

StorageWorks by Compaq

SAN Switch Integrated/32 and SAN Switch Integrated/64

Installation and Hardware Guide

Second Edition November 2001
Part Number: AA-RPDFB-TE
Compaq Computer Corporation

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Contents

About This Guide

Naming Conventions	xi
Related Documents	xii
Text Conventions	xii
Symbols in Text	xiii
Symbols on Equipment	xiii
Rack Stability	xiv
Getting Help	xv
Compaq Technical Support	xv
Compaq Website	xvi
Compaq Authorized Reseller	xvi

Chapter 1

Overview

Introduction	1-1
Features of the SAN Integrated Switch	1-2
Front Panel	1-3

Chapter 2

Installing the SAN Integrated Switch

Installation Considerations and Safety Guidelines	2-1
Selecting an Operating Location	2-2
Cooling Requirements	2-2
Power Requirements	2-3
Items Required for Installation	2-5
Unpacking the SAN Integrated Switch	2-5
Identifying the Crate Contents	2-7
Installing the SAN Integrated Switch	2-8

Chapter 3

Configuring the SAN Integrated Switch

Items Required for Configuring the SAN Integrated Switch	3-2
Powering Up the Switch Elements	3-2
Connecting the Serial and Ethernet Cables	3-2
Connecting the Serial Cable	3-3
Connecting Through a Workstation	3-5
Setting the IP Address	3-5
Connecting the Ethernet Cables	3-7
Modifying the Domain IDs	3-8
Specifying the Desired Status Policies	3-9
Checking the Fabric for Port or ISL Issues	3-9
Checking Each Switch Element for Port or ISL Issues	3-10
Resetting Factory Defaults	3-10
Saving and Restoring the Switch Element Configuration Settings	3-11
Saving Switch Element Configurations to a Host File	3-11
Installing an FTP Server	3-12
Uploading a Configuration	3-12
configUpload Parameters	3-14
Restoring Switch Element Configurations from a Host File	3-14
Downloading a Configuration	3-15
configDownload Parameters	3-16
Status Indicators	3-17
Connecting the Fibre Channel Cables	3-18
Connecting Fibre Channel Cables to the GBICs	3-20

Chapter 4

Repair and Replacement

Replacing a GBIC Module	4-2
Removing a GBIC Module	4-2
Installing a GBIC Module	4-3
Replacing the Switch Element	4-4
Items Required	4-4
Removing the Switch Element	4-5
Installing the Replacement Switch Element	4-9
Configuring the Replacement Switch Element	4-10
Adding the New Switch Element to the Integrated Fabric	4-12
Replacing ISL Cables	4-14
Items Required	4-14
Disconnecting the Faulty Fiber-Optic Cable	4-15
Connecting the New ISL Cable to the Appropriate Ports	4-15
Checking the Switch Element and Fabric for Port or ISL Issues	4-15

Chapter 5

Upgrading Firmware

Downloading Firmware from the Compaq Website	5-1
Upgrading Firmware Using Web Management Tools	5-2
Upgrading Firmware Using a Telnet Command	5-4
Windows NT Intel Host	5-4
Windows NT Alpha Host	5-5
Compaq Tru64 UNIX Host	5-6

Appendix A

Regulatory Compliance Notices

Regulatory Compliance Identification Numbers	A-1
Federal Communications Commission Notice	A-2
Class A Equipment	A-2
Class B Equipment	A-2
Declaration of Conformity for Products Marked with FCC	
Logo – United States Only	A-3
Modifications	A-4
Network and Serial Cables	A-4
Canadian Notice (Avis Canadien)	A-4
Class A Equipment	A-4
Class B Equipment	A-4
European Union Notice	A-5
Japanese Notice	A-5

Taiwanese Notice	A-6
Laser Devices	A-6
Laser Safety Warnings	A-6
Compliance with CDRH Regulations	A-6
Compliance with International Regulations	A-7
Laser Product Label	A-7
Laser Information	A-7
Battery Replacement Notice	A-8

Appendix B

Electrostatic Discharge

Precautions Against Electrostatic Discharge	B-1
Grounding Methods	B-2

Appendix C

Specifications

Weight Specifications	C-1
Physical Dimensions	C-2
Environmental Specifications	C-2
GBICs	C-3
Switch Element Specifications	C-3
Switch Element Memory	C-4
Power Supply	C-4
Factory Default Settings	C-5

Index

Figures

Figure 1-1:	Front Panel Features of a IS/32 or IS/64-port SAN Integrated Switch	1-3
Figure 1-2:	Front panels of the IS/32 and IS/64	1-4
Figure 1-3:	Logical view showing ISLs and user ports on the IS/32 and IS/64	1-4
Figure 2-1:	Distributing switch elements among multiple power sources	2-4
Figure 2-2:	SAN Integrated Switch on pallet, with crate cover removed	2-6
Figure 2-3:	Package contents	2-7
Figure 2-4:	Installing the SAN Integrated Switch in the rack	2-9
Figure 2-5:	Align Holes in Upper Rear Bracket with the four screw holes on the SAN Integrated Switch	2-11
Figure 2-6:	Insert the cage nuts into the rail	2-12
Figure 2-7:	Front and rear views of power cable Installation	2-14
Figure 3-1:	Connecting the serial cable	3-4
Figure 3-2:	Connecting the Ethernet cables	3-7
Figure 3-3:	configUpload command example 1	3-13
Figure 3-4:	configUpload command example 2	3-14
Figure 3-5:	configDownload command example 1	3-15
Figure 3-6:	configDownload command example 2	3-16
Figure 3-7:	Dual SC fiber-optic plug keyed connector	3-18
Figure 3-8:	An optical cable connecting to a GBIC module	3-20
Figure 4-1:	GBIC module with locking bar	4-2
Figure 4-2:	Squeeze-prong GBIC module	4-3
Figure 4-3:	Replacing the switch element from the SAN Integrated Switch	4-7
Figure 4-4:	The switch element with slide mounting brackets	4-8
Figure 4-5:	The ISL cabling diagram for an IS/32	4-18
Figure 4-6:	The ISL cabling diagram for an IS/64	4-18
Figure 5-1:	Firmware Upgrade page example	5-3

