 or 4 indicates adapter two.

Action: Exchange the failing FRU for a new FRU. See "Possible Cause-FRUs or other."

Possible Cause-FRUs or other:

Fibre-channel adapter assembly (100%)

Related Topics:

• "Removing an adapter" on page 161

540

Explanation: An Ethernet port has failed on the SAN Volume Controller.

Action: Go to Ethernet map.

Possible Cause-FRUs or other:

Ethernet cable

System board assembly

Other:

The Ethernet cable is disconnected.

Ethernet hub.

Related Topics:

*   "MAP 5500: Ethernet" on page 132
*   "Removing the system board" on page 163

550

Explanation: Unable to form a cluster due to a lack of cluster resources. Supplemental data displayed with this error code will list the missing IDs for the SAN Volume Controllers and the quorum disk controller.

Action:

1. Ensure that the other SAN Volume Controllers in the cluster are powered on and operational.
2. From the front panel, display the fibre-channel port status. If any port is not active, perform the fibre-channel port problem determination procedures.
3. Do the problem determination procedures for the network.
4. The quorum disk failed or cannot be accessed. Perform the problem determination procedures for the disk controller.

Possible Cause-FRUs or other:

None

555

Explanation: Power Domain error. Both SAN Volume Controllers in an I/O group are being powered by the same uninterruptible power supply. The other SAN Volume Controller's ID is displayed with the node error code on the front panel.

Action: Ensure that the configuration is correct and that each SAN Volume Controller is in an I/O group is connected from a separate uninterruptible power supply.

Possible Cause-FRUs or other:

None

Other:

Configuration problem.

558

Explanation: The SAN Volume Controller cannot see the fibre-channel fabric.

Action: Ensure that

1. The fibre-channel network fabric switch is powered-on.

2. At least one fibre-channel cable connects the SAN Volume Controller to the fibre-channel network fabric.
3. At least one fibre-channel adapter is installed in the SAN Volume Controller.
4. Go to the Fibre-channel MAP. See MAP 5600: Fibre-channel.

Possible Cause-FRUs or other:

None

Related Topics:

*   "MAP 5600: Fibre-channel" on page 134

560

Explanation: The fibre-channel network fabric is too big. The configuration is not valid.

Action:

1. Ensure that all the fibre-channel connections are correct.
2. Reboot the SAN Volume Controller.

Possible Cause-FRUs or other:

None

Other:

See the *IBM TotalStorage SAN Volume Controller: Configuration Guide*.

562

Explanation: The hardware configuration is not valid. This error has probably been caused by a service action error when replacing FRUs.

Action:

1. Ensure that the SAN Volume Controller hardware is correct.
2. Reboot the SAN Volume Controller.

Possible Cause-FRUs or other:

None

564

Explanation: This SAN Volume Controller node is repeatedly crashing because of a software failure.

If this is the only node with this problem and if you can still access the data on the virtual disks (VDisks), perform the following actions. If more than one node has this problem or if you cannot access the data on the VDisks, call your support center for assistance.

Action:

1. Use the front panel controls to delete the node from the cluster. To do this:

a. Display Node on the front panel menu. See the SAN Volume Controller menu options.

b. Press the Left or Right buttons until "Create Cluster?" is displayed.

c. Press Select. "Delete Cluster?" is displayed.

d. Press and hold the "Up" button, press and release the "Select" button, release the "Up" button. The node will be deleted from the cluster and will restart.

2. Delete the node from the cluster. See Deleting a node using the SAN Volume Controller Console application on the master console.

3. Add the node back into the cluster. See Adding a node to a cluster using the SAN Volume Controller Console application on the master console.

4. Call your software support center for assistance.

Possible Cause-FRUs or other:

None

Other:

Software error.

Related Topics:

• "Deleting a node using the SAN Volume Controller Console application on the master console" on page 8

• "Adding a node to a cluster using the SAN Volume Controller Console application on the master console" on page 9

570

Explanation: The SAN Volume Controller data is readable, but corrupted. The SAN Volume Controller has been rejected by the cluster.

If this is the only node with this problem and if you can still access the data on the virtual disks (VDisks), perform the following actions. If more than one node has this problem or if you cannot access the data on the virtual disks, call your support center for assistance.

Action: Perform the node rescue recovery procedure. Then, delete then re-add the node. If the problem persists, exchange the FRUs for new FRUs in the sequence shown. See "Possible Cause-FRUs or other".

Possible Cause-FRUs or other:

Disk drive assembly (50%)

System board assembly (50%)

Other:

Software problem.

Related Topics:

• "Removing the disk drive" on page 152

• "Removing the system board" on page 163

572

Explanation: The SAN Volume Controller cannot determine the VPD for a FRU. A FRU in the SAN Volume Controller has been changed, and the VPD is unreadable or unrecognized.

Action:

1. Update the SAN Volume Controller software to the latest level.

2. Exchange the most-recently replaced FRU for a new FRU. See "Possible Cause-FRUs or other"

Possible Cause-FRUs or other:

None

Other:

Software problem.

574

Explanation: The SAN Volume Controller software on this node is corrupted. Recovery is required.

If this is the only node with this problem and if you can still access the data on the virtual disks (VDisks), perform the following actions. If more than one node has this problem or if you cannot access the data on the virtual disks, call your support center for assistance.

Action:

1. Perform the node rescue procedure.

Possible Cause-FRUs or other:

None

Other:

Software problem.

Related Topics:

• "Performing the node rescue" on page 104

576

Explanation: The SAN Volume Controller data cannot be read. The SAN Volume Controller has been rejected from the cluster.

Action: In the sequence shown, exchange the FRUs for new FRUs. See "Possible Cause-FRUs or other".

Possible Cause-FRUs or other:

Disk drive assembly (50%)

System board assembly (50%)

Related Topics:

• "Removing the disk drive" on page 152

• "Removing the system board" on page 163

578

Explanation: This SAN Volume Controller node has lost power without saving data. The node has been rejected by the cluster. The problem has occurred because the node temporarily lost its input power. Power is now present.

if you can still access the data on the virtual disks (VDisks), perform the following actions. If you cannot access the data on the VDisks, call your support center for assistance.

Action:

1. If this error has occurred because power was accidentally removed from this SAN Volume Controller, for example, by pulling out the power cable, you can reintroduce the node to the cluster by deleting the offline node from the cluster and then adding the node back into the cluster.

2. If you cannot determine the cause of the temporary power loss, check that the input power cable is securely connected at both the SAN Volume Controller end and at the uninterruptible power supply end. If the cable is securely connected, follow the sequence shown to exchange the FRUs for new FRUs each time this error reoccurs. See "Possible Cause-FRUs or other" after the last action in this section.

3. This node will be offline. Delete the offline node from the cluster and then add the node back into the cluster.

Possible Cause-FRUs or other:

SAN Volume Controller power cable (25%)

Power supply assembly (25%)

Uninterruptible power supply electronics assembly (10%)

Service controller system board assembly (10%)

System board assembly (10%)

Other:

User error

Related Topics:

* "Removing the power from the SAN Volume Controller" on page 140
* "Removing the SAN Volume Controller power supply" on page 157
* "Removing the uninterruptible power supply electronics" on page 169
* "Removing the service controller from the SAN Volume Controller" on page 147
* "Removing the system board" on page 163

579

Explanation: The SAN Volume Controller has lost power without saving data. When the cluster is available The SAN Volume Controller will rejoin the cluster. However, this SAN Volume Controller cannot access the cluster at this time.

Action:

1. Repair failures on any other SAN Volume Controllers that might be preventing a cluster form being formed.

2. Display the Fibre Channel port status on this SAN Volume Controller and repair any fibre channel paths that do not have a status of **Active**.

3. Verify with the customer that no changes have been made to the fibre channel switch zoning or cabling that might prevent this node being able to access other SAN Volume Controllers in the cluster. If changes have been made then reverse those changes to enable this SAN Volume Controller to rejoin the cluster.

4. If more than one SAN Volume Controller is displaying this error code on its front panel, those SAN Volume Controllers have simultaneously lost power without saving data. This might have been caused by simultaneous failures of SAN Volume Controller power supplies, SAN Volume Controller UPS assemblies or the simultaneous accidental removal of SAN Volume Controller power cables. This might result in the total loss of the cluster. Call your support center for assistance.

Possible Cause-FRUs or other:

User error

Related Topics:

* "Fibre channel port–1 through 4 option" on page 69

580

Explanation: The SAN Volume Controller cannot read the unique ID from the service controller, so the fibre-channel adapters cannot be started.

Action: In the sequence shown, exchange the following FRUs for new FRUs. See "Possible Cause-FRUs or other".

Possible Cause-FRUs or other:

Front panel assembly (50%)

Service controller (50%)

Other:

None.

Related Topics:

* "Removing the front panel from the SAN Volume Controller" on page 144
* "Removing the service controller from the SAN Volume Controller" on page 147

900

Explanation: Cluster recovery required.

Action: Contact the IBM Support Center for assistance.

Possible Cause-FRUs or other:

None.

990

Explanation: Cluster recovery has failed and a software dump has been created.

Understanding the create cluster error codes

Cluster Create error codes are displayed on the menu screen when you are using the front panel to create a new cluster, but the create operation fails. Line 1 of the menu screen contains the message Create Failed. Line 2 shows the error code and, where necessary, additional data.

700

Explanation: All the available unique identifications have been used. Each time a new cluster is created, the SAN Volume Controller service controller creates a unique ID. When 255 clusters have been created, the service controller must be exchanged for a new one.

Action: Use a different node to create the cluster.

Possible Cause-FRUs or other:

| Service controller (100%) ("Removing the service controller from the SAN Volume Controller" on page 147).

710

Explanation: The service controller cannot increase the cluster ID counter. When a new cluster ID is requested

Action: Contact the IBM Support Center for assistance.

Possible Cause-FRUs or other:

None

from the service controller, the service controller is told to increase the ID counter. The new ID is read back for verification. If the ID counter has not been increased, this error code is displayed. This error has occurred because the service controller failed.

Action: Exchange the FRU for a new FRU.

Possible Cause-FRUs or other:

| Service controller (100%) ("Removing the service controller from the SAN Volume Controller" on page 147).

Maintaining the master console

Loss of the master console or any of its functions does not cause loss of customer data or prevent access to customer data. However, it does mean that the customer will not be able to make changes to the storage configuration which could have an impact to customer operations. Ensure that you understand the software that is installed and the potential impact on the customer's storage configuration if any of the various configuration utilities are used improperly.

With the exception of recovering from a disk drive failure in the master console, you perform service tasks on the master console by following your master console's documentation.

Related topics:

- "Recovering from a master console disk drive failure" on page 113

Performing software recovery

This task describes how to do a total software recovery of the master console, using the supplied set of recovery compact discs.

Prerequisites:

Obtain a set of the recovery compact discs.

Steps:

Perform the following steps to recover the software on the master console:

1. Turn the power off to the master console.
2. Insert recovery CD 1.
3. Power on the master console and follow the on-screen instructions.
4. Check each software package and update to the latest level where required, using the supplied CD or by downloading from the Web.
5. The master console software is now reset to manufacturing default settings. You must now perform all the steps in the "Software upgrade strategy using the CLI and the SAN Volume Controller Console" chapter of the *IBM TotalStorage SAN Volume Controller: Configuration Guide* that pertain to changing settings in the master console software.

Recovering from a master console disk drive failure

The hard disk drive in the master console is in the form of a mirrored pair to protect against loss of the master console due to a disk failure. If one of these mirrored pair of disk drives fails and needs to be replaced, perform the following steps:

Steps:

Perform the following steps to recover data from the master console:

1. Right-click the **My Computer** icon on your desktop and select **Manage**.
2. Select **Disk Management**. The hard drives display in the right panel.
3. If the failing disk drive displays, right-click the main volume of the drive and select **Break Mirror**.
4. Shut down the master console and replace the failing disk drive using the procedures detailed in the documentation for your master console. Ensure that the new drive has its jumpers set the same as the drive that is being replaced. The new drive must be the same capacity or larger than the drive being replaced.

   Notes:

   a. It might not be obvious which of the two drives has failed. In this case, reboot with each drive connected in turn to isolate the failed drive.
   b. If the replacement drive has a boot record present, erase it prior to use.
   c. If the master console fails to boot, due to not being able to find the Boot Record, change the boot sequence in the BIOS to the other hard drive
5. Disconnect the fibre-channel cables from the master console making note of where they were connected.
6. Restart the master console.
7. Right-click the **My Computer** icon on your desktop and select **Manage**.
8. Select **Disk Management**. The hard drives display in the right panel.
9. If a disk drive displays in the list marked "Missing", remove it by right-clicking the drive and selecting **Remove Disk**.

10. If the new disk drive has a "no entry sign" displayed on it, right-click it and select **Write Signature**. This removes the "no entry sign."

11. Right-click the new disk drive and select **Upgrade to Dynamic Disk**.

12. Right-click the volume that you want to mirror and select **Add Mirror**. This step starts the Add Mirror Wizard.

13. Use the dialogue boxes that display to configure the second volume.

14. A dialogue box with reference to making changes to the boot.ini file displays. You can safely ignore this.

15. The status of both volumes, the existing drive and the new drive, will change to "Regenerating" and will, after a short period of time, start to show the percentage of regeneration completed. When the regeneration completes, the status should show as "Healthy."

16. Reconnect the fibre-channel cables to the master console.

Replacing the fibre-channel cable or GBICs

This topic describes how to replace the fibre-channel cable or GBIC.

Steps:

Perform the following steps to replace the fibre-channel cable or GBIC:

1. Start by replacing the GBICs on each end of the failing link, one at a time, and checking to see if the problem is resolved. If the new GBIC does not resolve the problem, refit the original GBIC.

2. Disconnect each end of the suspected failing fibre-channel cable.

3. Fit a replacement fibre-channel cable.

4. Check out the repair.
   - If the repair fixes the problem:
     a. Ensure that labels are fitted to each end of the new fibre-channel cable with the same information that was on the original fibre-channel cable.
     b. If it is not possible to easily remove the failed fibre-channel cable, clearly label each end of the cable as failed to avoid future reuse.
   - If the repair does not fix the problem, remove the new fibre-channel cable and reconnect the original fibre-channel cable.

Viewing error information on the master console

All of the SAN Volume Controllers, fibre-channel switches, and Storage, for example, FAStTs, generate SNMP Traps as a result of events, such as errors and configuration changes. The errors are usually sent to IBM Director and are listed in the Director Event Log. You can view all the events with their time stamps that help you to determine which event is most likely to cause a problem.

Example:

For example, the loss of a fibre-channel path/link due to a cable or GBIC fault could result in a number of different events being logged to the Director Event Log from the devices at each end of the failing cable, such as a SAN Volume Controller, fibre-channel switch, or storage.

Some SAN component communication, such as fibre-channel path errors, can also be seen in the Tivoli SAN Manager topology displays. The link and/or component are shown in red. If the problem is intermittent , you might see the component

shown in yellow. For example, you might see the component shown in yellow if there is a loss of the link and now the link is restored.

Loss of just a component (shown in red) without the loss of the fibre-channel path (still showing in black) to it can indicate an IP connection problem between the master console and the component. Loss of the IP connection between the master console and a host can, if that host is the only Host with a Tivoli SAN Manager Agent installed, that has VDisks assigned from that SAN Volume Controller cluster, result in one or more SAN Volume Controllers also showing in red.

If you identify a fibre-channel path/link problem, the failure might be the fibre-channel cable, GBICs, SAN component, or host adapter at ends of the failing link.

To resolve the problem, you might need to see the following information:
- Service documentation for the link end device involved (SAN Volume Controller, fibre-channel switch, FAStT, host)

If you identify a particular SAN Component failure, refer to the service documentation for that component to resolve the problem. The master console C:\Documents directory contains copies of the various component documentation.

Related topics:
- "Replacing the fibre-channel cable or GBICs" on page 114

SAN problem determination

The procedures to service the SAN Volume Controller that are provided in this chapter help you solve problems on the SAN Volume Controller and its connection to the storage area network.

Context:

SAN failures might cause the SAN Volume Controller cluster to be unable to form or they might cause SAN Volume Controller disks to be inaccessible to host systems. Failures can be caused by SAN configuration changes or by hardware failures in SAN components.

Steps:

If you were sent here from the Maintenance Analysis Procedures or error codes in this chapter, then perform the following steps:
1. If the customer has changed the SAN configuration by changing the fibre-channel cable connections or switch zoning, ask the customer to verify that the changes were correct and, if necessary, reverse those changes.
2. Verify that the power is turned on to all switches and RAID controllers that the SAN Volume Controller uses, and that they are not reporting any hardware failures. If problems are found, resolve those problems before proceeding further.
3. Verify that the fibre-channel cables that connect the SAN Volume Controllers to the switches are securely connected.
4. If the customer is running a SAN management tool that you are familiar with and that you have access to, use that tool to view the SAN topology and isolate the failing component. If the customer is not using any other SAN management

tool, start Tivoli SAN Manager (TSanM) on the master console and use that tool to view the SAN topology and isolate the failure. For details of performing SAN problem determination with TSanM, contact the Tivoli Storage Area Network (SAN) support center.

Related topics:
- www.ibm.com/storage/support/2145
- "MAP 5000: Start" on page 118

Chapter 7. Maintenance analysis procedures (MAPs)

This topic provides maintenance analysis procedures (MAPs) that tell you how to analyze a failure that occurs in a SAN Volume Controller.

With the MAPs, you can isolate the field replaceable units (FRUs) of the SAN Volume Controller that fail. This chapter provides the following MAPs:
- Start
- Power
- Uninterruptible Power Supply
- Uninterruptible Power Supply repair verification
- Front panel
- Ethernet
- Fibre-channel
- Repair verification

Note: Start all problem determination procedures and repair procedures with "MAP 5000: Start" on page 118.

Using the MAPs

To allow concurrent maintenance, you must configure the SAN Volume Controllers in pairs. When you service one SAN Volume Controller, the other keeps the SAN operational. With concurrent maintenance, all FRUs can be removed, replaced, and tested on one SAN Volume Controller while the SAN and host systems are powered on and doing productive work.

Note: Unless you have a particular reason to do so, do not remove the power from both SAN Volume Controllers unless these instructions tell you to do so.

Steps:
- To isolate the FRUs in the failing SAN Volume Controller, complete the actions and answer the questions given in these MAPs.
- When instructed to exchange two or more FRUs in sequence:
  1. Exchange the first FRU in the list for a new one.
  2. Verify that the problem is solved.
  3. If the problem remains:
     a. Reinstall the original FRU.
     b. Exchange the next FRU in the list for a new one.
  4. Repeat steps 2 and 3 until either the problem is solved, or all the related FRUs have been exchanged.
  5. Complete the next action indicated by the MAP.
  6. If the MAPs are being used due to a cluster error code, following the repair, mark the error as fixed in the cluster error log before completing the actions in the Repair Verification MAP.

MAP 5000: Start

This MAP is the entry point to the MAPs for the SAN Volume Controller.

Prerequisites:

If you are not familiar with these MAPs, read "Using the MAPs" first.

Context:

You might have been sent here for one of the following reasons:
- The web-based Directed Maintenance procedure sent you here.
- A problem occurred during the installation of a SAN Volume Controller.
- Another MAP sent you here.
- A customer observed a problem that was not detected by the system.

SAN Volume Controllers are configured in pairs. While you service one SAN Volume Controller, the other permits access to all the storage managed by the pair. With concurrent maintenance, all FRUs can be removed, replaced, and tested on one SAN Volume Controller while the SAN and host systems are powered on and doing productive work

Note: Unless you have a particular reason to do so, do not remove the power from both SAN Volume Controllers unless these instructions tell you to do so.

Steps:

Perform the following steps:
1. **Were you sent here from a Directed Maintenance Procedure?**

   NO   Go to step 2

   YES Go to step 8 on page 119
2. (from step 1)

   Find the master console that is used to access the SAN Volume Controller cluster. This is normally located in the same rack as the SAN Volume Controllers but might be located in another rack if the master console is used to support more than one SAN Volume Controller cluster.
3. (from step 2)

   Log on to the master console using the user ID and password provided by the customer.
4. (from step 3)

   Log in to the SAN Volume Controller Console using the user ID and password provided by the customer, and launch the SAN Volume Controller application for the cluster you are repairing.
5. (from step 4)

   Does the SAN Volume Controller application start?

   NO   Go to step 8 on page 119.

   YES Go to step 6.
6. (from step 5)

   When the SAN Volume Controller cluster that you want to service is selected, is the Welcome panel displayed?

NO   Go to step 8.

YES   Go to step 7.

7. (from steps 1, 5, and 6)

   Start the Directed Maintenance Procedures.

   Did the maintenance procedures find an error that needs to be fixed?

   NO   Go to step 8.

   YES   Follow the Directed Maintenance Procedures.

8. (from steps 1, 5, 6, and 7)

   Is the power light on any SAN Volume Controller front panel off or flashing?

   NO   Go to step 9.

   YES   Go to power map.

9. (from step 8)

   Is the front panel check light on any SAN Volume Controller illuminated?

   NO   Go to step 10.

   YES   The service controller for the SAN Volume Controller failed.

       a. Replace the service controller in the SAN Volume Controller with the check light on.

       b. Go to the Repair Verification MAP.
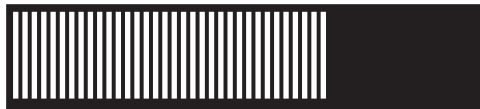
10. (from step 9)

Figure 79. Hardware boot display

   Is the hardware boot display that you see in Figure 79 displayed on any of the SAN Volume Controllers?

   NO   Go to step 12.

   YES   Go to step 11.

11. (from step 10)

   Has the hardware boot display that you see in Figure 79 displayed for more than three minutes?

   NO   Go to step 12.

   YES

       a. Go to Determining a hardware boot failure.

       b. Go to the Repair Verification MAP.

12. (from steps 10 and 11)

   Is `Failed` displayed on the top line of the service display of any SAN Volume Controller?

   NO   Go to step 13 on page 120.

   YES

       a. Note the failure code. Go to Understanding the Boot codes and perform the repair actions.

b. Go to the Repair Verification MAP

13. (from step 12)

Is Booting displayed on the top line of the service display of any SAN Volume Controller?

NO Go to step 15.

YES Go to step 14.

14. (from step 13)

A progress bar and a boot code are displayed. If the progress bar does not advance for more than three minutes it has stalled.

Has the progress bar stalled?

NO Go to step 15.

YES

a. Note the failure code. Go to Understanding the Boot codes and perform the repair actions.
b. Go to the Repair Verification MAP.

15. (from steps 13 and 14)

If any of the navigation buttons on the front panel have been pressed, you should now wait for sixty seconds to ensure that the display has switched to its default display.

Is Node Error displayed on the top line of the service display of any SAN Volume Controller?

NO Go to step 16.

YES

a. Note the failure code. Go to Understanding the node error codes and perform the repair actions.
b. Go to the Repair Verification MAP.

16. (from step 15)

Is Cluster Error displayed on the top line of the service display of any SAN Volume Controller?

NO Go to step 17.

YES

a. A cluster error has been detected. This error code will be displayed on all the operational nodes in the cluster. This type of error should normally be repaired using the Directed Maintenance Procedures. If you are unable to start the directed maintenance procedures then go to Cluster error codes and perform the repair actions.
b. Go to the Repair Verification MAP.

17. (from step 16)

Is Powering Off, Restarting, Shutting Down, or Power Failure displayed in the top line of the service display?

NO Go to step 19.

YES The progress bar will move every few seconds. Wait for the operation to complete and then return to step 1 on page 118 in this MAP. If the progress bar does not move for three minutes, press the power button and go to step 18 on page 121.

18. (from step 17)

    Did the SAN Volume Controller power off?

    NO

        a. Remove the power cord from the rear of the box.

        b. Wait 60 seconds.

        c. Replace the power cord.

        d. If the node does not power on, press the power button to power on the SAN Volume Controller, then return to step 1 on page 118 in this MAP.

    YES

        a. Wait 60 seconds.

        b. Press the power button to power on the SAN Volume Controller, then return to step 1 on page 118 in this MAP.

        Note: If the SAN Volume Controller is powered off for more than five minutes and it is the only SAN Volume Controller connected to the uninterruptible power supply, the uninterruptible power supply will also power off. Before pressing the power button on the SAN Volume Controller you will need to press the power on button on the uninterruptible power supply.

19. (from step 18)

    Is Charging or Recovering displayed in the top line of the service display of any SAN Volume Controller?

    NO   Go to step 20.

    YES   If Charging is displayed the uninterruptible power supply battery is not yet charged sufficiently to support the SAN Volume Controller. If this is displayed for more than three hours go to the Uninterruptible power supply MAP. If Recovering is displayed the uninterruptible power supply battery is not yet charged sufficiently to be able to support the SAN Volume Controller immediately following a power supply failure, however, while Recovering is displayed the SAN Volume Controller Controller can be used normally. If Recovering is displayed for more than two hours go to the Uninterruptible power supply MAP.

20. (from step 19)

    Is the service display unreadable?

    NO   Go to step 21.

    YES

        a. The display might be set to another language.

        b. If the language is set correctly, go to front panel map.

21. (from step 20)

    No errors have been detected by the SAN Volume Controller. If you suspect that the problem reported by the customer is a hardware problem perform the following tasks:

    a. Perform problem determination procedures on your host systems, disk controllers, and fibre channel switches.

    b. Ask your hardware support center for assistance.

If you suspect that the problem is a software problem, go to Installing and maintaining the software for the SAN Volume Controller.

Related topics:
- "Using the MAPs" on page 117
- "Determining a hardware boot failure" on page 100
- "Understanding the node error codes" on page 108
- "MAP 5400: Front panel" on page 130
- "Navigating through the change language menu" on page 73
- "Using the SAN Volume Controller Console application on the master console" on page 3
- "Defining cluster error codes" on page 84
- "Using directed maintenance procedures" on page 34
- "MAP 5700: Repair verification" on page 137
- "Understanding the boot codes" on page 100
- "MAP 5200: Uninterruptible power supply" on page 124
- Chapter 3, "Installing and maintaining the software for the SAN Volume Controller," on page 51
- "MAP 5100: Power"

MAP 5100: Power

This map helps you to solve problems that have occurred on the SAN Volume Controller power.

Prerequisites:

If you are not familiar with these MAPs, read "Using the maps" first.

Context:

You might have been sent here for one of the following reasons:
- A problem occurred during the installation of a SAN Volume Controller system, the Power On switch failed to turn the node on.
- Another MAP sent you here.

Steps:

Perform the following steps:

1.

    Press the Power On switch on the SAN Volume Controller front panel.

    Is the Power On indicator on the SAN Volume Controller front panel illuminated a solid green?

    NO   Go to step 2.

    YES   The Power On indicator on the front panel shows that the SAN Volume Controller has successfully powered on. Continue with the repair verification MAP to verify the correct operation.

2. (from step 1)

    Is the System board power LED indicator on the SAN Volume Controller rear panel flashing green?

| **NO**   Go to step 3.

| **YES**   The System board power LED indicator on the node rear panel shows
| that power is present at the power supply but the power on switch
| failed to turn the node on.

| • Replace the parts in the following sequence:

| – Power supply unit.

| – Service controller.

| – Front panel assembly.

| – System board assembly.

| • Verify the repair by continuing with the repair verification MAP.

3. (from step 2 on page 122)

| **Is the System board power LED indicator on the SAN Volume Controller rear**
| **panel illuminated a solid green?**

    NO   Go to step 4.

| **YES**   The System board power LED indicator on the node rear panel shows
| that power on the SAN Volume Controller is on, but is not being
| displayed on the front panel Power On indicator.

| • Replace the parts in the following sequence:

| – Service controller.

| – Front panel assembly.

| – System board assembly.

| • Verify the repair by continuing with the repair verification MAP.

4. (from step 3)

Does the uninterruptible power supply powering this SAN Volume
Controller node have its mode indicator a solid green?

    NO   Refer to the uninterruptible power supply map.

    YES   Go to step 5.

5. (from step 4)

Does the uninterruptible power supply powering this SAN Volume
Controller node have all of its circuit breakers on?

    NO   Go to step 6.

    YES   The input power to the SAN Volume Controller node is missing. Verify
    that the power cord assembly is correctly plugged into the SAN
    Volume Controller and the uninterruptible power supply.

    • Replace the parts in the following sequence:

    – Power supply assembly.

    – Power cord assembly.

    – Verify the repair by continuing with the repair verification MAP.

6. (from step 5)

One of the uninterruptible power supply's circuit breakers has tripped. Reset
the tripped circuit breaker to On.

Does the uninterruptible power supply's circuit breaker remain on?

    NO   Go to step 7.

    YES   Verify the repair by continuing with the repair verification MAP.

7. (from step 6)

One of the uninterruptible power supply's output loads caused a circuit breaker to trip. Remove each of up to four SAN Volume Controller node power cables in turn, and try to reset the circuit breakers to On.

Does the removal of any SAN Volume Controller node power cables enable the circuit breaker to remain on?

NO   Uninterruptible power supply output circuit breaker is faulty.

        a. Replace the uninterruptible power supply assembly.

        b. Go to "MAP 5300: Uninterruptible power supply repair verification."

YES   The input power current to the SAN Volume Controller node is too high.

        a. Replace the parts in the following sequence

            1) Power supply assembly.

            2) Power cord assembly

        b. Verify the repair by continuing with the repair verification MAP.

Related topics:

- "SAN Volume Controller front panel controls and indicators" on page 24
- "SAN Volume Controller rear panel indicators" on page 26
- "Removing the SAN Volume Controller power supply" on page 157
- "Removing the service controller from the SAN Volume Controller" on page 147
- "Removing the front panel from the SAN Volume Controller" on page 144
- "Removing the system board" on page 163
- "MAP 5700: Repair verification" on page 137
- "Hardware for the uninterruptible power supply" on page 48
- "MAP 5300: Uninterruptible power supply repair verification" on page 128
- "Removing the SAN Volume Controller power supply" on page 157
- "Removing the uninterruptible power supply" on page 166
-

MAP 5200: Uninterruptible power supply

This map helps you to solve problems that have occurred in the uninterruptible power systems used on a SAN Volume Controller.

Prerequisites:

If you are not familiar with these MAPs, read using the maps first.

Context:

You might have been sent here for one of the following reasons:

- The system problem determination procedures sent you here.
- A problem occurred during the installation of a SAN Volume Controller.
- Another MAP sent you here.
- A customer observed a problem that was not detected by the system problem determination procedures.

Figure 80 shows an illustration of the front of the panel for the uninterruptible power supply.

1	Mode indicator	**2**	On button
3	Off button	**4**	Test/alarm reset button
5	Load level indicator	**6**	Site wiring fault indicator
7	Battery mode indicator	**8**	Battery power indicator
9	General alarm		
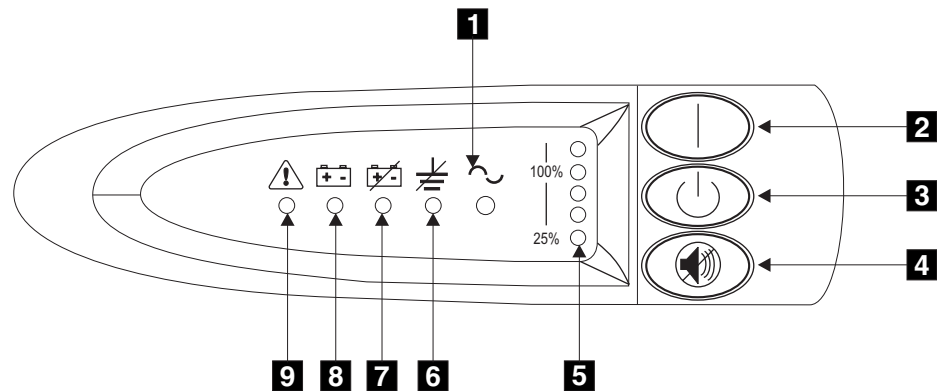
Figure 80. Uninterruptible power supply front panel assembly

Steps:

Perform the following steps:

1.

   Is the uninterruptible power supply connected to the failing SAN Volume Controller, Mode indicator off?

   NO   Go to step 3.

   YES   Go to step 2.

2. (from step 1)

   Are other uninterruptible power supplies showing Mode indicator off?

   NO   Power supply to this uninterruptible power supply is faulty or not connected correctly.

   a. Ask the customer to check the site power connection to this uninterruptible power supply.

   b. If input power connection is okay, replace the FRUs in the following sequence:

      1) Uninterruptible power supply power cord

      2) Uninterruptible power supply electronics assembly

      3) Uninterruptible power supply assembly

   c. Verify the repair by continuing with the uninterruptible power supply repair verification MAP.

   YES   Main power is missing from installation

   a. Restore main power to installation

   b. Verify the repair by continuing with the uninterruptible power supply repair verification MAP.

3. (from step 1)

Is the uninterruptible power supply Mode indicator illuminated and flashing green?

NO   Go to step 4.

YES   The uninterruptible power supply is in standby mode. This may be because the SAN Volume Controllers powered by this uninterruptible power supply have been powered off for more than five minutes, or the Off button on this uninterruptible power supply has been pressed.

   a. Press and hold the On button until you hear the uninterruptible power supply beep (approximately one second) and the Power On indicator shows solid green. If the Mode indicator does not change to solid green replace the uninterruptible power supply electronics assembly.

   b. Verify the repair by continuing with the uninterruptible power supply repair verification MAP.

4. (from step 3)

   Is the Mode indicator illuminated solid red?

   NO   Go to step 8 on page 127.

   YES   The uninterruptible power supply is in bypass mode. Go to step 5

5. (from step 4)

   Is the uninterruptible power supply Overload Load Level indicator illuminated red?

   NO   Go to step 6.

   YES   The uninterruptible power supply output power requirement exceeded the uninterruptible power supply capacity.

   a. Check that no more than four SAN Volume Controller nodes are connected to the uninterruptible power supply.

   b. Check that only SAN Volume Controller nodes are connected to the uninterruptible power supply.

   c. After ensuring output loading is correct, turn off and unplug the input power from the uninterruptible power supply. Wait at least 5 seconds until all LEDs are off and restart the uninterruptible power supply by reconnecting to input power and pressing the On button until you hear the uninterruptible power supply beep (approximately one second).

   d. If the condition persists, call the IBM support center.

   e. Verify the repair by continuing with the uninterruptible power supply repair verification MAP.

6. (from step 5)

   Is the uninterruptible power supply General Alarm indicator illuminated and flashing red? (This will cause a continuous audible alarm)

   NO   Go to step 7 on page 127.

   YES   The uninterruptible power supply internal temperature is too high.

   a. Turn off and unplug the uninterruptible power supply. Clear vents at the front and rear of the uninterruptible power supply. Remove any heat sources. Ensure the airflow around the uninterruptible power supply is not restricted.

b. Wait at least 5 minutes and restart the uninterruptible power supply by reconnecting to input power and pressing the On button until you hear the uninterruptible power supply beep (approximately one second).

c. If the condition persists, replace the uninterruptible power supply electronics assembly.

d. Verify the repair by continuing with the uninterruptible power supply repair verification MAP.

7. (from step 6)

Is the uninterruptible power supply Battery Mode indicator illuminated and flashing red? (This causes an audible beep every five seconds).

NO The uninterruptible power supply is in bypass mode because of an internal uninterruptible power supply fault.

a. Replace in turn
- Uninterruptible power supply electronics assembly
- Uninterruptible power supply battery assembly
- Uninterruptible power supply assembly

b. Verify the repair by continuing with the uninterruptible power supply repair verification MAP.

YES The uninterruptible power supply battery might be fully discharged or not connected correctly.

a. Check that the uninterruptible power supply Battery assembly is installed correctly.

b. Check that the uninterruptible power supply has been connected to a power outlet for at least 3 hours to charge the battery. After charging the battery, press and hold the Test/Alarm Reset Button for 3 seconds; then check the Battery Mode indicator.

c. If the Battery Mode indicator is still on, replace the uninterruptible power supply Battery assembly.

d. Verify the repair by continuing with the uninterruptible power supply repair verification MAP.

8. (from step 4

Is the uninterruptible power supply Wiring Fault indicator illuminated and flashing red? (This causes an audible beep every five seconds).

NO Go to step 9.

YES The uninterruptible power supply ground wire connection does not exist or the power input line and neutral wires are reversed.

a. Check the grounding of the uninterruptible power supply.

b. Ask the customer to check the uninterruptible power supply input power connection.

c. Verify the repair by continuing with the uninterruptible power supply repair verification MAP.

9. (from step 8)

Is the uninterruptible power supply Mode indicator flashing red? (This causes an audible beep every five seconds).

NO Go to step 10 on page 128.

YES The uninterruptible power supply is receiving input power that may be unstable or outside the specified voltage or frequency range. The SAN

Volume Controller automatically adjusts the uninterruptible power supply voltage range. If the input voltage has recently changed, the alarm condition might be present until the SAN Volume Controller has adjusted the alarm setting. Ensure that an operational SAN Volume Controller is connected to the uninterruptible power supply. If the condition persists for at least five minutes, do the following:

   a. Ask the customer to check the site power for the uninterruptible power supply providing power to this SAN Volume Controller. Check the connection, voltage, and frequency.

   b. If input power is okay, replace the uninterruptible power supply electronics assembly.

   c. Verify the repair by continuing with the uninterruptible power supply repair verification MAP.

10. (from step 9

   Are the uninterruptible power supply General Alarm, Battery Power, Battery Mode, Wiring Fault, Mode indicators illuminated and flashing red? (This causes a continuous audible alarm).

   NO   The uninterruptible power supply is no longer showing a fault. Verify the repair by continuing with the uninterruptible power supply repair verification MAP.

   YES   The uninterruptible power supply is reporting a fault condition.

      a. Replace in turn:
         • Uninterruptible power supply electronics assembly
         • Uninterruptible power supply battery assembly
         • Uninterruptible power supply assembly

      b. Verify the repair by continuing with the uninterruptible power supply repair verification MAP.

   Related topics:
   • "MAP 5300: Uninterruptible power supply repair verification"
   • "Checking the grounding of the SAN Volume Controller and the uninterruptible power supply" on page xvi
   • "Removing the power from the uninterruptible power supply" on page 141

MAP 5300: Uninterruptible power supply repair verification

This MAP helps you to verify that FRUs that you have exchanged for new FRUs, or repair actions that have been done, have solved all the problems on the SAN Volume Controller uninterruptible power supply.

Prerequisites:

If you are not familiar with these MAPs, read "Using the MAPs" first.

Context:

You might have been sent here because you have performed a repair and want to confirm that no other problems exist on the machine.

Attention: If a SAN Volume Controller is powered off for more than five minutes and it is the only SAN Volume Controller connected to this uninterruptible power supply, the uninterruptible power supply will also power off. To power on the uninterruptible power supply, press and hold the On button until you hear the uninterruptible power supply beep (approximately one second) and the Mode indicator shows solid green.

Steps:

Perform the following steps:

1.

   Is the mode indicator for the repaired uninterruptible power supply illuminated solid green and the load level indicators showing an output load level between 25% and 100%?

   NO   Continue with the start MAP.

   YES   Go to step 2.

2. (from step 1)

   Are all SAN Volume Controller nodes powered by repaired uninterruptible power supply Powered On?

   NO   Press `Power On` on all SAN Volume Controller nodes that are powered off. Go to step 3.

   YES   Go to step 3.

3. (from step 2)

   Are any nodes still not Powered On or showing error codes in front panel display?

   NO   Go to step 4.

   YES   Continue with the start MAP.

4. (from step 3)

   Do SAN Volume Controller nodes show Charging on front panel display?

   NO   Go to step 5.

   YES   Wait for Charging display to finish. (This might take up to 60 minutes). Go to step 5.

5. (from step 4)

   Press and hold the `Test/alarm reset button` on the repaired uninterruptible power supply for three seconds to initiate a self-test. During the test individual indicators illuminate as various parts of the uninterruptible power supply are checked.

   Does the alarm beep or a uninterruptible power supply alarm indicator stay on?

   NO   Uninterruptible power supply repair verification has been successfully completed. Continue with the repair verification MAP.

   YES   Continue with the start MAP.

Related topics:
- "Using the MAPs" on page 117
- "MAP 5000: Start" on page 118
- "MAP 5700: Repair verification" on page 137

MAP 5400: Front panel

This map helps you to solve problems that have occurred on the SAN Volume Controller front panel.

Prerequisites:

If you are not familiar with these MAPs, read "Using the MAPs" first.

Context:

You might have been sent here because:
- A problem occurred during the installation of a SAN Volume Controller system, and the front panel display test failed, or the correct Node Number failed to be displayed.
- Another MAP sent you here.

Steps:

Perform the following steps:
1.
   Is the Power On indicator on the SAN Volume Controller front panel illuminated and showing a solid green?

   NO   Continue with the power map.

   YES   Go to step 2.
2. (from step 1)
   Is the Check indicator on the SAN Volume Controller front panel illuminated and showing a solid amber?

   NO   Start the front panel tests by pressing and holding the select button for five seconds. Go to step 3.

   YES   The SAN Volume Controller Service controller has failed. Replace the parts in the following sequence:
      a. Service controller
      b. Front panel assembly

      Verify the repair by continuing with the repair verification MAP.
3. (from step 2)
   The front panel check light will illuminate, and the display test of all display bits turned on for 3 seconds, all display bits turned off for 3 seconds, vertical line travelling left to right followed by horizontal line travelling top to bottom. Test will complete with the switch test display of a single rectangle in the center of the display.

   Did the front panel lights and display behave as described?

   NO   SAN Volume Controller front panel has failed its display test.
   - Replace the parts in the following sequence:
     - Front panel assembly
     - Service controller
   - Verify the repair by continuing with the repair verification MAP.

   YES   Go to step 4 on page 131.

4. (from step 3)

Figure 81 shows four examples of what the front panel display shows when you press no button, up button, left and right button, and select button. To perform the front panel switch test, press any button in any sequence or any combination. The display indicates which buttons you pressed.

No button pressed (border only)

Up button pressed

Left and Right button pressed

Select button pressed
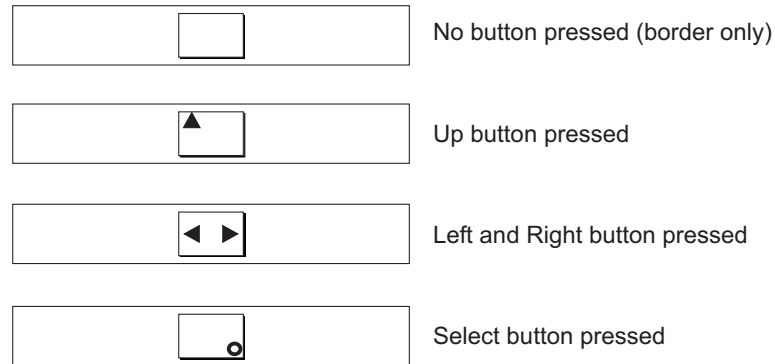
Figure 81. Sequence in which to push buttons on front panel display

Check each switch in turn. Did the service panel switches and display behave as described in Figure 81?

NO The SAN Volume Controller front panel has failed its switch test.
- Replace the parts in the following sequence:
  - Front panel assembly
  - Service controller
- Verify the repair by continuing with the repair verification MAP.

YES Press and hold the Select button for five seconds. Go to step 5.

5. (from step 3)

Is front panel display showing: `Charging` , `Cluster Error` , or `Node Error` ?

NO Go to step 6.

YES Press down. Go to step 6.

6. (from step 5)

Is front panel display now showing its `Default Menu`?

NO Continue with the start MAP.

YES Keep pressing and releasing the Down button until Node is displayed in line 1 of the menu screen. Go to step 7.

7. (from step 6)

Is this MAP being used as part of the installation of a new node?

NO Front panel tests have completed with no fault found. Verify the repair by continuing with the repair verification MAP.

YES Go to step 8.

8. (from step 7)

Is the node number that is displayed in line 2 of the menu screen the same as the node number that is printed on the front panel of the node?

NO Node number stored in front panel electronics is not the same as printed on front panel.

- Replace the front panel assembly.
- Verify the repair by continuing with the repair verification MAP.

YES   Front panel tests have completed with no fault found. Verify the repair by continuing with the repair verification MAP.

Related topics:
- Chapter 8, "Removing and replacing parts," on page 139
- "SAN Volume Controller menu options" on page 66
- "Using the MAPs" on page 117
- "MAP 5100: Power" on page 122
- "MAP 5700: Repair verification" on page 137
- "MAP 5000: Start" on page 118
-

MAP 5500: Ethernet

This map helps you to solve problems that have occurred on the SAN Volume Controller Ethernet.

Prerequisites:

If you are not familiar with these MAPs, read using the maps first.

Context:

You might have been sent here for one of the following reasons:
- A problem occurred during the installation of a SAN Volume Controller system, and the Ethernet checks failed.
- Another MAP sent you here.

Steps:

Perform the following steps:
1.
    Display the Ethernet status, using the Front panel display.
    Does the display read failed?

    NO   Go to step 2.

    YES   Go to step 5 on page 133.
2. Display Node Error if present, using the Front panel display.
    Is the front panel displaying `Node Error` with error code 540?

    NO   Go to step 3.

    YES   Go to step 5 on page 133.
3. (from step 2)
    Display Cluster Error if present, using the Front panel display.
    Is the front panel displaying `Cluster Error` with error code 1400?

    NO   Go to step 4.

    YES   Go to step 5 on page 133.
4. (from step 3)

Display the Ethernet port status, using the Front panel display.

Is the display showing an Ethernet port status status of `Failed`?

NO Go to step 8 on page 134.

YES Go to step 5.

5. (from steps 1 on page 132, 2 on page 132, 3 on page 132, and 4 on page 132)

   Is the green LED on the upper left of the Ethernet port assembly illuminated?