Tables

Table 3-1:	Serial Port Pinouts	3-3
Table 3-2:	Serial Port Settings.	3-5
Table 3-3:	Syntax of a Name: Value Pair	3-13
Table 3-4:	Port Status Indicators.	3-17
Table 3-5:	AC Module Status Indicators.	3-17
Table 3-6:	User Ports on the SAN Integrated Switch	3-18
Table 3-7:	Fibre Channel Cabling Specifications	3-19
Table 3-8:	Fibre Channel Cabling Part Numbers	3-19
Table 4-1:	Group Information	4-13
Table 4-2:	Cable Configuration for IS/32	4-16
Table 4-3:	Cable Configuration for IS/64	4-17
Table C-1:	Weight Specifications	C-1
Table C-2:	Dimensions for the SAN Integrated Switch	C-2
Table C-3:	Environmental Specifications	C-2
Table C-4:	Switch Element Specifications	C-3
Table C-5:	Power Supply Requirements	C-4
Table C-6:	Factory Default Settings	C-5

About This Guide

This guide provides instructions for installing the Compaq *StorageWorks SAN Switch Integrated/32* and *SAN Switch Integrated/64*. In addition, this guide contains information regarding operation and troubleshooting.

Naming Conventions

Throughout this document, the Compaq StorageWorks SAN Switch Integrated/32 and SAN Switch Integrated/64, will be referred to as follows:

- Collectively, both models will be called the SAN Integrated Switch.
- Individually, the models will be called the IS/32 or the IS/64.

Each of the six individual switches comprising the SAN Integrated Switch will be referred to as one of the following:

- A switch element
- The Fibre Channel SAN Switch 16-EL

Related Documents

In addition to this guide, the following documentation provides useful information for installing, configuring, operating and upgrading your SAN Integrated Switch:

Document:	Part Number/Location:
Compaq <i>StorageWorks Fibre Channel SAN Switch 16-EL Installation and Hardware Guide</i>	AA-RNAPB-TE / Located on the StorageWorks SAN Switch Software V2.4.1 CD
Compaq <i>StorageWorks Fibre Channel SAN Switch Management Guide</i>	AA-RMMJB-TE / Located on the StorageWorks SAN Switch Software V2.4.1 CD

Text Conventions

This document uses the following conventions to distinguish elements of text:

Keys	Keys appear in boldface. A plus sign (+) between two keys indicates that they should be pressed simultaneously.
USER INPUT	User input appears in a different typeface and in uppercase
<i>FILENAMES</i>	File names appear in uppercase italics.
Menu Options, Command Names, Dialog Box Names	These elements appear in initial capital letters.
COMMANDS, DIRECTORY NAMES, and DRIVE NAMES	These elements appear in upper case. NOTE: UNIX commands are case sensitive and will not appear in uppercase.
Type	When you are instructed to <i>type</i> information, type the information without pressing the Enter key.
Enter	When you are instructed to enter information, type the information and then press the Enter key.

Symbols in Text

These symbols may be found in the text of this guide. They have the following meanings.



WARNING: Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or loss of life.



CAUTION: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

IMPORTANT: Text set off in this manner presents clarifying information or specific instructions.

NOTE: Text set off in this manner presents commentary, sidelights, or interesting points of information.

Symbols on Equipment

These icons may be located on equipment in areas where hazardous conditions may exist.



Any surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

WARNING: To reduce the risk of injury from electrical shock hazards, do not open this enclosure.



Any RJ-45 receptacle marked with these symbols indicates a Network Interface Connection.

WARNING: To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.



Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists.

WARNING: To reduce the risk of injury from a hot component, allow the surface to cool before touching.



Power Supplies or Systems marked with these symbols indicate the equipment is supplied by multiple sources of power.

WARNING: To reduce the risk of injury from electrical shock, remove all power cords to completely disconnect power from the system.



Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

WARNING: To reduce the risk of personal INJURY or damage to the equipment, observe local occupational health and safety requirements and guidelines for manual material handling.

Rack Stability



WARNING: To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks are extended to the floor.
 - The full weight of the rack rests on the leveling jacks.
 - The stabilizing feet are attached to the rack if it is a single rack installation.
 - The racks are coupled together in multiple rack installations.
 - Only one component is extended at a time. A rack may become unstable if more than one component is extended for any reason.
 - Heaviest components are installed at the bottom of the rack.
-

Getting Help

If you have a problem and have exhausted the information in this guide, you can get further information and other help in the following locations.

Compaq Technical Support

In North America, call the Compaq technical support phone center at 1-800-652-6672 (1-800-OK-COMPAQ). This service is available 24 hours a day, 7 days a week.

NOTE: For continuous quality improvement, calls may be recorded or monitored.

Outside North America, call the nearest Compaq technical support phone center. Telephone numbers for worldwide technical support centers are listed on the Compaq website. Access the Compaq website by logging on to the Internet at <http://www.compaq.com>.

Be sure to have the following information available before you call Compaq:

- Technical support registration number (if applicable)
- Product serial numbers
- Product worldwide name
- Product model names and numbers
- Product licenses
- Applicable error messages
- Add-on boards or hardware
- Third-party hardware or software
- Operating system type and revision level
- Detailed, specific questions

Compaq Website

The Compaq website has latest information on this product as well as the latest firmware. You can access the Compaq website by logging on to the Internet at <http://www.compaq.com/storage>.

Compaq Authorized Reseller

For the name of your nearest Compaq authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.
- Elsewhere, see the Compaq website for locations and telephone numbers.

Chapter 1

Overview

This chapter covers the following topics:

- Introduction, page 1-1
- Features of the SAN Integrated Switch, page 1-2
- Front Panel, page 1-3

Introduction

The SAN Integrated Switch is a low-cost, one gigabit (GB), Fibre Channel switch. It is available in two models: 32-port high-performance (IS/32), or 64-port high connectivity (IS/64). Use the SAN Integrated Switch to connect storage devices, hosts, and servers in a Storage Area Network (SAN).