   NO The Ethernet connection between the SAN Volume Controller and the Ethernet network is faulty. If a spare Ethernet cable is available, connect the replacement cable between the lower and upper Ethernet connectors on the back of the SAN Volume Controller. If a spare Ethernet cable is not available select a node with an Ethernet port status of Inactive (this is working but not currently being used). Remove this cable and connect it between the upper and lower Ethernet connectors as described above.

   Note: Remove and retain any blanking plate over the unused upper Ethernet connector. Go to step 6.

   YES Go to step 7.

6. (from step 5)

   Are the green LEDs on the upper left and upper right of the Ethernet port assembly both illuminated?

   NO Ethernet interfaces on the system board assembly are not working correctly.
   - Perform the following tasks:
     – Replace the system board assembly.
     – Verify the repair by continuing with the repair verification MAP.

   YES The Ethernet connection between the SAN Volume Controller and the Ethernet network is faulty.

   Perform the following tasks:
   - Remove the test cable inserted in step 5.
   - Replace any blanking plate retained in step 5 to the upper Ethernet connector.
   - Replace the Ethernet cable with a new cable and display the Ethernet port status. If the status is still Failed:
     a. Use the problem determination procedures for your Ethernet hub to resolve an Ethernet network connection problem.
     b. Verify the repair by continuing with the repair verification MAP.

7. (from step 5)

   Display the Ethernet status, using the Front panel display.

   Is the displayed status failed?

   NO Go to step 8 on page 134.

   YES Ethernet connected LED shows an active Ethernet connection to the SAN Volume Controller. However, service display shows Ethernet Failed
   a. Replace the system board assembly.
   b. Verify the repair by continuing with the repair verification MAP.

8. (from step 7 on page 133.

   A previously reported fault with the Ethernet interface is no longer being shown.

   Check with the customer that the Ethernet interface has not been intentionally disconnected, and that there is no recent history of fixed Ethernet problems with other components of the Ethernet network.

   Is the Ethernet failure explained by the above checks?

   NO Perform steps in the following sequence:
   - a. Replace the Ethernet cable
   - b. Use Ethernet hub problem determination procedure to resolve an Ethernet network connection problem.
   - c. Replace the system board assembly.
   - d. Verify the repair by continuing with the repair verification MAP.

   YES Verify the repair by continuing with the repair verification MAP.

   Related topics:
   - "Removing the system board" on page 163
   - "Using the MAPs" on page 117
   - "MAP 5700: Repair verification" on page 137

MAP 5600: Fibre-channel

This map helps you to solve problems that have occurred on the SAN Volume Controller fibre-channel ports.

Prerequisites:

If you are not familiar with these MAPs, read about using the MAPs first.

Context:

You might have been sent here for one of the following reasons:
- A problem occurred during the installation of a SAN Volume Controller system, and the fibre-channel checks failed.
- Another MAP sent you here.

Steps:

Perform the following steps:

1.

   Display fibre-channel port 1 status on the SAN Volume Controller front panel display. See SAN Volume Controller menu options.

   Is the front panel display on the SAN Volume Controller showing fibre-channel port-1 active?

   NO A fibre-channel port is not working correctly. Check port status on second line of the display.
   - a. **Inactive:** The port is operational but cannot access the fibre-channel fabric. The fibre-channel cable has failed, is not installed, or the device at the other end of the cable has failed. Note port-1. Go to step 6 on page 136.

b. **Failed:** The port is not operational because of a hardware failure. Note port-1. Go to step 7 on page 136.

c. **Not installed:** This port is not installed. Note port-1. Go to step 8 on page 136.

YES Press and release the right button to display fibre-channel port-2 . Go to step 2.

2. (from step 1 on page 134)

Is the front panel display on the SAN Volume Controller showing fibre-channel port-2 active?

NO A fibre-channel port is not working correctly. Check port status on second line of display.

a. **Inactive:** The port is operational but cannot access the fibre-channel fabric. The fibre-channel cable has failed, is not installed, or the device at the other end of the cable has failed. Note port-2. Go to step 6 on page 136.

b. **Failed:** The port is not operational because of a hardware failure. Note port-2. Go to step 7 on page 136.

c. **Not installed:** This port is not installed. Note port-2. Go to step 8 on page 136.

YES Press and release the right button to display fibre-channel port-3 . Go to step 3.

3. (from step 2)

Is the front panel display on the SAN Volume Controller showing fibre-channel port-3 active?

NO A fibre-channel port is not working correctly. Check port status on second line of display.

a. **Inactive:** The port is operational but cannot access the fibre-channel fabric. The fibre-channel cable has failed, is not installed, or the device at the other end of the cable has failed. Note port-3. Go to step 6 on page 136.

b. **Failed:** The port is not operational because of a hardware failure. Note port-3. Go to step 7 on page 136.

c. **Not installed:** This port is not installed. Note port-3. Go to step 8 on page 136.

YES Press and release the right button to display fibre-channel port-4. Go to step 4.

4. (from step 3)

Is the front panel display on the SAN Volume Controller showing fibre-channel port-4 active?

NO A fibre-channel port is not working correctly. Check port status on second line of display.

a. **Inactive:** The port is operational but cannot access the fibre-channel fabric. The fibre-channel cable has failed, is not installed, or the device at the other end of the cable has failed. Note port-4. Go to step 6 on page 136.

b. **Failed:** The port is not operational because of a hardware failure. Note port-4. Go to step 7 on page 136.

c. **Not installed:** This port is not installed. Note port-4. Go to step 8 on page 136.

YES Go to step 5.

5. (from step 4 on page 135)

   A previously reported fault with a fibre-channel port is no longer being shown.

   Check with the customer that fibre-channel ports have not been intentionally disconnected, and that there is no recent history of fixed problems with other components of the fibre-channel fabric.

   Is the Fibre Channel port failure explained by the above checks?

   NO Replace parts in the following order:
   - a. Fibre-channel cables from the SAN Volume Controller to fibre channel network.
   - b. Use the fibre-channel problem determination procedure to resolve any fibre-channel fabric connection problem.
   - c. Fibre-channel adapter assemblies.
   - d. Verify the repair by continuing with the repair verification MAP.

   YES Verify the repair by continuing with the repair verification MAP.

6. (from steps 1 on page 134, 2 on page 135, 3 on page 135, 4 on page 135)

   The noted port on the SAN Volume Controller is displaying a status of inactive. If the noted port still displays a status of inactive.

   Replace parts associated with the noted port in the following order:
   - a. Fibre-channel cables from the SAN Volume Controller to fibre channel network.
   - b. Use the fibre-channel problem determination procedure to resolve any fibre-channel fabric connection problem.
   - c. Fibre-channel adapter assemblies.
   - d. Verify the repair by continuing with the repair verification MAP.

7. (from steps 1 on page 134, 2 on page 135, 3 on page 135, 4 on page 135)

   The noted port on the SAN Volume Controller is displaying a status of failed.

   Replace parts associated with the noted port in the following order:
   - a. Fibre-channel adapter assemblies.
   - b. Verify the repair by continuing with the repair verification MAP.

8. (from steps 1 on page 134, 2 on page 135, 3 on page 135, 4 on page 135)

   The noted port on the SAN Volume Controller is displaying a status of not installed.

   Replace parts associated with the noted port in the following order:
   - a. Fibre-channel adapter assemblies.
   - b. System board assembly.
   - c. Verify the repair by continuing with the repair verification MAP.

Related topics:
- "Using the MAPs" on page 117
- "Fibre channel port–1 through 4 option" on page 69
- "MAP 5700: Repair verification" on page 137
- "SAN problem determination" on page 115

MAP 5700: Repair verification

This MAP helps you to verify that FRUs that you have exchanged for new FRUs, or repair actions that have been done, have solved all the problems on the SAN Volume Controller.

Prerequisites:

If you are not familiar with these MAPs, read about using the maps first.

Context:

You might have been sent here because you performed a repair and want to confirm that no other problems exists on the machine.

Steps:

Perform the following steps:

1.

    Are the Power LEDs on all the SAN Volume Controllers on? See "Power LED" on page 25.

    NO   Go to MAP 5000: Start.

    YES   Go to step 2.

2. (from step 1)

    Are the Check LEDs on all SAN Volume Controllers off? See Check LED.

    NO   Go to MAP 5000: Start.

    YES   Go to step 3.

3. (from step 2)

    Are all the SAN Volume Controllers displaying `cluster` on the top line of the front panel display with the second line blank or displaying a cluster name?

    NO   Go to MAP 5000: Start.

    YES   Go to step 4.

4. (from step 3)

    Using the SAN Volume Controller application for the cluster, you have just repaired, check the status of all configured mdisks.

    Do all mdisks have a status of online?

    NO   If any mdisks have a status of offline, repair the mdisks see "Determining the failing enclosure or disk controller" to locate the disk controller with the offline mdisk. Use the problem determination procedure for the disk controller to repair the mdisk faults before returning to this MAP.

    If any mdisks have a status of degraded repair any SAN and mdisk faults before returning to this MAP.

    If any mdisks show a status of excluded, include managed disks before returning to this MAP.

    Go to MAP 5000: Start.

    YES   Go to step 5.

5. (from step 4)

Using the SAN Volume Controller application for the cluster, you have just repaired, check the status of all configured vdisks.

Do all vdisks have a status of online?

NO   Go to step 6.

YES   Go to step 7.

6. (from step 5)

   Following a repair of the SAN Volume Controller, a number of vdisks are showing a status of offline. Refer the customer to *Recovering from offline VDisks after a node or an I/O group failed* for details on how to resolve this problem. This might be because data on these disks has been lost.

7. (from step 5)

Result:

You have successfully repaired the SAN Volume Controller.

Related topics:
- Chapter 6, "Diagnosing problems with the SAN Volume Controller, the uninterruptible power supply, and the master console," on page 75
- "Defining cluster error codes" on page 84
- "Using the MAPs" on page 117
- "MAP 5000: Start" on page 118
- "Check LED" on page 25
- "Using the SAN Volume Controller Console application on the master console" on page 3
- "SAN problem determination" on page 115
- "Determining the failing enclosure or disk controller" on page 23
- "Using the SAN Volume Controller Console application on the master console" on page 3

Chapter 8. Removing and replacing parts

This task describes how to remove and replace field replaceable units (FRUs) from the SAN Volume Controller and uninterruptible power supply.

Each FRU has its own removal procedure.

Sometimes you will find that a step within a procedure might refer you to a separate procedure within this chapter. You might need to complete the procedure before you can continue with the procedure you started.

Related topics:
- Start all problem determination and repair procedures from "MAP 5000: Start" on page 118.

Enabling concurrent maintenance

To allow concurrent maintenance, SAN Volume Controllers must be configured in pairs.

While one SAN Volume Controller is being serviced, the other keeps the I/O group operational. With concurrent maintenance, all FRUs can be removed, replaced, and tested on one SAN Volume Controller while the SAN and host systems are powered on and doing productive work

Attention: Unless you have a particular reason to do so, do not remove the power from both SAN Volume Controllers unless these instructions tell you to do so.

Preparing to remove and replace parts

Perform the following tasks before you begin to remove and replace parts:

Prerequisites:

First, read the safety precautions. These guidelines in the section will help you work safely when you work with the SAN Volume Controller and uninterruptible power supply.

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

Related topics:
- "Definitions of notices" on page xi

Removing the power from the SAN Volume Controller

This task describes how to remove the power cable from the SAN Volume Controller.

Steps:

Perform the following steps to remove the cable from the SAN Volume Controller:

1. Check the SAN Volume Controller power light. If the light is on **1**, go to step 2. If the light is either off or blinking, power has been removed from the SAN Volume Controller; go to step 4. See Figure 82.
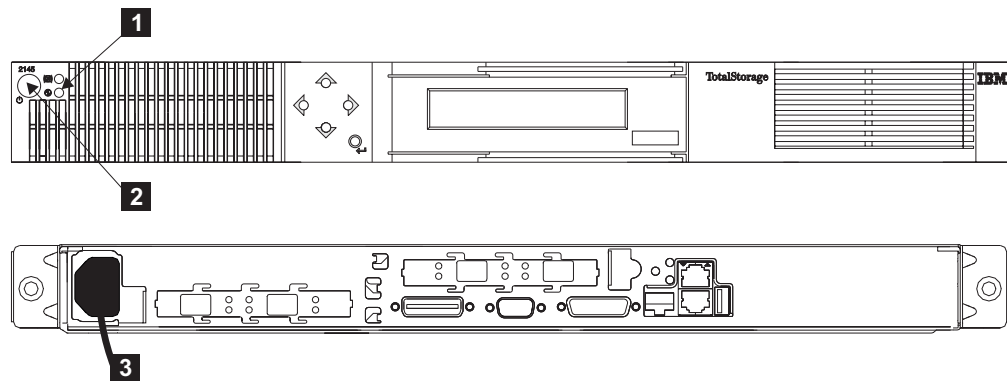
Figure 82. Removing the power cable from a SAN Volume Controller

2. SAN Volume Controllers operate in pairs. The members of each pair are in the same I/O group. Before removing power, determine if the SAN Volume Controller is an active member of the cluster. If you are not certain whether the SAN Volume Controller is being used, check the status of the node (refer to "Viewing general details"). Check the status of SAN Volume Controller that you are planning to power off and the other SAN Volume Controller in the same I/O group. Complete one of the following steps.

   a. If the SAN Volume Controller is offline, go to step 3.

   b. If the SAN Volume Controller from which you want to remove the power is online, but the other SAN Volume Controller in the same I/O group is offline, you must resolve the problem on the SAN Volume Controller that is offline before you continue this repair.

   Attention: If both SAN Volume Controllers are online, removing the power from one SAN Volume Controller will cause some performance degradation because I/O operations are automatically rerouted through the other SAN Volume Controller. You must obtain the customer's agreement before you continue with this procedure.

3. Press and release the power switch **2**. Wait one minute for the SAN Volume Controller to power off. The other SAN Volume Controllers in the cluster might display an error code indicating that a node is missing from the cluster. Ignore this error code; it will be resolved automatically when the repair is complete.

4. Remove the power cable **3** from the back of the SAN Volume Controller.

5. To return power to the SAN Volume Controller, reinstall the power cable **3**.

6. If the SAN Volume Controller does not turn on automatically, press and release the power switch.

Note: If the SAN Volume Controller has been powered off for more than five minutes and it is the only SAN Volume Controller connected to the uninterruptible power supply, the uninterruptible power supply will also power off. Before pressing the power button on the SAN Volume Controller you will need to press the power on button on the uninterruptible power supply.

Related topics:
- "Checking the status of the node" on page 16

Removing the power from the uninterruptible power supply

This task describes how to remove the power cable from the uninterruptible power supply.

Steps:

Perform the following steps to remove the cable from the uninterruptible power supply:

1. Remove the power from each SAN Volume Controller. See "Removing the power from the SAN Volume Controller."
2. See Figure 83. for an illustration of the front and rear view of the uninterruptible power supply.
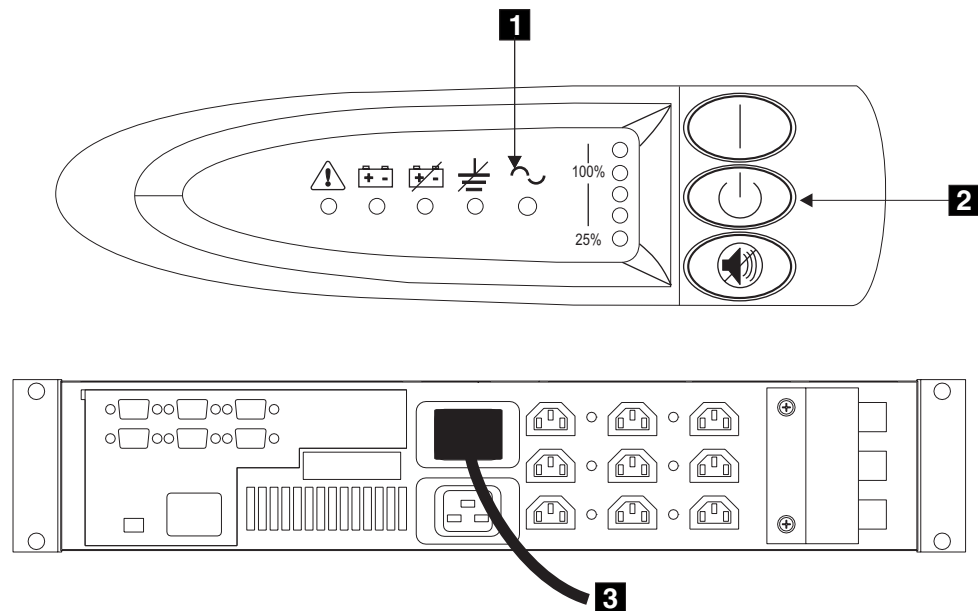
Figure 83. Removing the power cable from a uninterruptible power supply

3. Press and hold the Off switch **2** ; a long beep sounds for approximately five seconds. When the beep stops, release the switch. The /\/ indicator **1** starts to flash, and the uninterruptible power supply enters standby mode.
4. Unplug the the power cable **3** from the main power source.
5. To return power to the uninterruptible power supply, reinstall the power cable. The uninterruptible power supply runs a self-test and enters standby mode.

6. Press and hold the On switch until, after approximately one second, the uninterruptible power supply beeps. The /\/ indicator stops flashing and the load-level indicators show the percentage of load that is being supplied by the uninterruptible power supply.

Related topics:
- "Removing the power from the SAN Volume Controller" on page 140

Removing a SAN Volume Controller from a rack

This task describes how to remove the SAN Volume Controller from a rack.

Prerequisites:

Attention: Unless host systems or fibre channel switches need to be switched off for some other reason, do not turn them off when servicing the SAN Volume Controller. The SAN Volume Controller power cables must not be removed unless the SAN Volume Controller has first been shut down. Ethernet and fibre channel cables can be connected or disconnected at any time.

Steps:

Perform the following steps to remove a SAN Volume Controller from a rack:

1. If not already done:
   a. Remove all power from the SAN Volume Controller.
   b. Make a note of the positions of all the external cables that are connected at the back of the SAN Volume Controller.
   c. Disconnect all the external cables from the back of the SAN Volume Controller.

   Attention: Do not touch the power control switches on adjacent SAN Volume Controllers when removing or installing SAN Volume Controllers in a rack. Touching these switches on adjacent SAN Volume Controllers might cause those devices to power off and make customer data inaccessible.
2. Refer to Figure 84 on page 143

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

CAUTION:
To avoid any hazard from the rack tipping forward when boxes are installed or removed, observe all safety precautions for the rack into which you are installing or removing the device (24).

Figure 84. Unscrewing the front screws
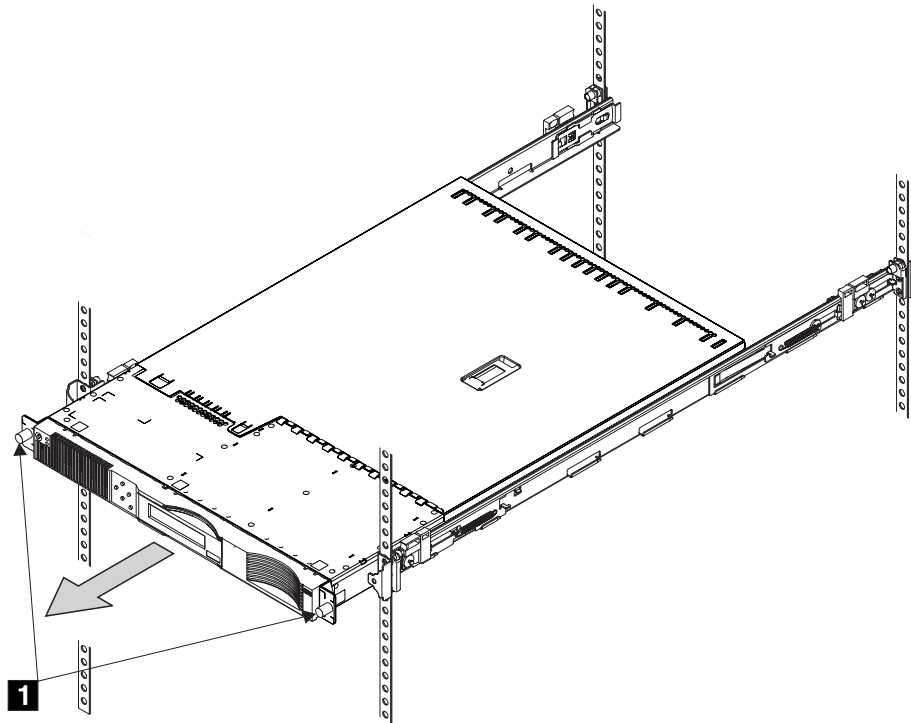
3. Unscrew the two front screws `1`.
4. Pull the SAN Volume Controller forward and remove it from the rack.
5. Reinstall parts in the reverse sequence.

Note: If you have replaced a FRU in the node, the repaired node will normally rejoin the cluster as soon as it is powered-on and has completed its self-tests. There are some exceptions to this, such as when a disk drive has been replaced, or when for some other reason the node has lost its identity or the integrity of its cluster metadata. Under these circumstances, the node will be offline and you will need to delete and add the node back into the cluster.

You can also perform these actions using the command-line interface.

Related topics:
- "Removing the power from the SAN Volume Controller" on page 140
- "Accessing the command-line interface from the master console" on page 12

Removing the front panel from the SAN Volume Controller

The following task describes how to remove the front panel from the SAN Volume Controller.

Steps:

Perform the following steps to remove the front panel from the SAN Volume Controller:

1. Verify with the customer that all operations between the SAN Volume Controller and the host system have been stopped.
2. Remove all power from the SAN Volume Controller.
3. Slide the SAN Volume Controller out from the rack approximately two inches.
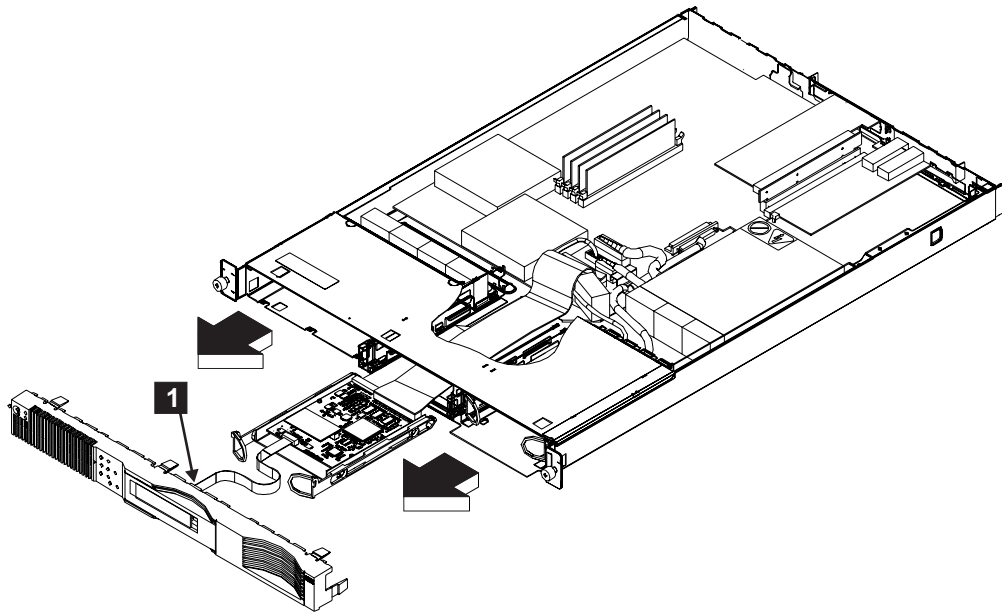
Figure 85. Removing the front panel of the SAN Volume Controller

4. Press the seven latches that are on the top, sides, and bottom of the front panel, then carefully pull the assembly and its attached cable away from the SAN Volume Controller.

   Note: Release the side and end latches first, then pulling the released end of the front panel toward you, release the other latches one by one.
5. Disconnect the connector **1**.

Related topics:
- "Replacing the front panel on the SAN Volume Controller"
- "Removing the power from the SAN Volume Controller" on page 140
- "Removing a SAN Volume Controller from a rack" on page 142
- "Removing the power from the uninterruptible power supply" on page 141

Replacing the front panel on the SAN Volume Controller

The following task describes how to replace the front panel of the SAN Volume Controller.

Steps:

Perform the following steps to replace the front panel of the SAN Volume Controller:

1. Refer to Figure 86.
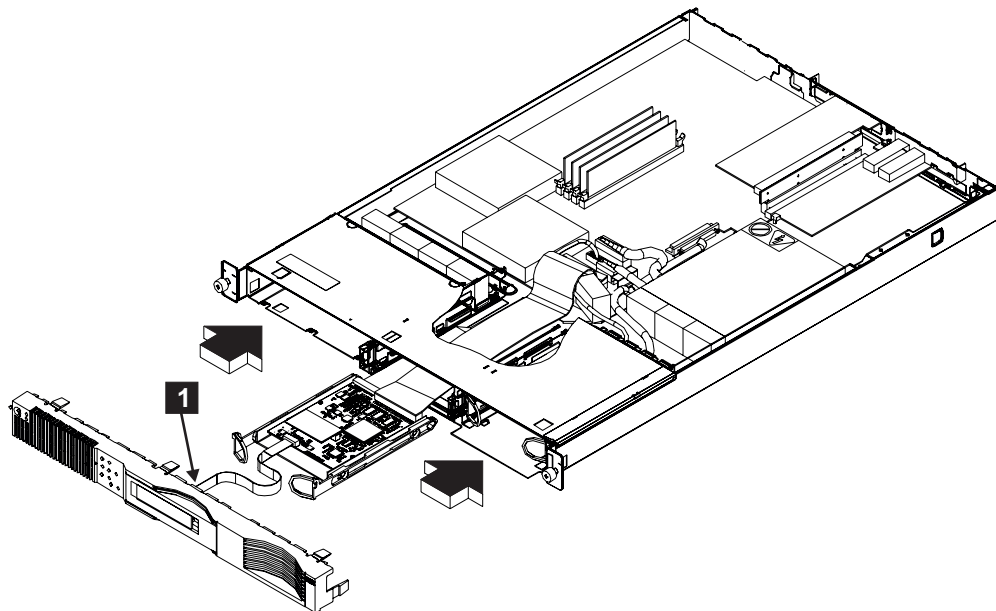
Figure 86. Replacing the front panel

2. Connect the cable **1** to the front panel.
3. Insert the cable into the front of the the SAN Volume Controller.
4. Align the front panel with the front of the SAN Volume Controller, and ensure that the latches enter the frame of the SAN Volume Controller. Push the front panel until you hear the latches click home.

   Note: If you replaced the front panel FRU with a new FRU, go to MAP 5400: Front panel, to perform the steps for the replacement of the front panel.

Related topics:

- "Removing the front panel from the SAN Volume Controller" on page 144
- "MAP 5400: Front panel" on page 130

Top cover

This section provides instructions to remove and replace the top cover of the SAN Volume Controller.

Removing the top cover from the SAN Volume Controller

The following task describes how to remove the top cover from the SAN Volume Controller.

Steps:

Perform the following steps to remove the top cover from the SAN Volume Controller:

1. Remove all power from the SAN Volume Controller.
2. Remove the SAN Volume Controller from the rack.
3. Refer to Figure 87.
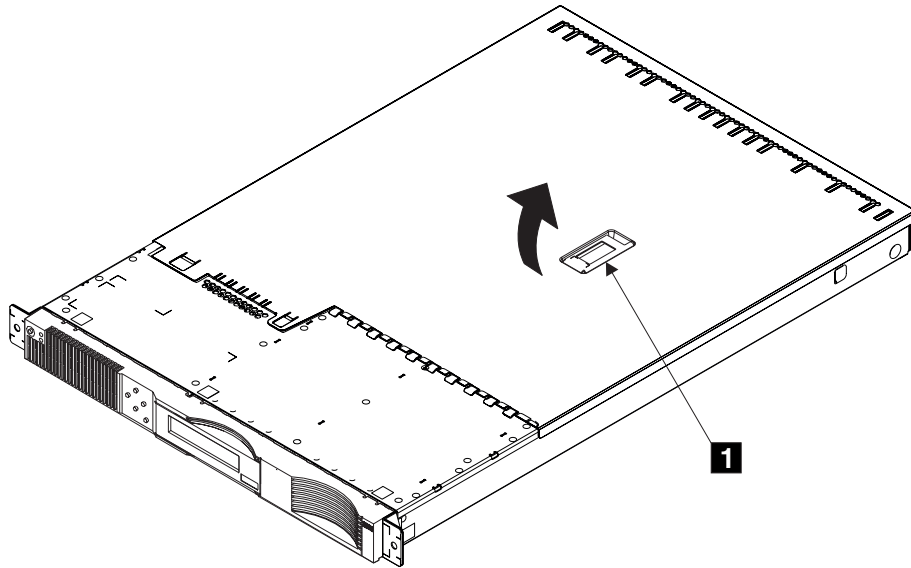
Figure 87. Removing the top cover

4. Lift the lever **1** . This action moves the top cover rearward approximately 13 mm (0.5 in).
5. Lift the front of the cover, then lift the cover away from the SAN Volume Controller.

Related topics:
- "Removing the power from the SAN Volume Controller" on page 140
- "Removing a SAN Volume Controller from a rack" on page 142

Replacing the top cover on the SAN Volume Controller

The following task describes how to replace the top cover on the SAN Volume Controller.

Steps:

Perform the following steps to replace the top cover of the SAN Volume Controller:

1. Refer to Figure 88 on page 147.
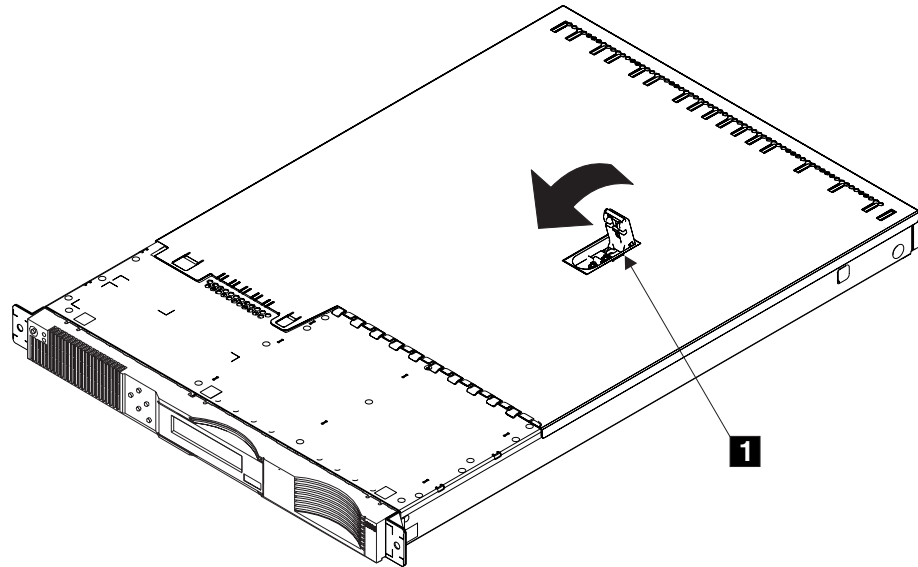
Figure 88. Installing the Top Cover

2. Ensure that the lever **1** is fully up.
3. Place the cover onto the SAN Volume Controller so that about 13 mm (0.5 in.) of the cover protrudes over the back edge of the SAN Volume Controller frame.
4. Press the lever downward. The top cover moves toward the front of the SAN Volume Controller.
5. Ensure that top fingers and back lugs of the cover correctly engage the frame of the SAN Volume Controller.
6. Press the lever fully home.
7. Install the SAN Volume Controller into the rack when required.

Related topics:

- "Removing the top cover from the SAN Volume Controller" on page 145

Removing the service controller from the SAN Volume Controller

The following task describes how to remove the service controller from the SAN Volume Controller.

Note: If you are replacing the service controller as part of a problem determination procedure, you must also replace the cables that are supplied as part of the service controller FRU.

Steps:

Perform the following steps to remove the service controller:

1. Refer to Figure 89 on page 148.
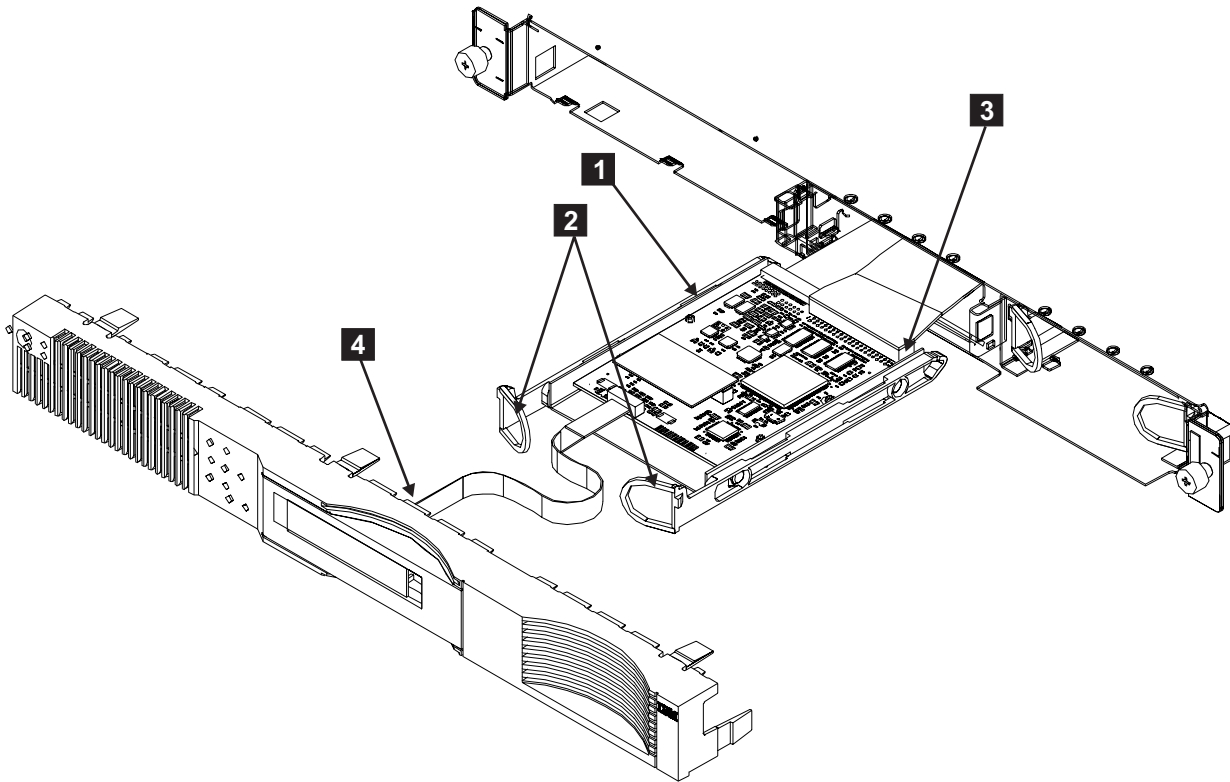
Figure 89. Removing the service controller

2. Remove all power from the SAN Volume Controller.

3. Remove the SAN Volume Controller from the rack.

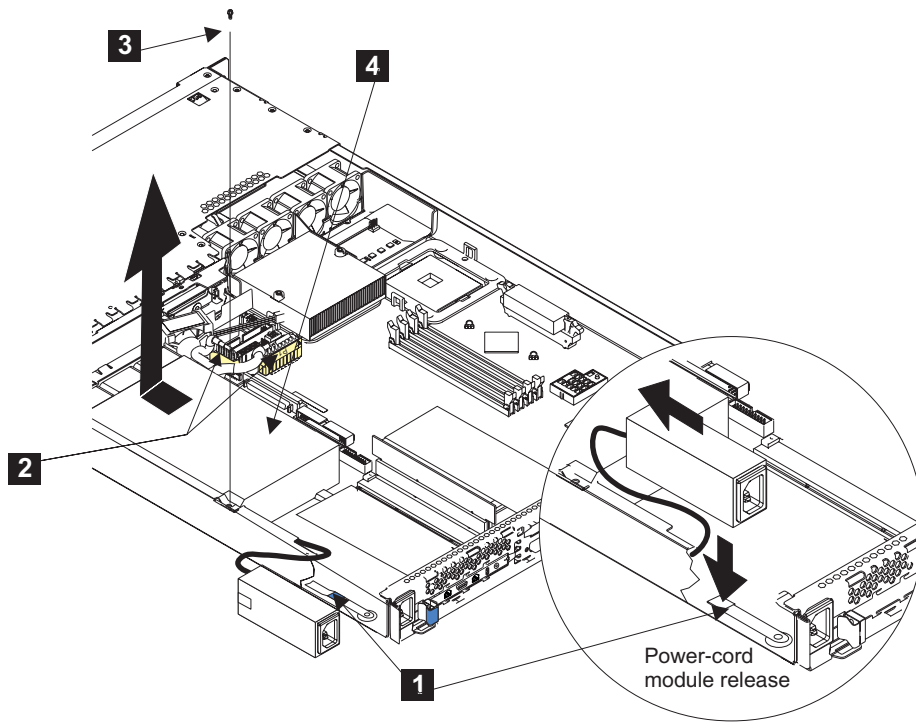4. Remove the top cover of the SAN Volume Controller.

5. Remove the front panel of the SAN Volume Controller.

6. **Attention:** Remove the service controller carefully to avoid damage to the attached cables.

   Pull the two handles **2** to release the latches, and carefully pull the service controller out of the SAN Volume Controller.

7. Remove the service controller **1**.

8. If you have any other tasks to do inside the SAN Volume Controller, do those tasks now. Otherwise, reinstall the service controller.

   Notes:

   a. The 40-way cable connector is keyed.

   b. Before you reconnect the ribbon cable, ensure that its contacts are downward. CAREFULLY install the cable to the rear of the service controller being sure to install the cable straight in with no rocking or twisting during installation. Be sure to verify that the dark blue line on the cable connector ends is not visible. This ensures that the cable is fully seated. See Figure 90 on page 149 and Figure 91 on page 149.
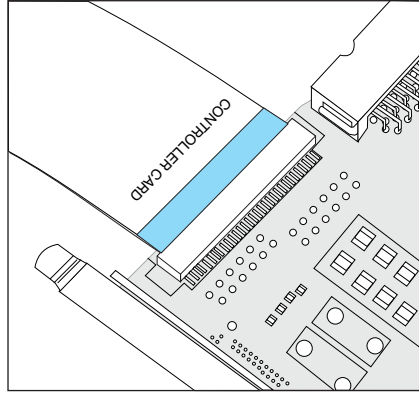
Figure 90. Service Controller card cable installed properly
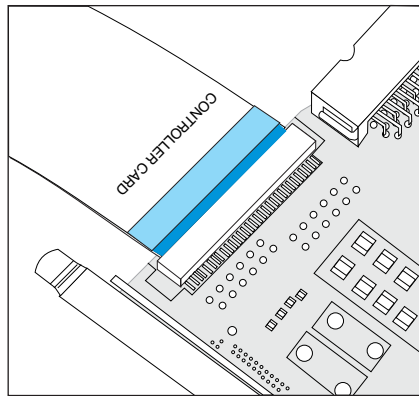
Figure 91. Service Controller card cable not properly seated

   c. When you install the service controller, ensure that the cables do not come into contact with the fan assembly that is mounted behind the service controller bay. Fold the cables under the service controller as you push the service controller into the SAN Volume Controller. Keep pushing the service controller until the latches click home.

   d. From the inside of the SAN Volume Controller, ensure that the cables are correctly attached to the service controller.

9. Reinstall other parts in the reverse sequence.

   Note: The WWPNs of the fibre-channel ports are derived from the WWNN of the service controller. If you do not perform step 10, you must restart the host systems before they are able to access disks through this SAN Volume Controller.

10. If a service controller is replaced as part of concurrent maintenance, it is necessary to re-write the WWNN on the new service controller. Failure to do so will mean that the host systems will not be able to access the fibre channel ports on that node until the host systems are rebooted. To restore the WWNN do the following:

   a. Power-on the SAN Volume Controller

   b. Display the node status on the service panel. Refer to the procedure for displaying node status on the service panel.

c. Press and hold the down button; press and release the select button; release the down button.

   d. The WWNN is displayed on Line 1 of the display; line 2 of the display contains the last five characters of the original WWNN. If the number displayed is all zeros, this is probably because you have also replaced the disk drive as part of this repair operation.

      1) If all zeros are displayed go to step 10e.

      2) If any other number is displayed, press the select button to accept the number. The WWNN is restored.

   e. If the number displayed is all zeros, display the World Wide Node Name in the VPD for the node that you are working on. Record the last five characters of the number.

   f. With the World Wide Node Name (WWNN) displayed on the service panel, press and hold the down button, press and release the select button, release the down button. Edit the displayed number using the up and down buttons to increase or decrease the numbers displayed. Use the left and right buttons to move between fields. When the number that you noted from the VPD is displayed, press the select button twice to accept the number. The WWNN is restored.

Related topics:

- "Removing the power from the SAN Volume Controller" on page 140
- "SAN Volume Controller menu options" on page 66
- "Removing a SAN Volume Controller from a rack" on page 142
- "Removing the top cover from the SAN Volume Controller" on page 145
- "Removing the front panel from the SAN Volume Controller" on page 144
- "Displaying the VPD" on page 57

Removing the service controller cables

The following task describes how to remove the service controller cables.

Steps:

Perform the following steps to remove the service controller cables:

1. Remove all power from the SAN Volume Controller.
2. Remove the SAN Volume Controller from the rack.
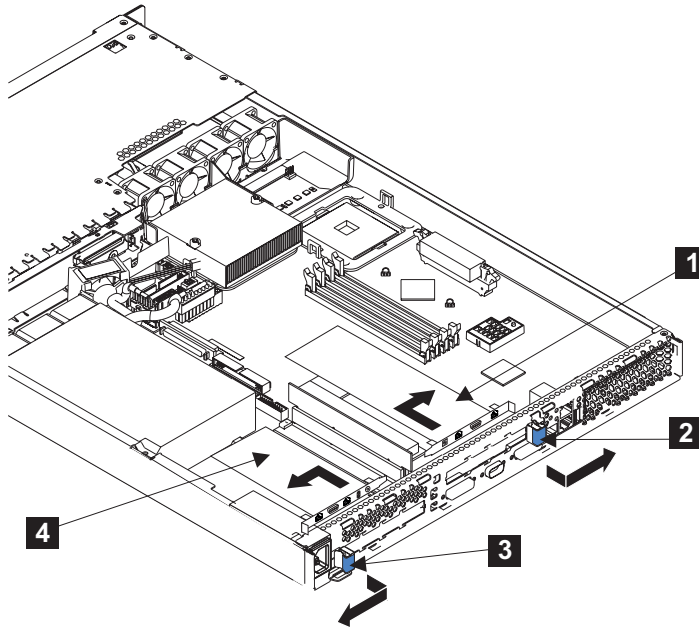3. Remove the top cover of the SAN Volume Controller.
4. Remove the service controller and remove the front panel cable from the front of the service controller.
5. Refer to Figure 92 on page 151.
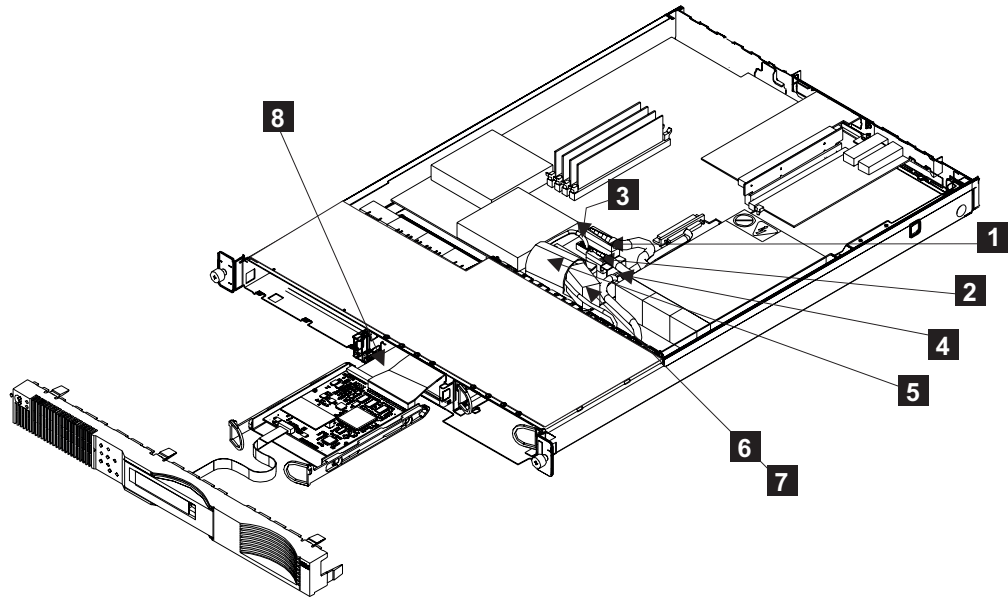
Figure 92. Service controller cables

6. Press the latch on power connector P1 **1** , and disconnect it from the system board.

7. Do the same actions for power connector P2 **2** .

8. Disconnect the fan cable **3** .

9. Disconnect the ATA cable **5** .

10. Lift the SCSI signal cable **4** away from the fan bracket.

11. Slide the right-hand side of the fan **6** forward, and pull the fan away from the clip **7** .

12. Lift the ribbon cable out from the connector **8** .

   Notes:

   a. The ribbon cable is labeled "System Planar."

   b. The ribbon cable is pre-folded so that it automatically follows the correct route inside the SAN Volume Controller.

   c. To reinstall the cables, CAREFULLY install the one end of the ribbon cable (marked "System Planar") to the system board being sure to install the cable straight in. See Figure 93 on page 152. Now route the flat cable and feed it through the opening where the service controller is to be installed and bring the other end of the cable (marked "Controller Card") out of the front end of the SAN Volume Controller chassis. Next, CAREFULLY install this other end of the cable to the rear of the service controller being sure to install the cable straight in with no rocking or twisting during installation. Install the ATA cable to the rear of the service controller. Carefully install the service controller while ensuring the cables do not get damaged as they slide into the chassis. Be sure to verify that the blue line on the cable connector ends is not visible. This ensures that it is fully seated. See Figure 90 on page 149 and Figure 91 on page 149.
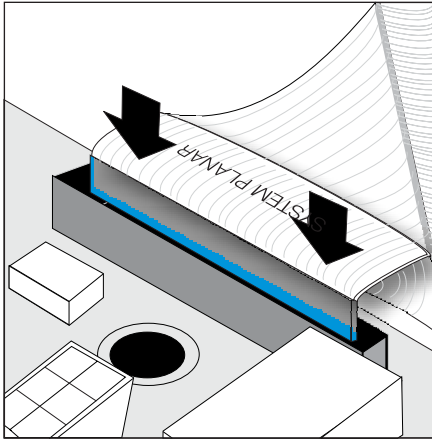
Figure 93. Install the service controller card cable into the system board

Related topics:

- "Removing the power from the SAN Volume Controller" on page 140
- "Removing a SAN Volume Controller from a rack" on page 142
- "Removing the top cover from the SAN Volume Controller" on page 145
- "Removing the service controller from the SAN Volume Controller" on page 147

Replacing a disk drive and a service controller

When you replace a service controller, the nonvolatile memory does not contain the operating system software that enables node rescue to perform. This is not a problem because the software is restored automatically as the node boots from the hard disk. If you must replace the hard disk and the service controller at the same time, you cannot boot the node to perform node rescue.