The SAN Integrated Switch offers 32 non-blocking or 64 low-latency ports; each port is capable of delivering 100 megabytes per second (MB/s) full-duplex. Cut-through routing provides latency of less than 2 microseconds from switch port to switch port. The SAN Integrated Switch consists of a 14U (25-inch) high rack-mountable enclosure with six integrated switch elements that are preconfigured with all necessary interswitch cabling for quick installation. Each switch element is a Compaq StorageWorks Fibre Channel SAN Switch 16-EL.

All ports for the SAN Integrated Switch are configured with removable short wave Gigabit Interface Converter (GBIC) modules. Switch elements are factory configured with interswitch link (ISL) optical cables.

All SAN Integrated Switch ports support full fabric capability. Full fabric allows the SAN Integrated Switch to be linked or cascaded to other StorageWorks Fibre Channel switches, enabling you to build a highly scalable SAN fabric. The SAN Integrated Switch supports F_port, FL_port, and E_port connections and Distributed Name Server (DNS).

Fully compatible with the entire Compaq StorageWorks SAN Switch product family, the SAN Integrated Switch enables customers to deploy SANs in a modular manner and scale storage environments as needed, while optimizing existing investments in server and storage infrastructure. The SAN Integrated Switch can be managed from a network.

Features of the SAN Integrated Switch

Features of the IS/32 and IS/64 include the following:

- High data throughput. All user ports are capable of the maximum Fibre Channel speed of one Gb/s in a full Fibre Channel fabric architecture.
- Factory-configured with shortwave optical GBICs and ISL optical cables to provide either 32 or 64 user ports. Each port can also accept longwave optical GBICs.
- High availability. Automatic, dynamic path rerouting in the event of a link failure. No single point of failure.
- Modular design. Single, integrated, rack-ready, 14U-chassis.
- Preconfigured with Web-Based Management Tools, and Zoning software.
- Backward compatibility between Fibre Channel SAN Integrated switches and Compaq StorageWorks Fibre Channel SAN switches. Older, discontinued Fibre Channel Switch 8 and 16 models are not compatible.
- Individual switch elements can be replaced with Compaq SAN Switch 16-ELs, for great serviceability and reduced spares inventory (see Replacing the Switch Element, page 4-4)
- High port-count solutions at an unmatched low cost of ownership and scalability.

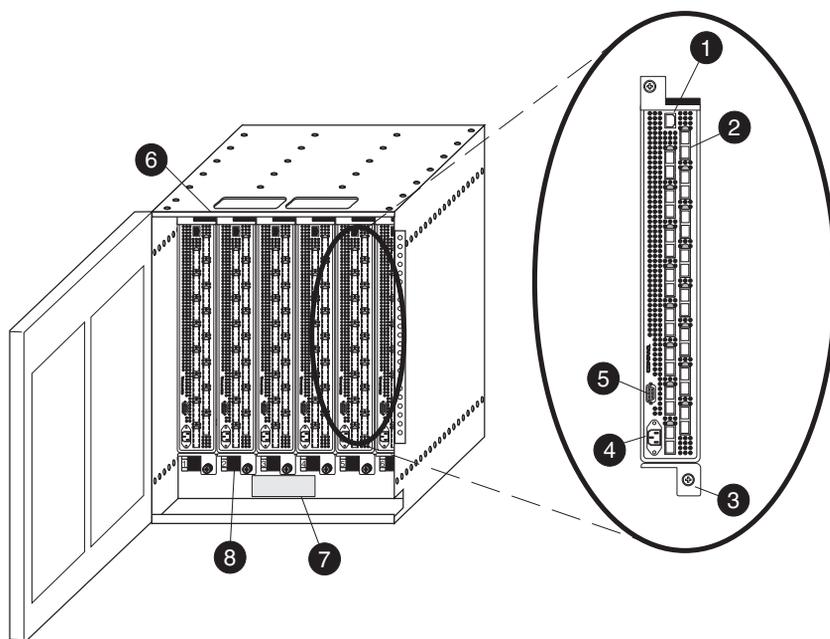
Front Panel

The 32-port and 64-port models of the SAN Integrated Switch share the same basic features. They differ only in the wiring of ISL cables and the number of available user ports.

Figure 1-1 shows the front panel of the SAN Integrated Switch, with all features common to both the IS/32 and IS/64.

Figure 1-2 shows the front panels of the IS/32 and IS/64 with all ISLs connected.

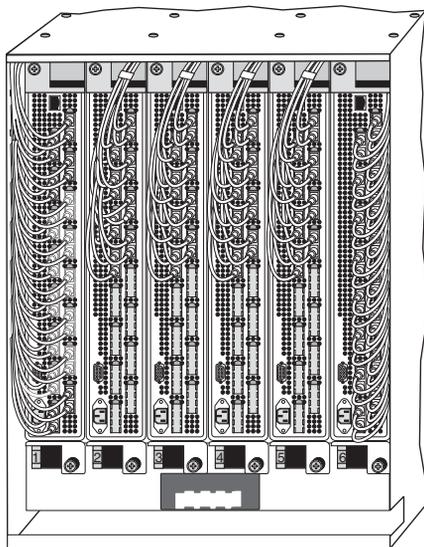
Figure 1-3 shows the logical view of the IS/32 and IS/64 user ports and ISLs.