You must swap the service controller with a service controller from a working node. The service controller that is swapped into the working node has its nonvolatile memory updated when the node is booted from the hard disk. The service controller that is swapped into the failed node will contain the operating system required to enable node rescue to be performed on that node.

Related topics:

- "Removing the service controller from the SAN Volume Controller" on page 147
- "Removing the disk drive"

Removing the disk drive

The following task describes how to remove the disk drive and cables.

Attention:

- The disk drive is fragile. Handle it with care, and keep it well away from strong magnetic fields.
- The disk drive is electrostatic-discharge (ESD) sensitive. Take precautions to avoid damage from static electricity. For information about handling these devices, see "Handling static-sensitive devices" on page xxiv.

Steps:

Perform the following steps to remove the disk drive and cables:

1. Verify with the customer that all operations between the SAN Volume Controller and the host system have been stopped.
2. Remove all power from the SAN Volume Controller.
3. Remove the SAN Volume Controller from the rack.
4. Remove the top cover of the SAN Volume Controller.
5. Refer to Figure 94.
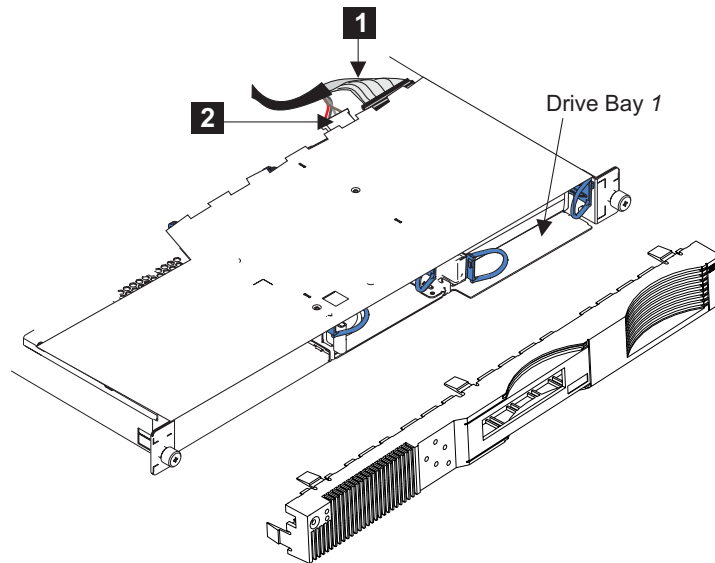
Figure 94. Removing the disk drive

6. Disconnect the SCSI signal connector **1** and the power connector **2** from the back of the disk drive.
7. Remove front panel.
8. Pull the two handles to release the latches, and pull the disk drive forward, and out of the SAN Volume Controller.
9. If you are exchanging the disk drive for another, refer to Figure 95.
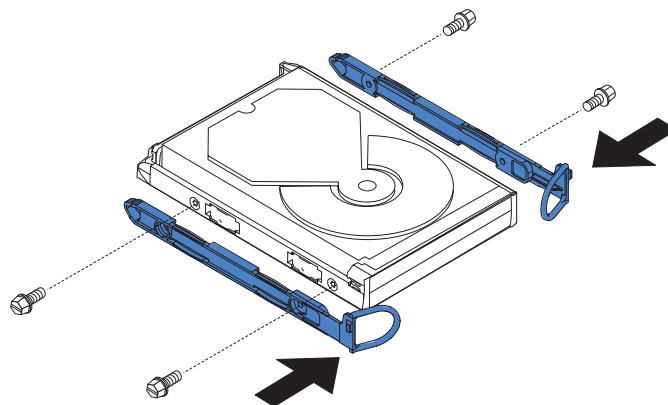
Figure 95. Attaching the rails to the disk drive

10. Find the rails and screws that are shipped with the new disk drive. Attach the rails to the disk drive.

11. Refer to Figure 96.

Drive HDA (rear view, PCB facing downward)

Figure 96. Disk drive jumpers

12. Check whether the old disk drive has any jumpers installed. If it has, install matching jumpers onto the new disk drive.
13. If you have any other tasks to do inside the SAN Volume Controller, do those tasks now. Otherwise, reinstall parts in the reverse sequence.

    Note: When you install the disk drive, push it into the SAN Volume Controller until the latches click home.

14. After you replace a disk drive, you must reinstall the software on the SAN Volume Controller by using the node rescue procedure.

    Note: If you must replace the hard disk and the service controller at the same time, you cannot boot the node to perform node rescue. See "Replacing a disk drive and a service controller."

Related topics:
- "Replacing a disk drive and a service controller" on page 152
- "Performing the node rescue" on page 104
- "Removing the power from the SAN Volume Controller" on page 140

Removing the disk drive cables

The following task describes how to remove the disk drive cables.

Steps:

Perform the following steps to remove the disk drive cables:
1. Remove all power from the SAN Volume Controller.
2. Remove the SAN Volume Controller from the rack.
3. Remove the top cover of the SAN Volume Controller.
4. Refer to Figure 97.
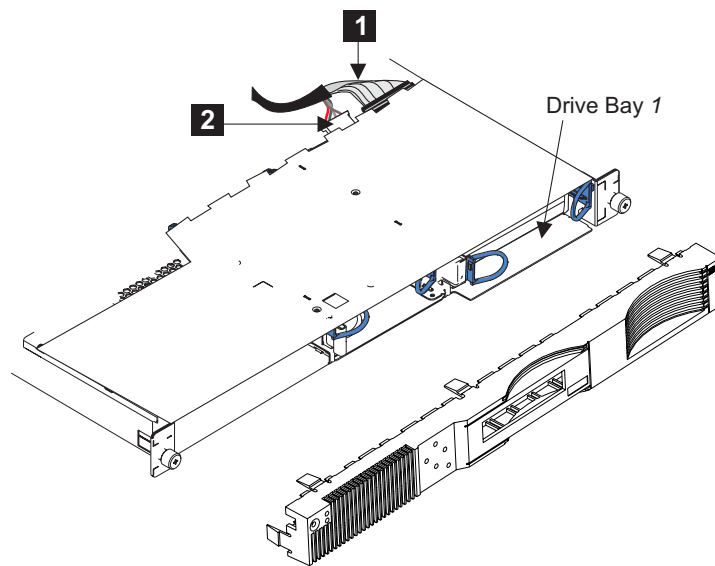
Figure 97. Removing the disk drive cables

5. Disconnect the SCSI signal connector **1** and the power connector **2** from the back of the disk drive, then remove the cable.
6. If you have any other tasks to do inside the SAN Volume Controller, do those tasks now. Otherwise, reinstall parts in the reverse sequence.

Related topics:

Removing the disk drive fan

The following task describes how to remove the disk drive fan.

Steps:

Perform the following steps to remove the disk drive fan:
1. Remove all power from the SAN Volume Controller.

2. Remove the SAN Volume Controller from the rack.
3. Remove the top cover of the SAN Volume Controller.
4. Refer to Figure 98.
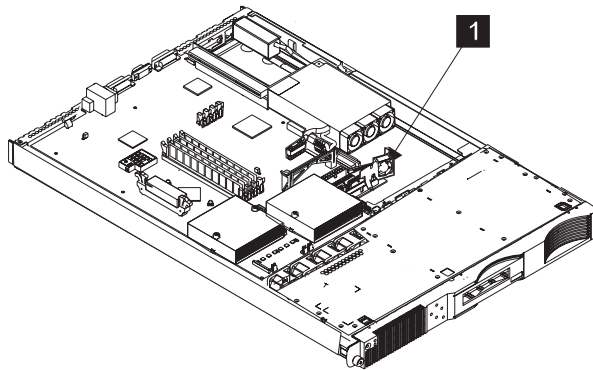
Figure 98. Removing a disk drive fan

5. Unplug the power cables connected to the system board.
6. See Figure 98. Remove the entire fan assembly **1** by sliding the right-hand side of the disk drive fan forward. Then, pull the assembly away from the clip.
7. To replace the fan:
   a. Remove the old fan from the bracket by pulling the sides of the bracket apart.
   b. Insert the new fan into the bracket by pulling the sides of the bracket apart.
8. If you have any other tasks to do inside the SAN Volume Controller, do those tasks now. Otherwise, reinstall the parts in the reverse sequence.

   Notes:
   a. The airflow is from the front to the back of the SAN Volume Controller.
   b. The fan cable comes out of the back of the fan. When you install a fan, ensure that the back of the fan is facing the back of the SAN Volume Controller.

Related topics:
- "Removing the power from the SAN Volume Controller" on page 140
- "Removing a SAN Volume Controller from a rack" on page 142
- "Removing the top cover from the SAN Volume Controller" on page 145

Removing the microprocessor fan

The following task describes how to remove the microprocessor fan.

Steps:

Perform the following steps to remove the microprocessor fan.
1. Remove all power from the SAN Volume Controller.
2. Remove the SAN Volume Controller from the rack.
3. Remove the top cover of the SAN Volume Controller.
4. Refer to Figure 99 on page 157.
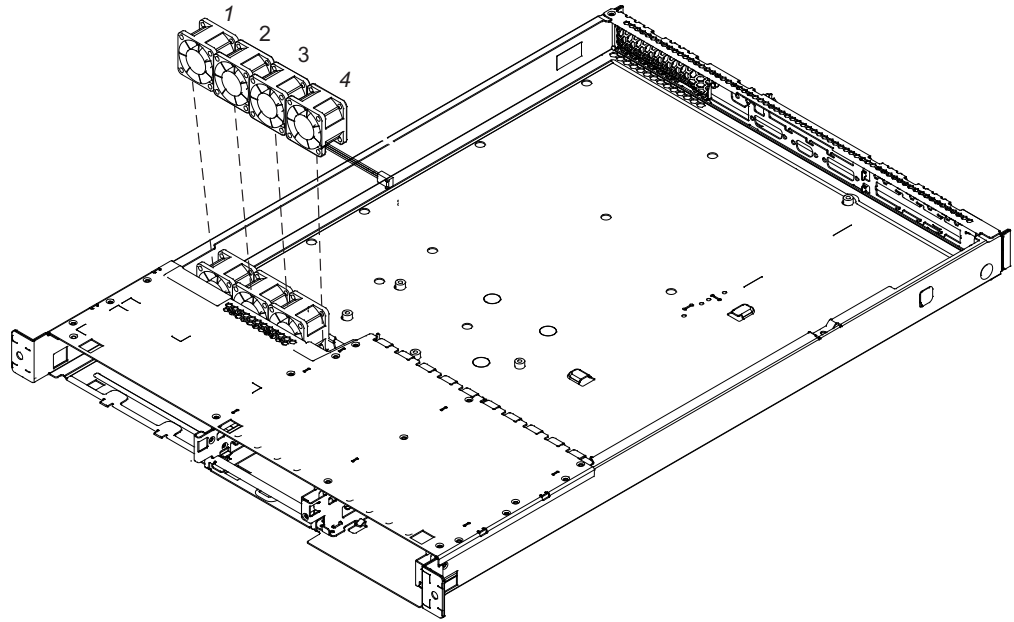
Figure 99. Removing a microprocessor fan

5. Disconnect the fan cable from the system board.
6. The fans are numbered from one to four, from left to right. See Figure 99. Lift the fan upward out of the retaining clip.

   Note: To remove the fourth fan, first remove the third fan. Then move the fourth fan to the left before lifting it.

7. If you have any other tasks to do inside the SAN Volume Controller, do those tasks now. Otherwise, reinstall parts in the reverse sequence.

   Notes:
   a. The airflow is from the front to the back of the SAN Volume Controller.
   b. The fan cable comes out of the back of the fan. When you install a fan, ensure that the back of the fan is facing the back of the SAN Volume Controller.
   c. If you are installing a microprocessor fan, orient the fan in the retaining clip so that the cable can reach the connector on the system board.

   Related topics:
   • "Removing the power from the SAN Volume Controller" on page 140
   • "Removing a SAN Volume Controller from a rack" on page 142
   • "Removing the top cover from the SAN Volume Controller" on page 145

Removing the SAN Volume Controller power supply

The following task describes how to remove the power supply.

Steps:

Perform the following steps to remove the power supply:
1. Remove all power from the SAN Volume Controller.
2. Remove the SAN Volume Controller from the rack.

3. Remove the top cover of the SAN Volume Controller.
4. Refer to Figure 100.

Figure 100. Removing the power supply

5. Remove the disk drive fan.
6. Press down on the clip **1** at the front of the power-cable module and slide the module toward the front of the SAN Volume Controller until the alignment tab is free of the slot that is on the side of the SAN Volume Controller.
7. Lift the power-cable module out from the SAN Volume Controller as far as its cable allows, and put it to one side.
8. Disconnect the power connector **2**.
9. Remove the screw **3**.
10. Slide the power supply **4** forward, then lift it from the SAN Volume Controller.

   The power supply is a complete FRU. Do not try to repair or exchange any part of it.

   Note: For a translation of the following notice, see *IBM TotalStorage Open Software Family SAN Volume Controller Translated Safety Notices*.

   DANGER

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

11. If you have any other tasks to do inside the SAN Volume Controller, do those tasks now. Otherwise, reinstall parts in the reverse sequence.

Related topics:

- "Removing the power from the SAN Volume Controller" on page 140

Removing and replacing the system board CMOS battery

This task describes how to remove the system board CMOS battery.

Steps:

Perform the following steps to remove the system board CMOS battery:
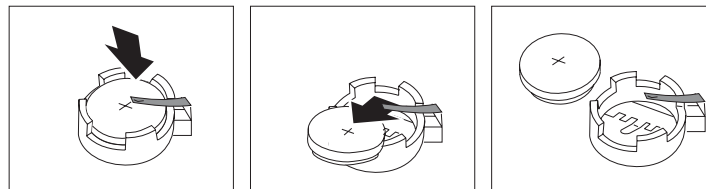
Figure 101. Removing the system board CMOS battery

If you are exchanging the battery for a new one, use only IBM Part Number 33F8354 or a similar type of battery that the manufacturer recommends.

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)

Do not:
- Throw into, or immerse in, water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Throw away the battery as required by local ordinances or regulations.
1. Remove all power from the SAN Volume Controller.
2. Remove the SAN Volume Controller from the rack.
3. Remove the top cover of the SAN Volume Controller.
4. Use one finger to lift the battery clip over the battery.
5. Use one finger to slightly slide the battery out from its socket. The spring mechanism pushes the battery out toward you as you slide it from the socket.
6. Use your thumb and first finger to pull the battery from under the battery clip.
7. Ensure that the battery clip is touching the base of the battery socket by pressing gently on the clip.

Steps:

Perform the following steps to replace the system board CMOS battery: See Figure 102 on page 160.
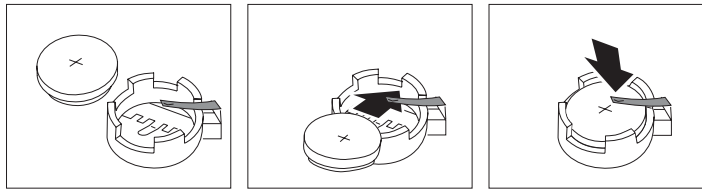
Figure 102. Replacing the system board CMOS battery

1. Tilt the battery so that you can insert it into the socket under the battery clip.
2. As you slide it under the battery clip, press the battery down into the socket.
3. If you have any other tasks to do inside the SAN Volume Controller, do those tasks now. Otherwise, reinstall parts in the reverse sequence.
4. If this SAN Volume Controller was the configuration node when the CMOS battery failed, the cluster date and time may not be correct. After replacing the CMOS battery, check the cluster time using the master console and correct if necessary.

Related topics:

- "Removing the power from the SAN Volume Controller" on page 140
- "Removing a SAN Volume Controller from a rack" on page 142
- "Removing the top cover from the SAN Volume Controller" on page 145

Removing the memory modules

The following task describes how to remove the memory modules.

Attention: The memory modules are electrostatic-discharge (ESD) sensitive. Take precautions to avoid damage from static electricity.

Steps:

Perform the following steps to remove the memory modules:

1. Remove all power from the SAN Volume Controller.
2. Remove the SAN Volume Controller from the rack.
3. Remove the top cover of the SAN Volume Controller.
4. Refer to Figure 103 on page 161.
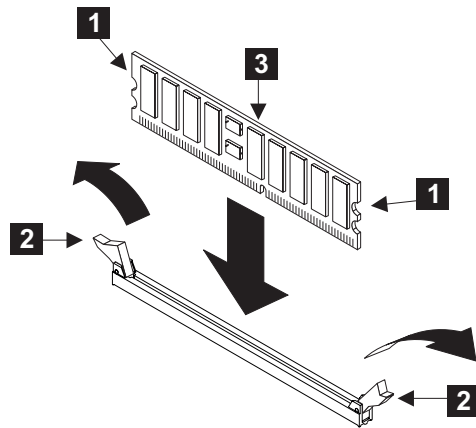
Figure 103. Removing the memory modules

5. **Attention:** If the fault has been isolated only to the *bank* of modules, instead of to a particular module, exchange both modules of the bank. When viewed from the front of the SAN Volume Controller, the modules are numbered 4 through 1, from left to right. Modules 4 and 3 are in bank 2; modules 2 and 1 are in bank 1.

   Holding your thumbs against the connector **1**, open the clips **2** by pressing them in the directions that are shown by the arrows in the diagram. This action pulls the memory module **3** out of the connector.

6. If you have any other tasks to do inside the SAN Volume Controller, do those tasks now. Otherwise, reinstall parts in the reverse sequence.

Related topics:
- "Handling static-sensitive devices" on page xxiv
- "Removing the power from the SAN Volume Controller" on page 140
- "Removing a SAN Volume Controller from a rack" on page 142
- "Removing the top cover from the SAN Volume Controller" on page 145

Adapter assemblies

The following sections describe how to remove and replace the adapter assemblies.

The adapter assemblies are electrostatic-discharge (ESD) sensitive. Take precautions to avoid damage from static electricity. For information about handling these devices, see "Handling static-sensitive devices" on page xxiv.

Related topics:
- "Removing an adapter"

Removing an adapter

The following task describes how to remove an adapter.

The adapter assemblies are electrostatic-discharge (ESD) sensitive. Take precautions to avoid damage from static electricity.

Steps:

Perform the following steps to remove an adapter:

1. Remove all power from the SAN Volume Controller.
2. Remove the SAN Volume Controller from the rack.
3. Remove the top cover of the SAN Volume Controller.
4. Refer to Figure 104.

Figure 104. Removing an adapter

5. For the adapter that you are going to remove, press the sides of the clip **2** or **3** together to unlock the clip, then pivot the clip away from the adapter. The clip remains loosely attached to the SAN Volume Controller.
6. **Attention:** Do not touch the components and gold-edge connectors of the adapter.
7. Unplug the adapter **1** or **4** from the connector.
8. Remove the adapter from the SAN Volume Controller.

Related topics:
- "Removing the power from the SAN Volume Controller" on page 140
- "Removing a SAN Volume Controller from a rack" on page 142
- "Removing the top cover from the SAN Volume Controller" on page 145
- "Handling static-sensitive devices" on page xxiv

Replacing an adapter

The following task describes how to replace an adapter assembly.

Steps:

Perform the following steps to replace an adapter assembly:
1. Refer to Figure 105 on page 163
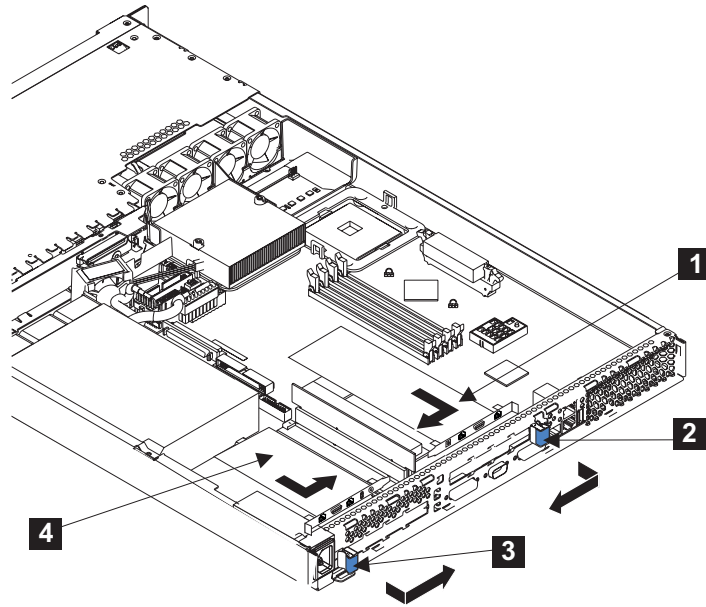
Figure 105. Replacing an adapter

2. **Attention:** Do not touch the components and gold-edge connectors of the adapter. When you install the adapter, ensure that the adapter is correctly seated in the connector before you turn on the SAN Volume Controller. Incorrectly-seated adapters might cause damage to the system board, the riser card for slot 1, or the adapter.

   If you are installing a new adapter, go to step 3.

   If you are reinstalling an adapter, go to step 4.