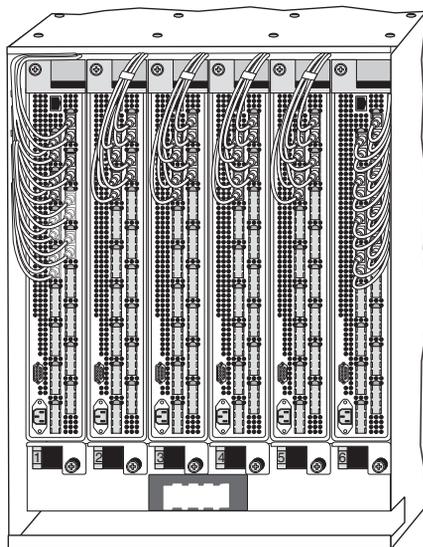
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- | | |
|---|---------------------------|
| ① RJ-45 Ethernet port used for switch management (6) | ④ AC power connector (6) |
| ② GBIC modules (96 total: 32 or 64 customer-accessible ports; the rest are used for ISLs) | ⑤ DB9 serial port (6) |
| ③ Self-retaining screw (12) | ⑥ Cable guide |
| | ⑦ Cable diagram |
| | ⑧ Power cable channel (6) |

Figure 1-1: Front panel features of a IS/32 or IS/64-port SAN Integrated Switch



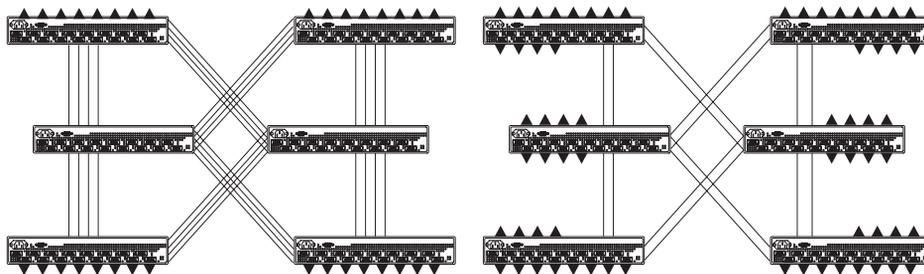
Front panel of IS/32



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Front panel of IS/64

Figure 1-2: Front panels of the IS/32 and IS/64



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▼ indicates user port; interconnecting lines indicate ISLs

ISL cable configuration on IS/32

ISL cable configuration on IS/64

Figure 1-3: Logical view showing ISLs and user ports on the IS/32 and IS/64

For a list of available user ports, see *Connecting the Fibre Channel Cables*, page 3-18.

Installing the SAN Integrated Switch

This chapter covers the following topics:

- Installation Considerations and Safety Guidelines, page 2-1
- Unpacking the SAN Integrated Switch, page 2-5
- Identifying the Crate Contents, page 2-7
- Installing the SAN Integrated Switch, page 2-8

Installation Considerations and Safety Guidelines



WARNING: The SAN Integrated Switch weighs approximately 200 pounds. Use proper handling and lifting equipment to reduce the possibility of injury or product damage.

This chapter provides instructions for installing the SAN Integrated Switch. A rack mounting kit is included with your SAN Integrated Switch. Plan before you begin to rack mount the SAN Integrated Switch, and observe the following guidelines:

- When you install the SAN Integrated Switch in a closed or multitrack assembly, be sure the air temperature measured at the front panel does not exceed 40° C (104° F) during operation.
- The SAN Integrated Switch can be installed facing either direction in a rack, which allows you to choose the orientation of the air inlet and service sides. However, the SAN Integrated Switch must be installed so that cooling air for all components in the rack is flows in the same direction. Installing the SAN Integrated Switch other than the way described here is considered an unsupported configuration.

- Make sure the airflow to the SAN Integrated Switch is at least 300 cubic feet per minute (cfm).
- Verify there is space in the rack. The SAN Integrated Switch is 14U (25 inches) high.
- Heaviest components should always be installed in the bottom of the rack.
- Before the SAN Integrated Switch is installed, verify that the rack is stable. (See Rack Stability, page xiv.)
- Verify that the SAN Integrated Switch does not unbalance the rack or exceed the rack's mechanical limits, when all six switch elements are in the chassis, and one of the six is partially extended out of the chassis.
- Verify that the supply circuit, the line fuse, and the wire size are adequate according to the electrical rating on the switch element's nameplate.
- Verify that all pieces of equipment installed in the rack have reliable grounds; do not rely on connection to a branch circuit, such as a power strip.
- Route and support the power cords to ensure that the switch elements move freely on the slide brackets without crimping or chafing the power cords, or interfering with other equipment and cables installed in the rack.



CAUTION: It is strongly recommended that the rack be mechanically secured to prevent tipping over in an earthquake.

Selecting an Operating Location

The SAN Integrated Switch should be located in a secure or limited-access area to ensure that cable connections are not compromised. The switch must meet the cooling air requirements and power requirements described below.

Cooling Requirements

Each of the six switch elements has built-in axial fans to cool the units. The direction of air flow is from the air inlet side (rear of the switch where fans are visible) to the service side (the front where the ports and ISL cables are) of the units. The entire SAN Integrated Switch is specially configured to provide proper cooling for a maximum power rating of 70 watts (W) per switch element. Total system power is 420W.



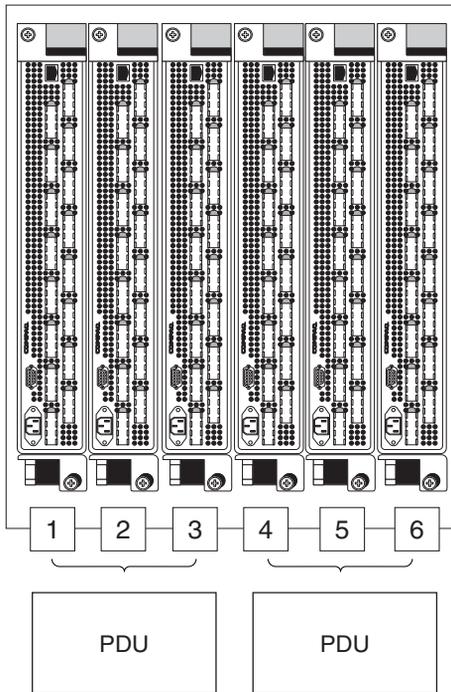
CAUTION: The cooling air for all components in the rack must flow in the same direction to allow for proper temperature control. Do not block the front or rear air vents. The switch uses ambient air for cooling.

Power Requirements

The switch element is powered up as soon as the power cable is connected to the switch and to a power source. The switch element automatically performs a Power-On Self-Test (POST), a diagnostic test that takes 2.5 to 5 minutes. Power supply requirements are listed in Appendix C.

Each switch element has its own universal power supply capable of functioning worldwide without voltage jumpers or switches. The power supply is auto-ranging in terms of accommodating input voltages and line frequencies, and meets IEC 61000-4-5 surge voltage requirements. Each AC power cord is inserted into the connector at the bottom of each switch element (see *Installing the SAN Integrated Switch*, page 2-8).

In order to protect the SAN Integrated Switch from power source failures, it is desirable to distribute the switch elements across two different power sources, if there are two AC power sources available. The division should place switch elements one, two and three on a different source than four, five and six, as shown in Figure 2-1.



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Figure 2-1: Distributing switch elements among multiple power sources

Each of the two power sources is best protected by its own Uninterruptable Power Supply (UPS).

The AC power source must meet these requirements:

- A properly wired, earth-grounded AC outlet
- Voltage capability of 85-264 VAC
- Input voltage frequency of 47-63 Hz
- Power capability of 75W, maximum, per switch element.

Items Required for Installation

The following items are required to install the SAN Integrated Switch:

- Lift device (recommended)
- SAN Integrated Switch (IS/32 or IS/64)
- Mounting brackets and hardware
- Number 2 Phillips screwdriver
- Minimum 30-inch deep rack space, 14 rack units (RU) high and 19 inches wide
- Six power outlets, one for each switch element (preferably distributed across two power sources)

Unpacking the SAN Integrated Switch

The SAN Integrated Switch arrives in a wooden crate. Use these steps to unpack the switch.



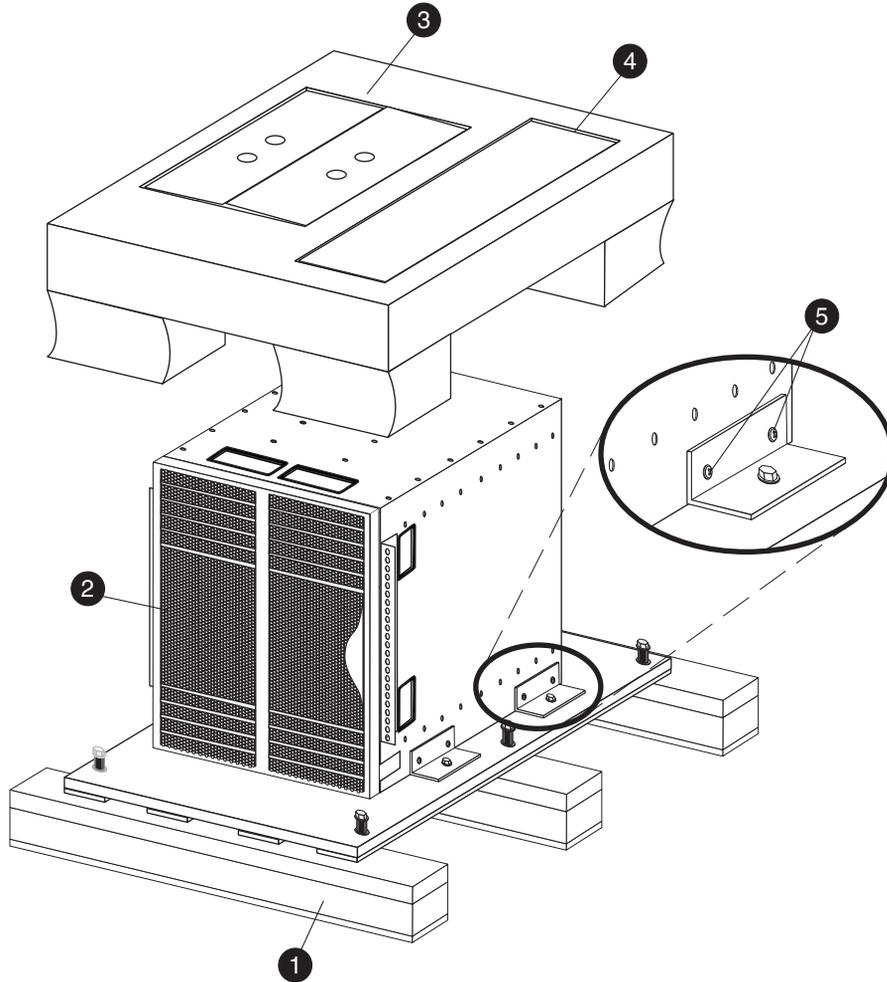
WARNING: The SAN Integrated Switch weighs approximately 200 pounds. The use of a lift device is recommended to install safely the SAN Integrated Switch, and to reduce the possibility of injury or product damage. This procedure documents the use of a lift device.

1. To release each of the six latches at the front of the crate and the two latches at the rear of the crate:



WARNING: Brace the front panel of the crate before releasing the final latch, otherwise the panel may fall away and could cause personal injury.

- a. Lift each key and turn it counterclockwise.
 - b. Remove the front panel of the crate and put aside.
2. Lift the crate cover away from the base to expose the SAN Integrated Switch and two boxes containing mounting hardware, cables, and a documentation kit. See Figure 2-2.
 3. Set aside the two boxes.
 4. Remove the packing material around and on top of the SAN Integrated Switch.



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- ❶ Pallet
- ❷ SAN Integrated Switch
- ❸ Box containing documentation kit and cables
- ❹ Box containing mounting hardware
- ❺ Screws which attach SAN Integrated Switch to pallet brackets (two per bracket/four brackets)

Figure 2-2: SAN Integrated Switch on pallet, with crate cover removed

Identifying the Crate Contents

The following items are included in the SAN Integrated Switch crate (see Figure 2-3).