3. Remove the adapter from its static-protective package.

4. Hold the adapter by its top edge or upper corners, and align it with the connector. Support the riser card, and press the adapter fully into the connector.

5. Pivot the expansion-slot clip toward the adapter, and press it into place.

Related topics:

- "Removing an adapter" on page 161

Removing the system board

The following task describes how to remove the system board.

The system board FRU is a kit that includes the following parts:

- PCI riser card
- Two microprocessors
- Microprocessor voltage regulator module (VRM)
- Planar

Use all the parts in the kit when you replace the system board FRU.

The system board is electrostatic-discharge (ESD) sensitive. Take precautions to avoid damage from static electricity.

Steps:

Perform the following steps to remove the system board:

1. Remove all power from the SAN Volume Controller.
2. Remove the SAN Volume Controller from the rack.
3. Remove the top cover of the SAN Volume Controller **1** .
4. If you are going to exchange the system board for another system board, go to step 5. Otherwise, go to step 7 on page 165.
5. Remove the adapter assemblies. Keep the adapter assemblies; they must be installed onto the replacement system board.
6. Remove the memory modules. Keep the memory modules; they must be installed onto the replacement system board.
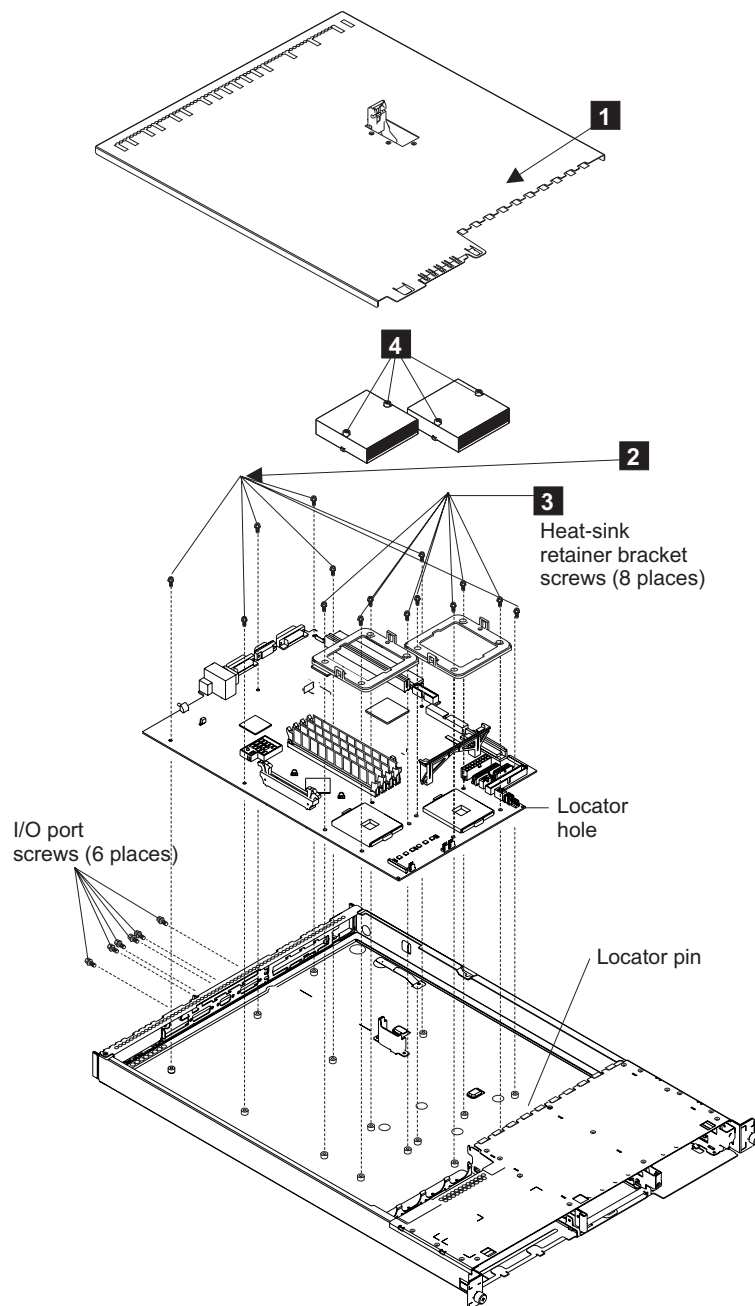
Figure 106. Removing the system board

7. Disconnect:
   - All fan connectors
   - Power connectors P1 and P2
   - SCSI power connector
   - ATA connector
   - Disk drive connectors
   - Service Controller connector
8. Lift out the air baffle.
9. Unscrew the heat sink captive screws **4** .
10. Move the heat sinks gently from side to side to break the seal formed by the thermal compound and then pull them off the processors.
11. Remove the screws from each of the heat sink retainer brackets **3** .
12. Remove the retainer brackets.
13. Remove the two screws from each of the three connectors.
14. Remove the seven screws **2** .
15. Remove the system board.
16. If you have any other tasks to do inside the SAN Volume Controller, do those tasks now. Otherwise, reinstall parts in the reverse sequence.

    Notes:

    a. Use all the parts in the system board FRU kit (system board, processors (2), VRM, riser card). Re-use only the four memory modules that you removed in step 6 on page 164 and the two adapter assemblies that you removed in step 4 on page 164.

    b. Before you install the new system board, check whether the old system board has any jumpers installed. If it has, install matching jumpers onto the new system board.

    c. Before you install the processors on the system board, remove the dust covers from the processor socket.

    d. If you were not sent here from the directed maintenance procedures rewrite the SAN Volume Controller serial number. If you were sent here from directed maintenance procedures this step will be performed from within the procedure.

    e. CAREFULLY install the end of the ribbon cable (marked ″System Planar″) to the system board being sure to install the cable straight in. See Figure 107 on page 166. Be sure to verify that the blue line on the cable connector end is not visible.
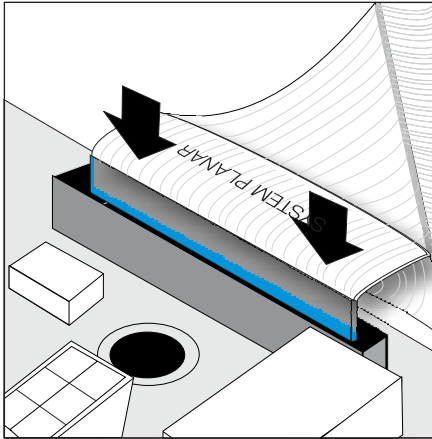
Figure 107. Install service controller cable into the system board

Related topics:

- "Handling static-sensitive devices" on page xxiv
- "Rewriting the SAN Volume Controller serial number"
- "Removing the power from the SAN Volume Controller" on page 140
- "Removing a SAN Volume Controller from a rack" on page 142
- "Removing the top cover from the SAN Volume Controller" on page 145
- "Removing an adapter" on page 161
- "Removing the memory modules" on page 160

Rewriting the SAN Volume Controller serial number

This topic describes how to rewrite the serial number for the SAN Volume Controller.

The SAN Volume Controller serial number may be rewritten either by using SAN Volume Controller console or using the command-line interface. When you type the following command:

svcservicetask writesernum -sernum *nodeserialnumber nodename*

The *nodeserialnumber* is written to the SAN Volume Controller system board.

Note: Copy the serial number from the serial number label on the right hand side of the front of the frame.

Related topics:

- "Accessing the command-line interface from the master console" on page 12

Removing the uninterruptible power supply

The following task describes how to remove the uninterruptible power supply.

Attention: Before you begin to remove the uninterruptible power supply, read the safety notices.

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

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

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

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

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

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

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

Context:

Removing the uninterruptible power supply requires that you first remove the uninterruptible power supply electronics and the uninterruptible power supply battery.

Steps:

Perform the following steps to remove the uninterruptible power supply.

CAUTION:
Check to make sure that any SAN Volume Controller that is powered by this uninterruptible power supply are shut down and powered off, prior to step 1.

1. At the front of the uninterruptible power supply, press and hold the off button **1** for approximately five seconds or until the long beep stops. See Figure 108 on page 168.
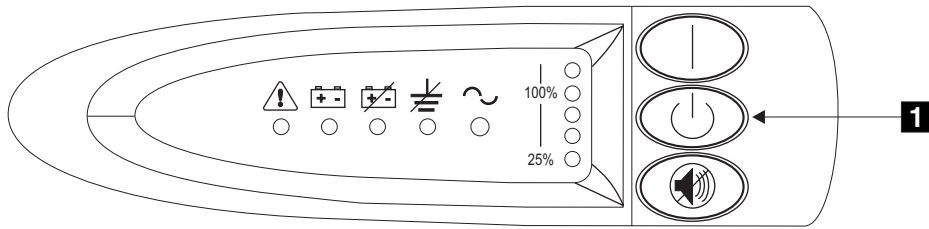
Figure 108. Uninterruptible power supply front panel assembly

2. At the back of the uninterruptible power supply, disconnect the power cables of the SAN Volume Controller **3** .

3. Disconnect the signal cables **1** .

4. Disconnect the main power cable **2** . See Figure 109.
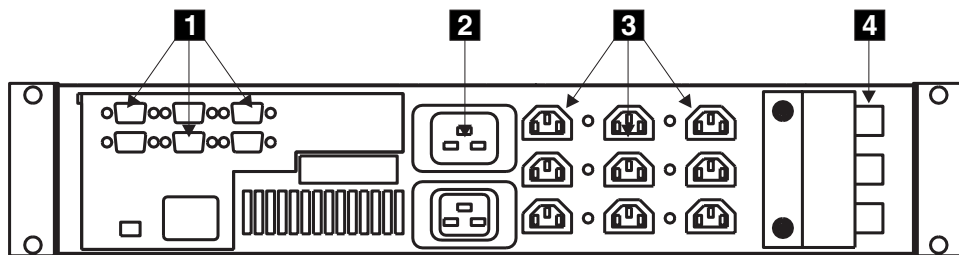
Figure 109. Uninterruptible power supply (rear view)

5. Remove the battery from the uninterruptible power supply. Refer to the procedure for removing uninterruptible power supply battery.

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

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

6. Remove the electronics assembly from the uninterruptible power supply. Refer to the procedure for removing the uninterruptible power supply electronics assembly.

7. At the front of the uninterruptible power supply, unscrew the mounting screws, **1** in Figure 110 on page 169.
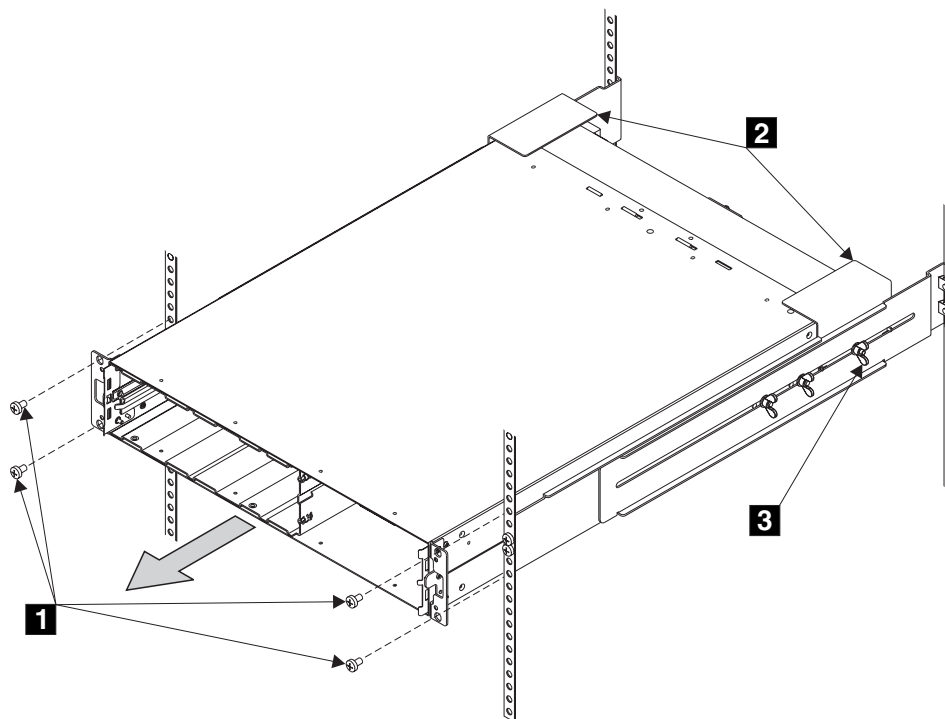
Figure 110. Removing the uninterruptible power supply

8. At the back of the rack, push the uninterruptible power supply forward approximately 5 cm (2 in).

   Attention: Do not push the uninterruptible power supply too far forward.

9. Go to the front of the rack.

10. With aid from another service representative, pull the uninterruptible power supply forward and remove it from the rack.

11. To replace the uninterruptible power supply refer to the procedure for replacing the uninterruptible power supply.

Related topics:

- "Removing the uninterruptible power supply battery" on page 171
- "Removing the uninterruptible power supply electronics"
- "Replacing the uninterruptible power supply" on page 173
- "Definitions of notices" on page xi

Removing the uninterruptible power supply electronics

The following task describes how to remove the uninterruptible power supply electronic assembly.

Steps:

Perform the following steps to remove the uninterruptible power supply electronic assembly:

CAUTION:
Check to make sure that any SAN Volume Controller that is powered by this uninterruptible power supply are shut down and powered off, prior to step 1.

1. At the front of the uninterruptible power supply, press and hold the off button
   1 for approximately five seconds, or until the long beep stops. See Figure 108
   on page 168.

2. At the back of the uninterruptible power supply, disconnect the signal cables,
   1 in Figure 111.
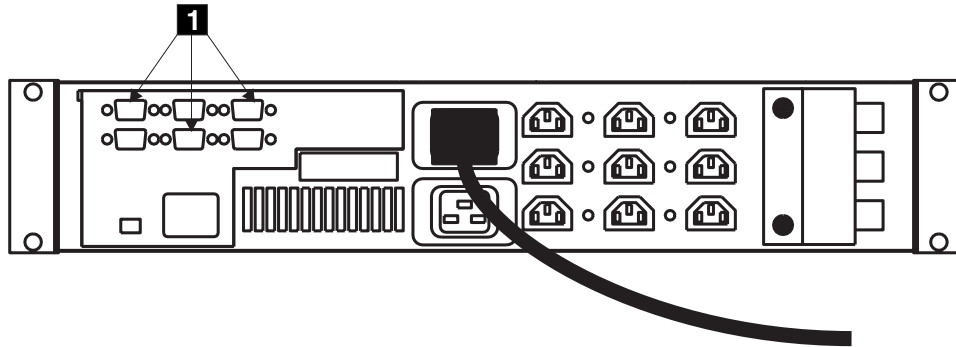
Figure 111. Disconnecting the signal cables

3. Remove the front panel by pressing the sides inward, then pulling on both
   ends (Figure 112).
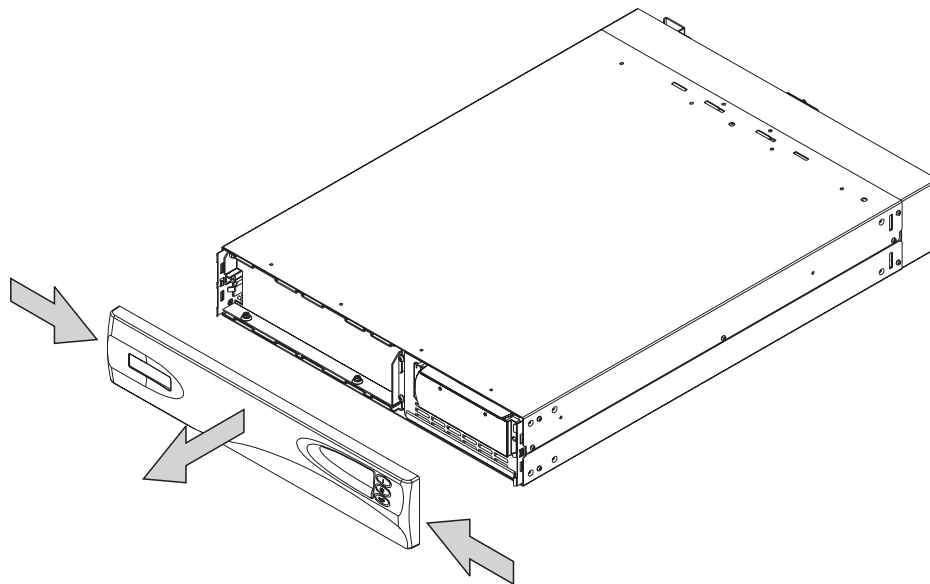
Figure 112. Removing the front panel of the uninterruptible power supply

4. Remove the two screws, **1** in Figure 113 on page 171.
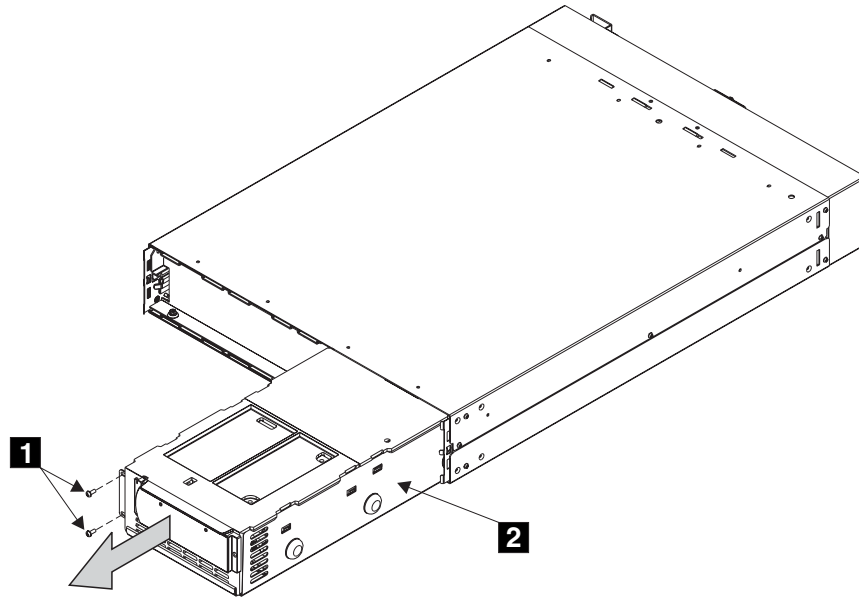
Figure 113. Removing the electronics unit from the uninterruptible power supply

5. Pull the electronics assembly 2 out from the uninterruptible power supply.
6. Reinstall parts in the reverse sequence.

   Attention: When reinstalling the signal cables only use the top row of serial connectors. Installing signal cables in the bottom row of serial connectors causes the uninterruptable power supply to malfunction.

Related topics:

- "Removing the uninterruptible power supply" on page 166

Removing the uninterruptible power supply battery

The following task describes how to remove the uninterruptible power supply battery assembly.

Steps:

Perform the following steps to remove the uninterruptible power supply battery assembly:

CAUTION:
Check to make sure that any SAN Volume Controller that is powered by this uninterruptible power supply are shut down and powered off, prior to step 1.

1. At the front of the uninterruptible power supply, press and hold the off button 1 for approximately five seconds, or until the long beep stops. See Figure 108 on page 168.
2. Remove the front panel by pressing the sides inward, then pulling on both ends (Figure 114 on page 172).
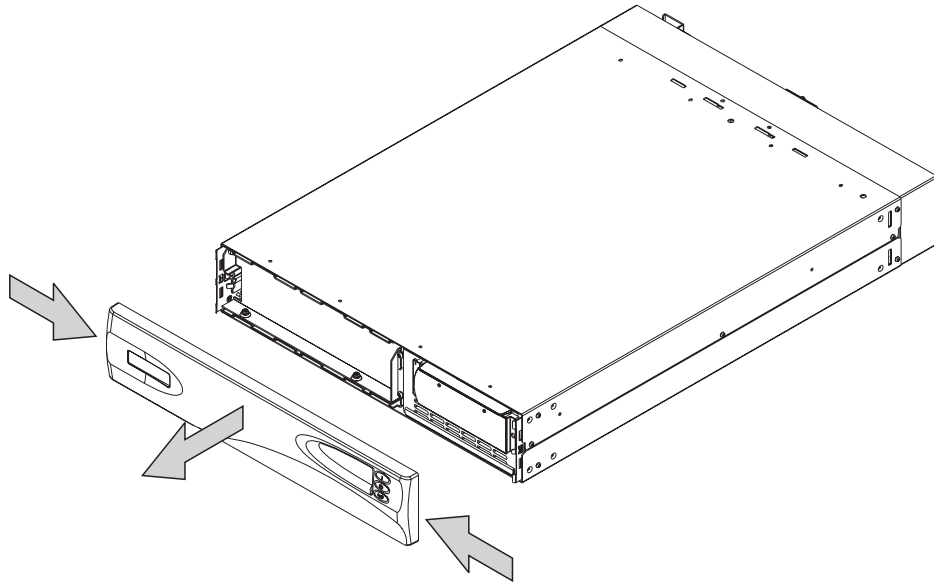
Figure 114. Removing the uninterruptible power supply front panel

3. Remove the battery retaining bracket (seeFigure 115).
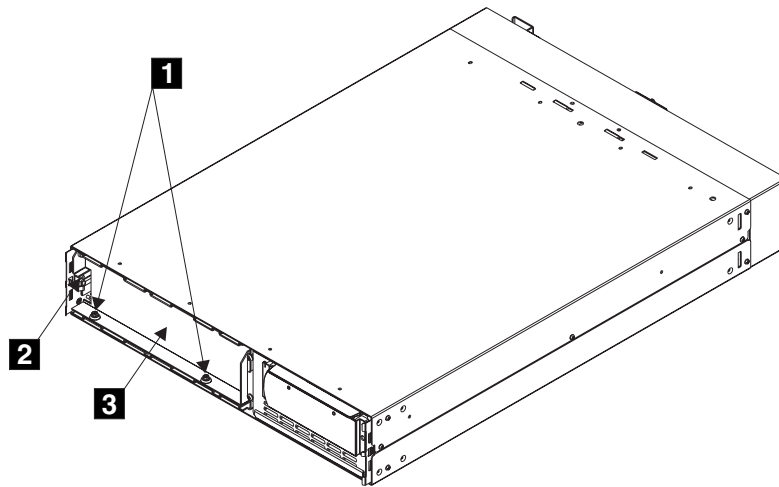
Figure 115. Removing the battery retaining bracket

    a. Remove the two bolts **1** .

    b. Remove the hex nut **2** .

    c. Remove the battery retaining bracket **3** .