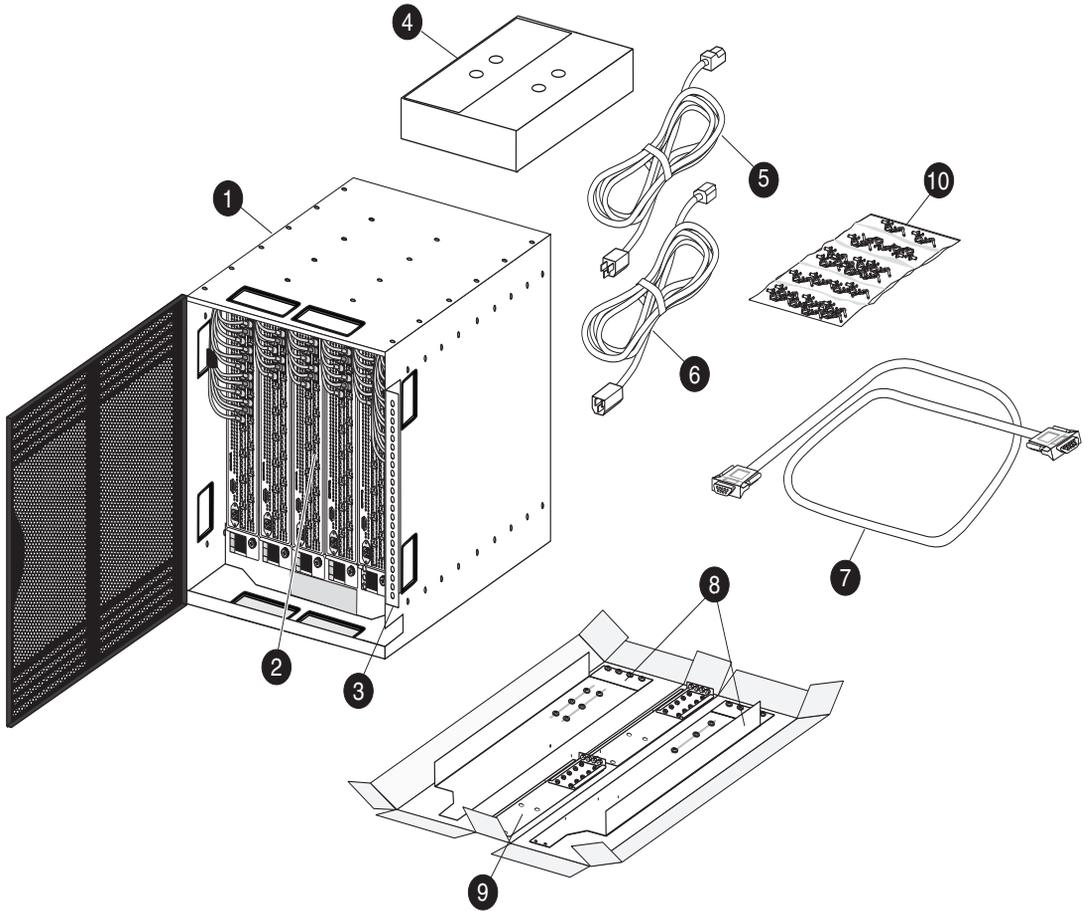


Figure 2-3: Package contents

Crate Contents		Quantity
❶	Fully configured SAN Integrated Switch	1
❷	Fibre Channel SAN Switch 16-EL switch elements interconnected with ISLs	6
❸	Left and Right Front Rail Bracket	1 of each
❹	Documentation and software kit	1
❺	AC power cords with standard 3-prong connectors	6
❻	AC power cords with recessed 3-prong connectors	6
❼	Serial cable	1
❽	Left and Right 2-part Rack Mount Brackets	1 of each
❾	Left and Right 2-part Upper Rear Brackets	1 of each
❿	Plastic pouch containing:	1
	■ 1/4-20 X .5 inch Phillips panhead screws for Rack Mount Brackets	12
	■ 1/4-20 X .5 inch Phillips panhead screws for Upper Rear Brackets	4
	■ 8-32 X 5/16 inch Phillips countersunk screws for attaching Upper Rear Brackets to chassis	8
	■ 10-32 cage nuts to be installed in rail	4
	■ 10-32 X .63 inch Phillips panhead screws for attaching Front Rail Brackets to rail	4

Installing the SAN Integrated Switch

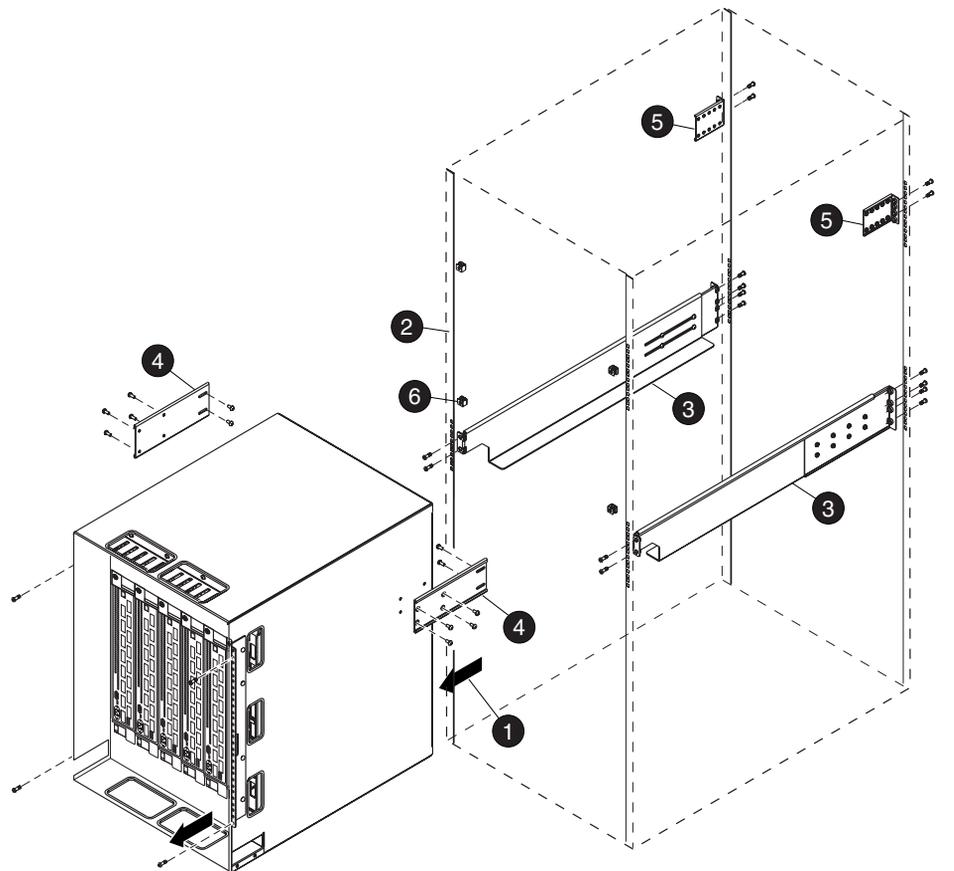
The procedure below describes how to install the SAN Integrated Switch.

1. Transfer the SAN Integrated Switch from the pallet to the lift device, and set aside.



WARNING: Three people will need to work together to transfer the SAN Integrated Switch to the lift. Make sure the wheels of the lift cannot roll as you transfer the SAN Integrated Switch to the lift. Move the SAN Integrated Switch slowly and carefully onto the lift to prevent back and hand injury. Dropping the SAN Integrated Switch could injure personnel or damage the equipment.

- a. Position the lift device adjacent to the SAN Integrated Switch.
- b. With a pallet jack, raise the pallet on which the SAN Integrated Switch is mounted to the same height as the top surface of the lift device.
- c. Remove the eight screws holding the SAN Integrated Switch to brackets on the pallet. See Figure 2-2.
- d. Slide the SAN Integrated Switch across from the pallet to the lift device.

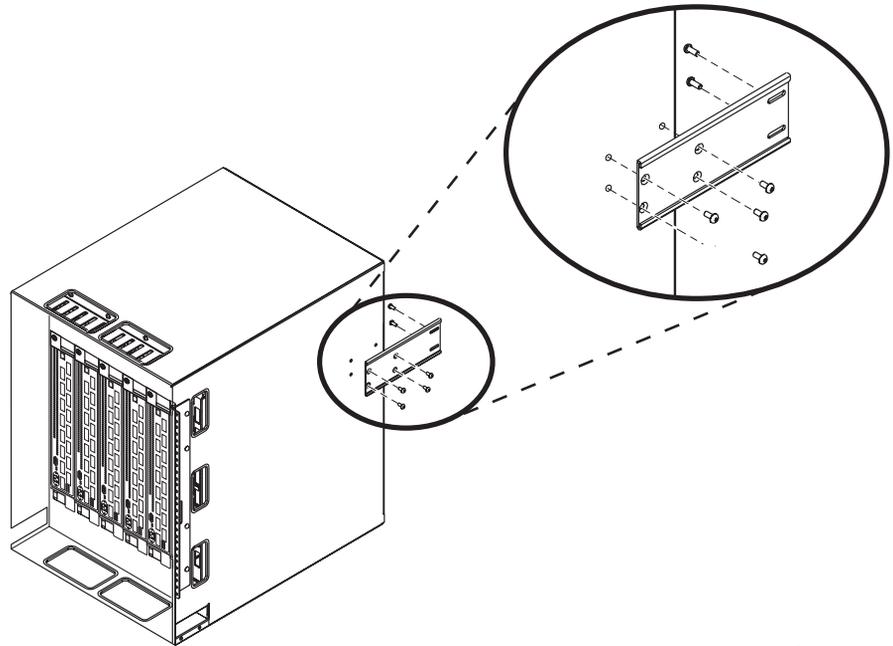


- | | | | |
|------------|-----------------|--|---|
| ❶ Air flow | ❷ Rails in Rack | ❸ Left and Right Rack Mount Brackets | ❹ Left and Right Upper Rear Brackets (straight section) |
| | | ❺ Left and Right Upper Rear Brackets (L section) | ❻ Cage nuts |

Figure 2-4: Installing the SAN Integrated Switch in the rack

NOTE: The rail is divided into units, each unit is marked with a small round hole and has three square openings for mounting equipment. The rail is positioned such that the top front screw is installed above the small round hole and the second screw below the round hole.

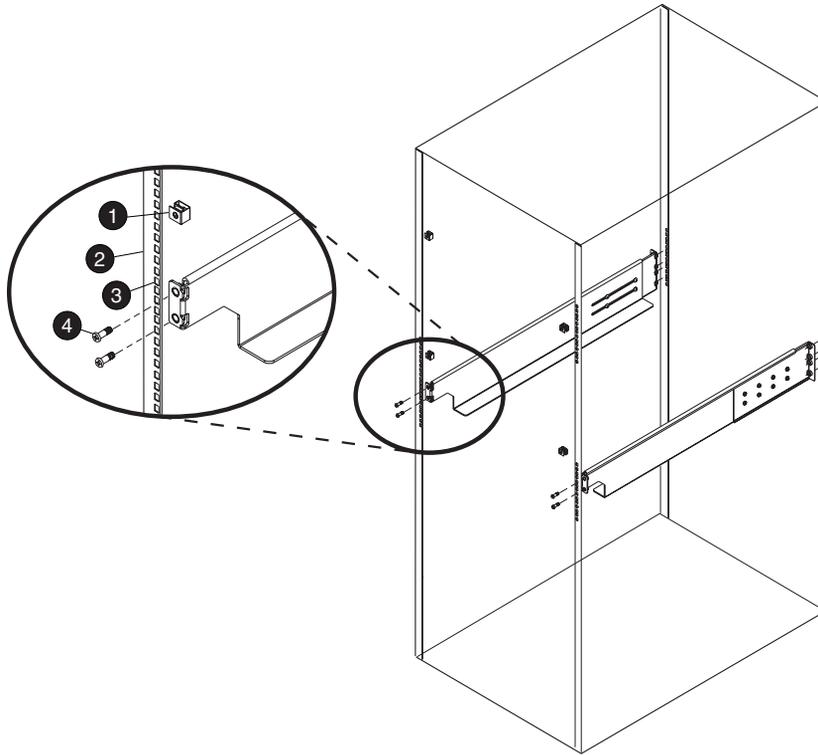
2. Attach the Rack Mount Brackets (item 3) to the rack rails (item 2) to create a shelf:
 - a. Loosen the screws which connect the two parts of each Rack Mount Bracket.
 - b. Adjust the depth of the bracket to fit into the rack. Leave the length-adjustment screws loose until after you have attached the Rack Mount Brackets.
 - c. Install each Rack Mount Bracket with the notched end aligned with the front (cable-side) of the SAN Integrated Switch, in such a way that cooling air of all components in the rack is flowing the same direction (item 1).
 - d. Attach the left and right Rack Mount Brackets to the rails in the rack. Use two 1/4-20 X .5 inch Phillips head screws to attach the front of each bracket. Use four 1/4-20 X .5 inch Phillips head screws to attach the rear of each bracket.
 - e. Tighten the length-adjustment screws in each Rack Mount Bracket.
 - f. Tighten the 1/4-20 Rack Mount screws.
3. Attach the Upper Rear Brackets:
 - a. Disassemble each two-part Upper Rear Bracket.
 - b. Set aside the L sections (item 5). Attach these after you install the SAN Integrated Switch in the rack.
 - c. Align the straight section (item 4) of the right bracket with the four screw holes in the right side of the SAN Integrated Switch, as shown in Figure 2-5.