4. Remove battery plate which will then allow access to the battery (see Figure 116 on page 173).

5. Grab the tabs on the battery assembly and pull battery outward to allow two people to access it for removal.

    CAUTION:

    The battery weighs 20.4 kg (45 lb). Do not attempt to lift it by yourself. Ask another service representative for aid. (27)

6. With the help from another service support representative, pull the battery out onto a flat, stable surface.

7. Reinstall parts in the reverse sequence.

CAUTION:
To avoid any hazard from the rack tipping forward when boxes are installed or removed, observe all safety precautions for the rack into which you are installing or removing the device. (23)

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. (28)

CAUTION:
Do not open or damage the battery. You might release electrolytes that are harmful to the skin and eyes. (29)

Note: See *IBM TotalStorage Open Software Family SAN Volume Controller Translated Safety Notices* for a translation of the caution notices.
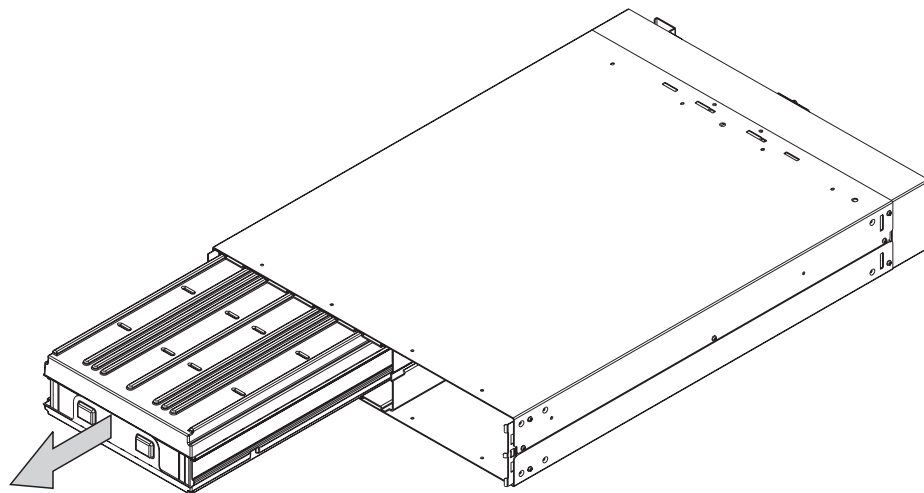
Figure 116. Removing the uninterruptible power supply battery

Related topics:
- "Removing the uninterruptible power supply electronics" on page 169
- "Removing the uninterruptible power supply" on page 166
- "Replacing the uninterruptible power supply"

Replacing the uninterruptible power supply

This task describes how to replace the uninterruptible power supply after you have removed the previous uninterruptible power supply.

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

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

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

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

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

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

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

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

Steps:

Perform the following steps to replace the uninterruptible power supply:

1. The weight of the uninterruptible power supply must be reduced by removing the battery assembly before removing it from the shipping carton. To remove the battery assembly:

    a. Open the top of the uninterruptible power supply shipping carton and then with the assistance of another service representative grip the flaps on either side of the uninterruptible power supply. See Figure 117 on page 175.

Figure 117. Two persons unboxing the uninterruptible power supply

    b. Slide the uninterruptible power supply to the end of the carton and rest its front edge on the edge of the carton as shown. See Figure 118.

Figure 118. Slide the uninterruptible power supply to the edge of the carton

    c. Remove the two bolts **1** and additional nut **2** on the left side of the bracket and remove the battery retaining bracket **3** .
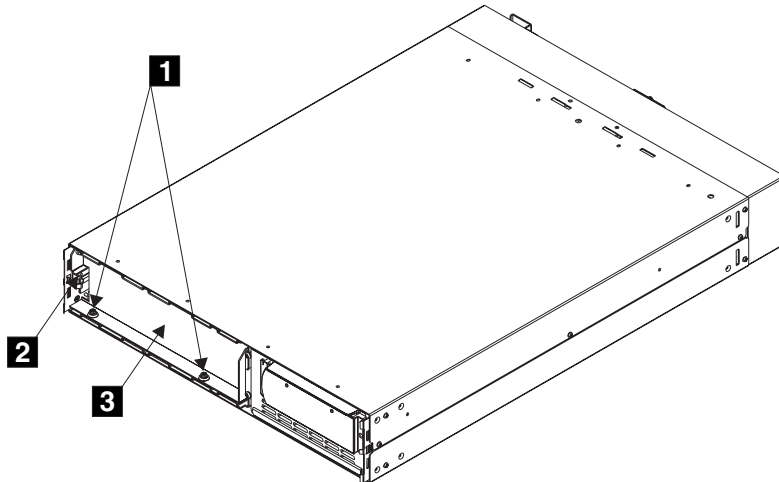
Figure 119. Remove the battery retaining bracket

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

     e. With the assistance of another service representative lift the battery assembly clear of the uninterruptible power supply and place to one side.

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

2. With the assistance of another service representative, lift the uninterruptible power supply onto a flat, stable surface.

3. Remove the electronic assembly from the uninterruptible power supply:

     a. Remove the two screws **1** (see Figure 120).
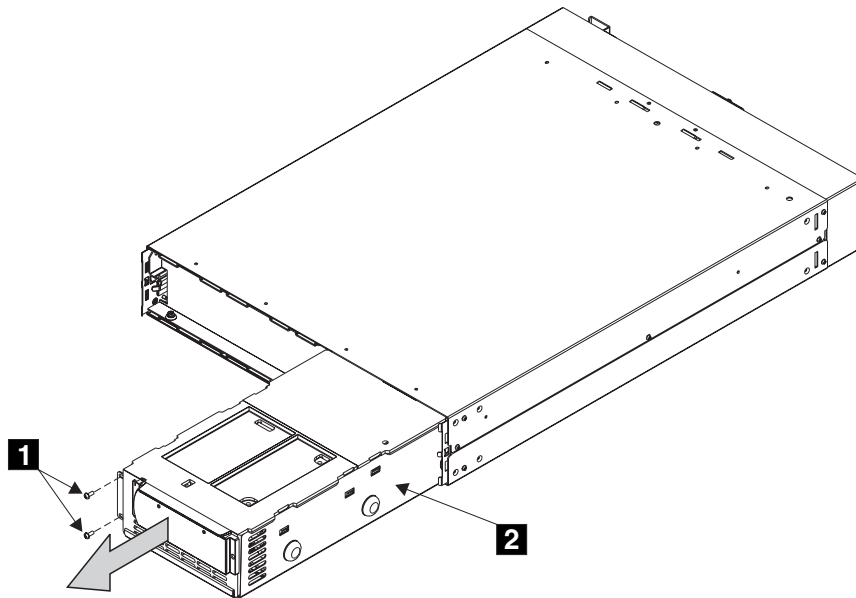
Figure 120. Removing the uninterruptible power supply electronics assembly

b. Pull the electronics assembly **2** out of the uninterruptible power supply, and put it to one side.

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

5. Install the front flathead screws **1** (see Figure 121).
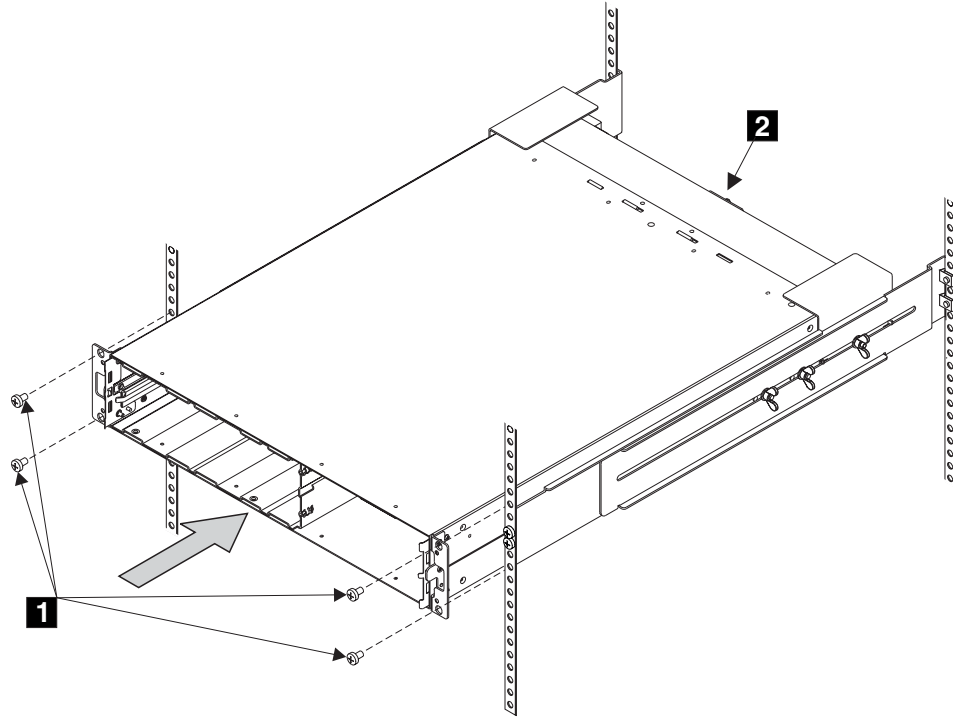
Figure 121. Replacing the uninterruptible power supply into a rack

6. With aid from another service representative, reinstall the following:

   a. Battery

   b. Electronics assembly

   Attention: A grounding screw feature is provided on the back of the uninterruptible power supply so that you can attach a ground bonding wire if required by local wiring codes. Since safety earthing of the uninterruptible power supply chassis is maintained through the input line power cord, you are usually not required to use this additional grounding screw feature.

7. Reconnect the signal cables.

8. Install the front panel.

9. At the back of the uninterruptible power supply, plug the uninterruptible power supply main power cable into the power socket, **1** in Figure 122 on page 178.

   Note: The uninterruptible power supply is intended to maintain power on SAN Volume Controller nodes until data can be saved to the local hard disk drive. Only SAN Volume Controller nodes can be plugged into the uninterruptible power supply or the SAN Volume Controller cluster malfunctions.
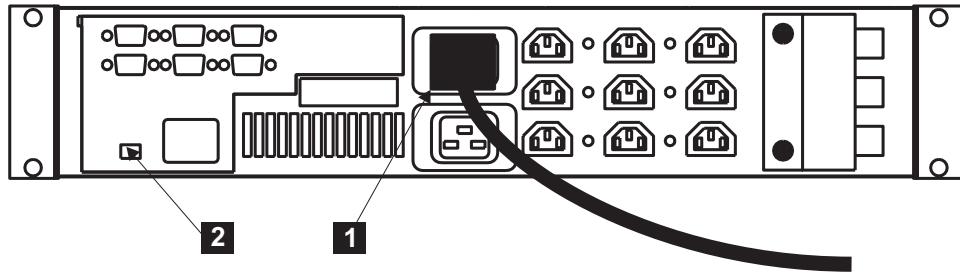
Figure 122. Installing the uninterruptible power supply power cable

> **Attention:** If possible, ensure that the two uninterruptible power supplies are not connected to the same power source.

> **Note:** The uninterruptible power supply requires a dedicated branch circuit that meets the following specifications:
> - One 15A circuit breaker in each branch circuit supplies the power to a uninterruptible power supply
> - Single-phase
> - 50 to 60 Hz
> - 200 - 240 Volt

10. All the front panel indicators (see Figure 123) flash for a short time while the uninterruptible power supply runs a self test. When the test is complete, the mode indicator, **1** in Figure 123, flashes to show that the uninterruptible power supply is in standby mode.

    Press and hold the uninterruptible power supply on the switch, **2** in Figure 123, until you hear the uninterruptible power supply beep (approximately one second). The mode indicator stops flashing and the load level indicators display the percentage of load that is being supplied by the uninterruptible power supply. The uninterruptible power supply is now in normal mode, and is charging its battery.
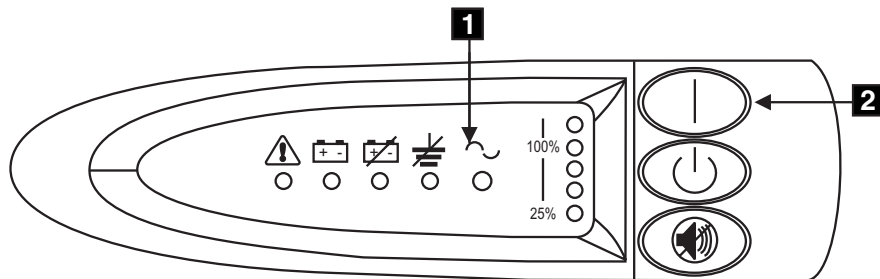
Figure 123. Power switch and indicators of the uninterruptible power supply

Related topics:
- "Removing the uninterruptible power supply electronics" on page 169
- "Removing the uninterruptible power supply battery" on page 171
- "Definitions of notices" on page xi

Support rails for the SAN Volume Controller

This topic describes how to remove the support rails for the SAN Volume Controller.

Related topics:

- "Removing the support rails for a SAN Volume Controller"
- "Removing the support rails for an uninterruptible power supply" on page 183

Removing the support rails for a SAN Volume Controller

This task describes how to remove the support rails for a SAN Volume Controller.

Steps:

Perform the following steps to remove the support rails for the SAN Volume Controller:

1. Refer to Figure 124.
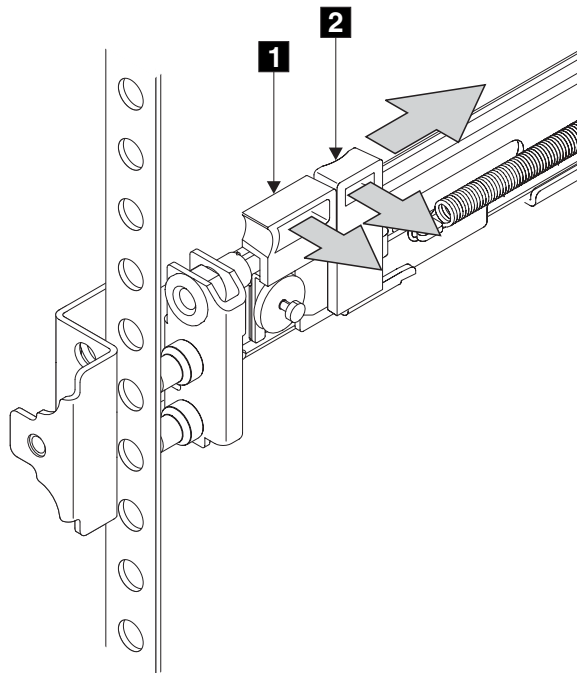
Figure 124. Releasing the front of the support rails for a SAN Volume Controller

2. Go to front of the the left-hand support rail.
3. Put your first finger onto the back edge of the latch lever **2**, and your left thumb on the front edge of the latch lock **1**.
4. Gently move the latch lock inward and push the latch-lock carrier toward the back of the rack until it latches on the rail.
5. Pull the rail out from the front rack-mounting flange.
6. Repeat the action at the back of the rail.
7. Remove the rail from the rack.
8. Repeat steps 3 through 7 for the right-hand support rail.

Related topics:

- "Installing the support rails for the SAN Volume Controller"

Installing the support rails for the SAN Volume Controller

The following task describes how to install the support rails for the SAN Volume Controller.

Steps:

Perform the following steps to install the support rails for the SAN Volume Controller:

1. Refer to the customer's hardware location table to find out where in the rack the SAN Volume Controller is to be installed.
2. Refer to the EIA markings on the rack and decide where you are going to install the support rails.
3. Check the labels on the support rails; each rail has a label that indicates which is the front end of the rail and whether the rail is for the left or right side of the rack. Perform this procedure for both rails.
4. Put your finger against the side of the latch lever **1** , and put your thumb against the front of the latch lock **2** (see Figure 125).
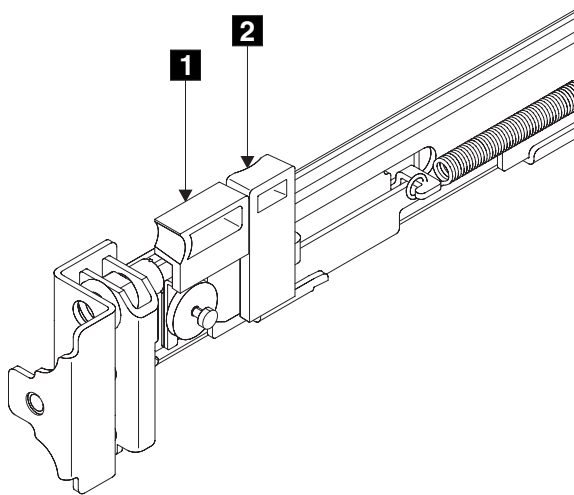
Figure 125. Retracting the latch lock carrier

5. Gently push the latch lock **2** (Figure 126 on page 181) 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.
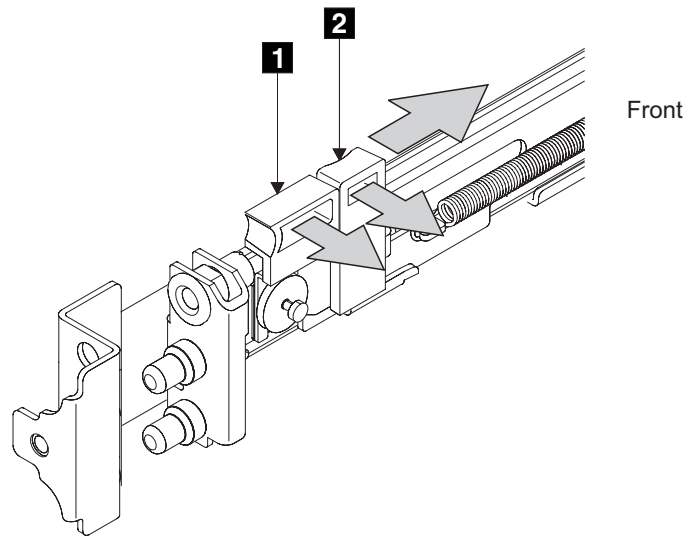
Figure 126. Opening the front latch-lock carrier assembly

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

7. Push the back rail bracket **1** (Figure 127) toward the front of the rail until it stops. The rail is now at its shortest adjustment.
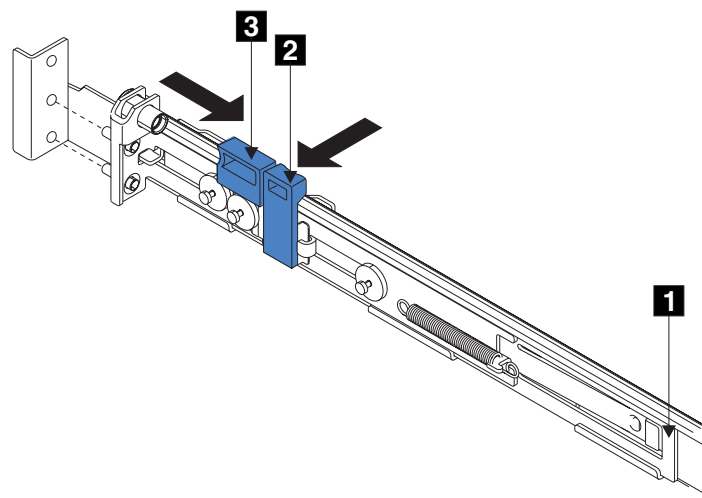
Figure 127. Opening the back latch-lock carrier assembly

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

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

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

11. Place the front end of the left rail in the rack cabinet. Align the top of the front bracket **1** (Figure 128) with the required EIA marking that is on the rack.
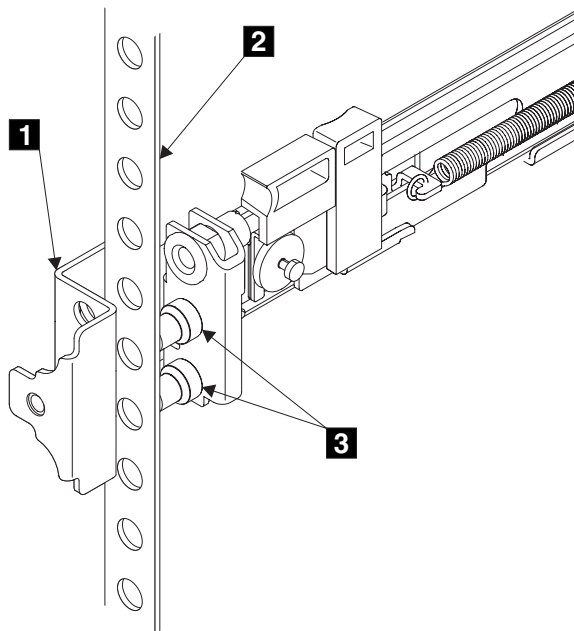
Figure 128. Installing the front end of the rail

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

13. Push the latch lock **2** (Figure 129 on page 183) 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.
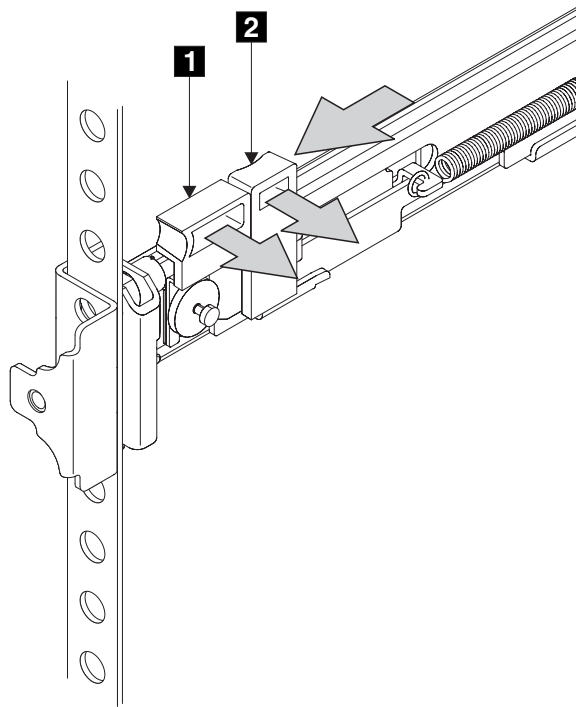
Figure 129. Closing the latch-lock carrier assembly

14. Push the back rail bracket **1** (see Figure 127 on page 181) toward the rear of the rack and align the locating pins with the rack-mounting flange.

15. Push the latch lock **2** (see Figure 127 on page 181) away from the rail to release the carrier. The latch-lock carrier slides toward the rear of the rack, and the locating pins project through the holes that are in the rear flange and in the rear rail bracket.

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

16. On the rear of each rail press the blue release tab and slide the shipping bracket off the slide rail. Store the shipping bracket for further use.

Related topics:

- "Removing the support rails for a SAN Volume Controller" on page 179

Removing the support rails for an uninterruptible power supply

This task describes how to remove the support rails for an uninterruptible power supply.

Steps:

Perform the following steps to remove the rails for a uninterruptible power supply.

1. Refer to Figure 130 on page 184.
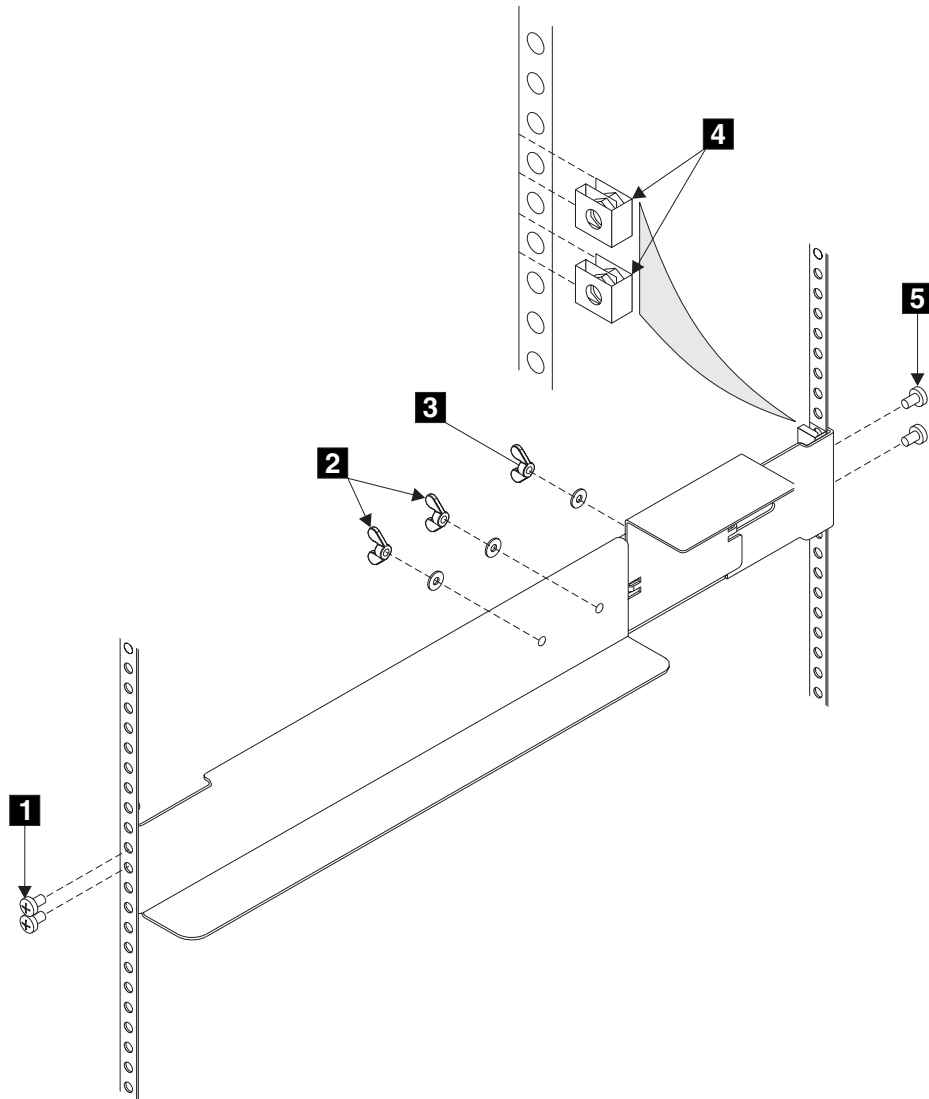
Figure 130. Removing support rails for a uninterruptible power supply from the rack

2. Go to the left-hand support rail.
3. Loosen the two adjustment wing nuts **2** .
4. Remove back screws **5** .
5. Remove the front screws **1** .
6. Remove the rail from the rack.
7. Remove the two nut clips **4** .

Related topics:

- "Installing the support rails for the uninterruptible power supply"

Installing the support rails for the uninterruptible power supply

This task describes how to install the support rails for the uninterruptible power supply.

Steps:

Perform the following steps to install the support rails for the uninterruptible power supply:

1. Refer to the customer's hardware location table to find out where in the rack the uninterruptible power supplies are to be installed.

   Note: If you are installing the SAN Volume Controller into a rack that already contains other SAN Volume Controllers 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 Controllers that you are going to install might have been delivered without uninterruptible power supplies.

2. Discard the two handles and their associated nuts that are shipped with the support rails for the uninterruptible power supply.

3. At the back of the rack, observe the EIA positions, and determine where you are going to install the uninterruptible power supply (see Figure 131 on page 186). A 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.
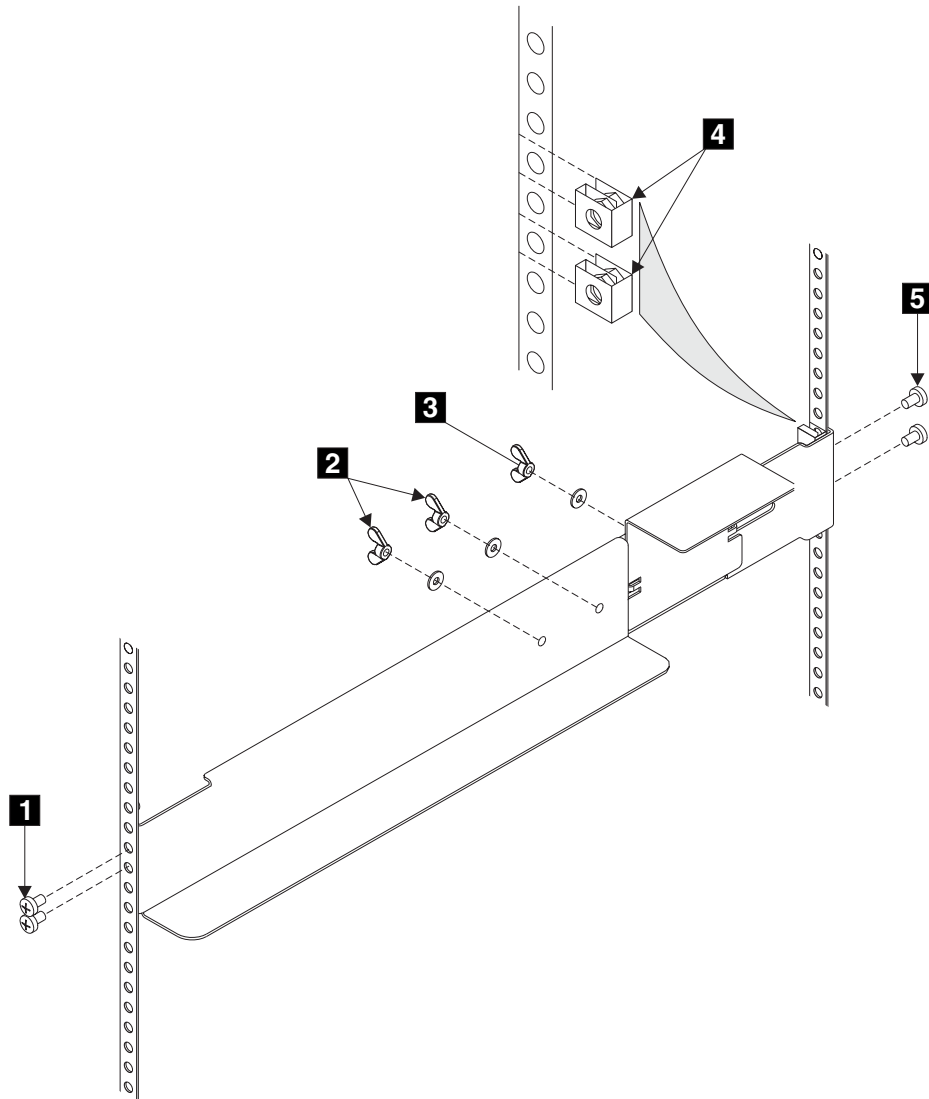
Figure 131. Installing support rails for a uninterruptible power supply into the rack

4. Perform the following steps for each rail:

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

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

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

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

   e. Go to the front of the rack.

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

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

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

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

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

j. Loosen the wing nut **3** and slide the bracket toward the front of the rail, as far as it will go, with the front edge of the bracket against the back end of the front support rail. Fully tighten the wing nut **3** .

Related topics:
- "Removing the support rails for an uninterruptible power supply" on page 183

Appendix A. Parts catalog

The following topics provide part numbers for the different parts and FRUs of the SAN Volume Controller and the uninterruptible power supply.

Related topics:

- "Assembly 1–: SAN Volume Controller"
- "Assembly 2–2: Uninterruptible power supply" on page 191
- "Country or region power cables for the uninterruptible power supply" on page 193

Assembly 1–: SAN Volume Controller

This topic provides information about the parts of the SAN Volume Controller.

The following graphic displays the different parts that make up the SAN Volume Controller.

Assembly 1: Assembly 1–: SAN Volume Controller
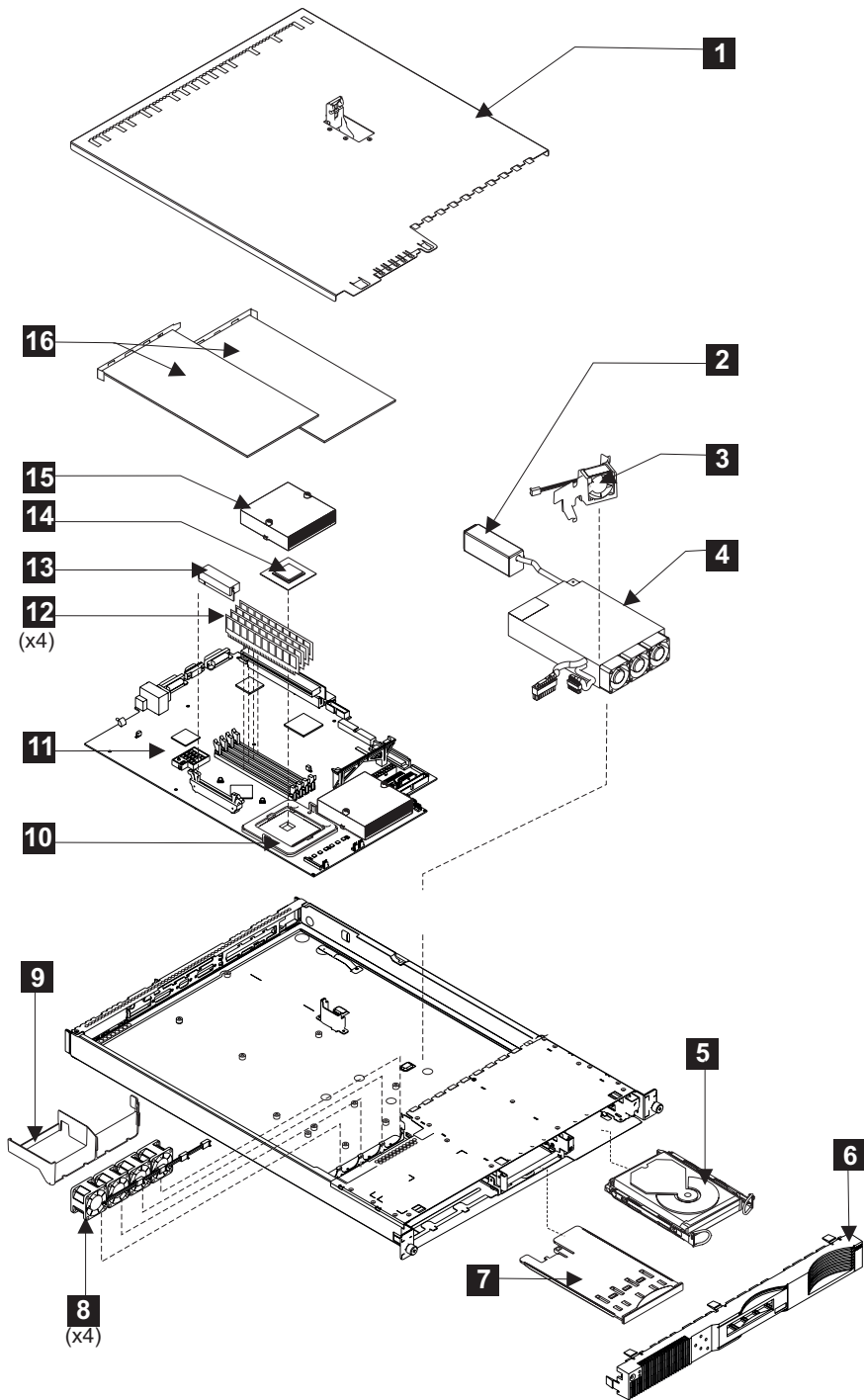
Asm–Index	Part Number	Units	Description
1–	64P7793	1	Frame assembly
–1	24P0708	1	Top cover
–9	24P0742	1	Baffle
–6	64P7858	1	Front panel assembly
–7	64P7785	1	Service controller
–5	24P3704	1	36 GB disk drive assembly
–	18P6414	1	Cable, SCSI power
–	27H0776	1	Cable, SCSI signal
–	32P1928	1	Rail kit for disk drive assembly (contains rails with screws)
–8	24P1118	4	Microprocessor fan assembly
–3	00N6991	1	Disk drive fan and bracket assembly
–11	64P7826	1	System board assembly kit
–12	09N4308	4	Memory module
–	33F8354	1	CMOS battery
–16	64P7783	2	Fibre-channel adapter assembly
–4	49P2090	1	Power supply assembly
–	32P9107	1	SAN Volume Controller support rail kit
–	64P7940	1	Power cable assembly, SAN Volume Controller to uninterruptible power supply
–	19K1265	AR	External Fibre Channel cable, LC-LC, 1.0 m (3.3 ft)
–	11P1373	AR	External Fibre Channel cable, LC-SC/LC, 1.0 m (3.3 ft)
–	19K1266	AR	External Fibre Channel cable, LC-LC, 5.0 m (16.4 ft)
–	19K1267	AR	External Fibre Channel cable, LC-LC, 25.0 m (82 ft)
–	19K1266	AR	Ethernet cable, 2 m (6.5 ft)
–	18P5056	AR	Ethernet cable, 13 m (42 ft)

Assembly 2–2: Uninterruptible power supply

This topic provides information about the parts of the uninterruptible power supply.

The following graphic displays the different parts that make up the uninterruptible power supply.

Assembly 2: Assembly 2–2: Uninterruptible power supply
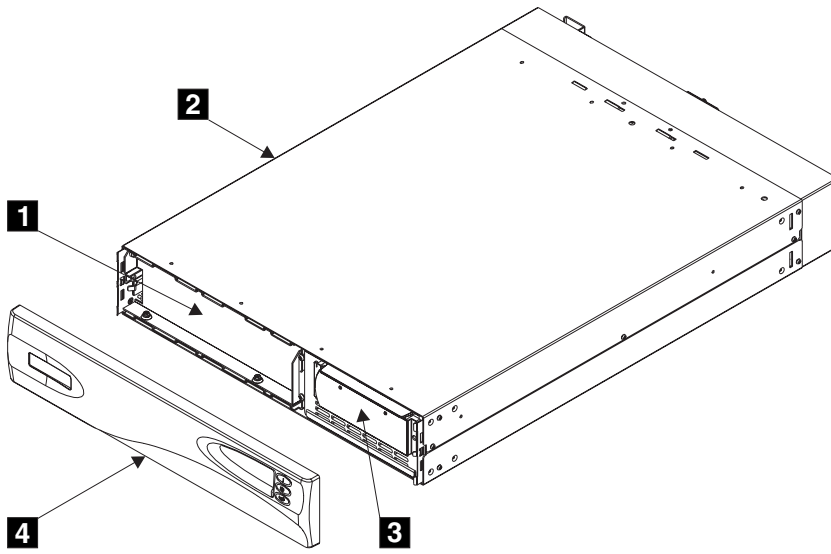
Asm–Index	Part Number	Units	Description
2–2	18P5864	1	Uninterruptible power supply assembly
–4	18P5865	1	Front panel
–3	18P5879	1	Electronics assembly
–1	18P5880	1	Battery assembly
–	21P7220	1	Support rail kit
			Contains rails, nut clips, and screws
–	18P5138	1	Input power cable, power distribution unit to uninterruptible power supply.
–	12J5119	1	Main power cable for the United States.
			For other countries, see "Country or region power cables for the uninterruptible power supply."

Related topics:

- "Country or region power cables for the uninterruptible power supply"

Country or region power cables for the uninterruptible power supply

This topic provides information about your country or region's requirements for the uninterruptible power supply cables.

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

Country or region	Length	Part
Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Cost 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)	12J5119
Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	2.5 m (8 ft)	12J5118
Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Israel, Ivory Coast, Jordan, Lebanon, Luxembourg, Macao S.A.R. of China, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe	2.5 m (8 ft)	55H6643

Country or region	Length	Part
Antigua, Bahrain, Brunei, Channel Islands, Cyprus, Denmark, Dubai, Fiji, Ghana, Hong Kong S.A.R. of China, India, Iraq, Ireland, Kenya, Kuwait, Liechtenstein, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Switzerland, Tanzania, Uganda, United Kingdom, Yemen, Zambia	2.5 m (8 ft)	55H6646
Bangladesh, Burma, Pakistan, South Africa, Sri Lanka	2.5 m (8 ft)	12J5124
Chile, Ethiopia, Italy, Libya, Somalia	2.5 m (8 ft)	12J5126
Thailand	2.5 m (8 ft)	12J5120
United States/Chicago	1.8 m (6 ft)	14F1549

Related topics:
- "Assembly 2–2: Uninterruptible power supply" on page 191

Appendix B. 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.ibm.com/storage/support/2145/

Related topics:

- "Related publications" on page vii

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Related topics:
- "Trademarks"

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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

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

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.

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.

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.

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.

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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

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.

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Glossary

This glossary includes terms for the IBM TotalStorage SAN Volume Controller.

This glossary includes selected terms and definitions from A Dictionary of Storage Networking Terminology (http://www.snia.org/education/dictionary), copyrighted 2001 by the Storage Networking Industry Association, 2570 West El Camino Real, Suite 304, Mountain View, California 94040-1313. Definitions derived from this book have the symbol (S) after the definition.

The following cross-references are used in this glossary:

See   Refers the reader to one of two kinds of related information:

- A term that is the expanded form of an abbreviation or acronym. This expanded form of the term contains the full definition.
- A synonym or more preferred term.

See also
>Refers the reader to one or more related terms.

Contrast with
>Refers the reader to a term that has an opposite or substantively different meaning.

A

asymmetric virtualization. A virtualization technique in which the virtualization engine is outside the data path and performs a metadata-style service. The metadata server contains all the mapping and locking tables while the storage devices contain only data. See also *symmetric virtualization*

C

cache. A high-speed memory or storage device used to reduce the effective time required to read data from or write data to lower-speed memory or a device. Read cache holds data in anticipation that it will be requested by a client. Write cache holds data written by a client until it can be safely stored on more permanent storage media such as disk or tape.

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

CIM. See *Common Information Model*.

Common Information Model (CIM). A set of standards developed by the Distributed Management Task Force (DMTF). CIM provides a conceptual framework for storage management and an open approach to the design and implementation of storage systems, applications, databases, networks, and devices.

D

degraded. Pertaining to a valid configuration that has suffered a failure but continues to be supported and legal. Typically, a repair action can be performed on a degraded configuration to restore it to a valid configuration.

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

disk zone. A zone defined in the storage area network (SAN) fabric in which the SAN Volume Controller can detect and address the logical units that the disk controllers present.

E

error code. A value that identifies an error condition.

excluded. In SAN Volume Controller, the status of a managed disk that the cluster has removed from use after repeated access errors.

extent. A unit of data that manages the mapping of data between managed disks and virtual disks.

F

failover. In SAN Volume Controller, the function that occurs when one redundant part of the system takes over the workload of another part of the system that has failed.

fibre channel. A technology for transmitting data between computer devices at a data rate of up to 4 Gbps. It is especially suited for attaching computer servers to shared storage devices and for interconnecting storage controllers and drives.

FC. See *fibre channel*.

G

GBIC. See *gigabit interface converter*.

gigabit interface converter (GBIC). An interface module that converts the light stream from a fibre-channel cable into electronic signals for use by the network interface card.

H

HBA. See *host bus adapter*.

host bus adapter (HBA). In SAN Volume Controller, an interface card that connects a host bus, such as a peripheral component interconnect (PCI) bus, to the storage area network.

host ID. In SAN Volume Controller, a numeric identifier assigned to a group of host fibre-channel ports for the purpose of logical unit number (LUN) mapping. For each host ID, there is a separate mapping of Small Computer System Interface (SCSI) IDs to virtual disks (VDisks).

host zone. A zone defined in the storage area network (SAN) fabric in which the hosts can address the SAN Volume Controllers.

I

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

input/output (I/O). Pertaining to a functional unit or communication path involved in an input process, an output process, or both, concurrently or not, and to the data involved in such a process.

Internet Protocol (IP). In the Internet suite of protocols, a connectionless protocol that routes data through a network or interconnected networks and acts as an intermediary between the higher protocol layers and the physical network.

IP. See *Internet Protocol*.

I/O. See *input/output.*

I/O group. A collection of virtual disks (VDisks) and node relationships that present a common interface to host systems.

L

local fabric. In SAN Volume Controller, those storage area network (SAN) components (such as switches and cables) that connect the components (nodes, hosts, switches) of the local cluster together.

logical unit (LU). An entity to which Small Computer System Interface (SCSI) commands are addressed, such as a virtual disk (VDisk) or managed disk (MDisk).

logical unit number (LUN). The SCSI identifier of a logical unit within a target. (S)

LU. See *logical unit*.

LUN. See *logical unit number*.

M

managed disk (MDisk). A Small Computer System Interface (SCSI) logical unit that a redundant array of independent disks (RAID) controller provides and a cluster manages. The MDisk is not visible to host systems on the storage area network (SAN).

managed disk group. A collection of managed disks (MDisks) that, as a unit, contain all the data for a specified set of virtual disks (VDisks).

mapping. See *FlashCopy® mapping*.

MDisk. See *managed disk*.

N

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

O

object. In object-oriented design or programming, a concrete realization of a class that consists of data and the operations associated with that data.

offline. Pertaining to the operation of a functional unit or device that is not under the continual control of the system or of a host.

online. Pertaining to the operation of a functional unit or device that is under the continual control of the system or of a host.

P

port. The physical entity within a host, SAN Volume Controller, or disk controller system that performs the data communication (transmitting and receiving) over the fibre channel.

R

RAID. See *redundant array of independent disks*.

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

S

SAN. See *storage area network.*

SCSI. See *Small Computer Systems Interface.*

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

SNMP. See *Simple Network Management Protocol.*

storage area network (SAN). A network whose primary purpose is the transfer of data between computer systems and storage elements and among storage elements. A SAN consists of a communication infrastructure, which provides physical connections, and a management layer, which organizes the connections, storage elements, and computer systems so that data transfer is secure and robust. (S)

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

U

uninterruptible power supply. A device connected between a computer and its power source that protects the computer against blackouts, brownouts, and power surges. The uninterruptible power supply contains a power sensor to monitor the supply and a battery to provide power until an orderly shutdown of the system can be performed.

V

valid configuration. A configuration that is supported.

VDisk. See *virtual disk.*

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

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

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

W

worldwide node name (WWNN). An identifier for an object that is globally unique. WWNNs are used by Fibre Channel and other standards.

worldwide port name (WWPN). A unique 64-bit identifier associated with a fibre-channel adapter port. The WWPN is assigned in an implementation- and protocol-independent manner.

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