SHR-2201A

Figure 2-5: Align holes in Upper Rear Bracket with the four screw holes on the SAN Integrated Switch

- d. Attach the straight section of the right bracket to the SAN Integrated Switch with four 8-32 X 5/16 inch Phillips countersunk screws. The flat side of the bracket should lay against the SAN Integrated Switch.
 - e. Repeat steps c and d for the straight section of the left Upper Rear Bracket.
4. Insert four cage nuts in the rails. They are used to attach the Front Rail Brackets of the SAN Integrated Switch to the rails in the rack (see Figure 2-6):
- a. On the left front rail, count up three square openings from the upper screw of the Rack Mount Bracket. Insert the first cage nut.
 - b. Measure 26 square openings above first cage nut, and insert second cage nut.
 - c. Repeat steps a and b for the right front rail, inserting third and fourth cage nuts.



SHR-2211A

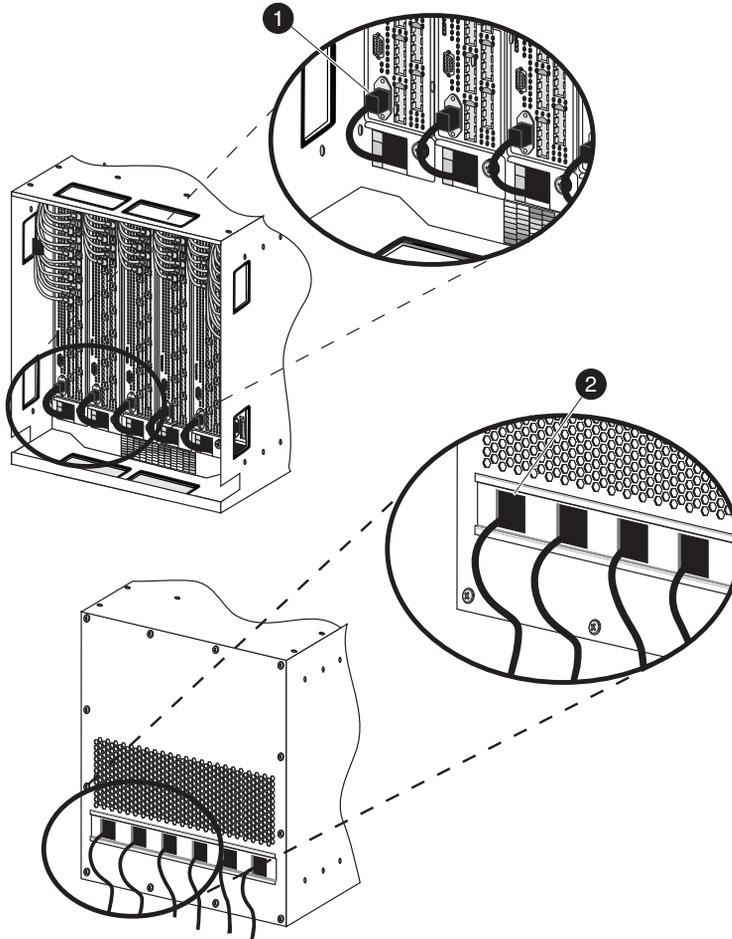
- | | |
|-------------------|-------------------------------------|
| ❶ Cage nut | ❸ Square opening |
| ❷ Left front rail | ❹ Upper screw of rack mount bracket |

Figure 2-6: Insert the cage nuts into the rail

5. Guide the SAN Integrated Switch into the rack:
 - a. Remove the door of the SAN Integrated Switch by releasing the spring-loaded hinges.
 - b. Using the lift device, position the SAN Integrated Switch adjacent to the rack.
 - c. Align the lift table top so it is level with the Rack Mount Bracket.
 - d. Assign one person to guide the SAN Integrated Switch into place from the rear of the rack.
 - e. Assign another person to simultaneously guide the SAN Integrated Switch off the lift and onto the shelf created by the Rack Mount Brackets.

- f. Slowly and carefully, maneuver the SAN Integrated Switch into the rack, until it is fully supported by the Rack Mount Brackets.
 - g. Remove the lift.
6. Secure the SAN Integrated Switch in the rack:
- a. Reattach the left and right L sections to the straight sections of the Upper Rear Brackets with the length-adjustment screws.
 - b. Secure the L section of the Upper Rear Bracket to the rail, using a total of four 1/4-20 X .5 inch Phillips head screws; two on the left, and two on the right.
 - c. Tighten the length-adjustment screws in the brackets.
 - d. Tighten the screws holding the bracket to the rail.
 - e. At the front of the SAN Integrated Switch, insert a total of four 10-32 X .63 Phillips panhead screws through the left and right Front Rail Brackets and corresponding cage nuts.

7. Install each of the six AC power cords (see Figure 2-7):
 - a. Route each cord from the rear of the SAN Integrated Switch, through the power cable channel.
 - b. Insert the cable into the receptacle on the SAN Integrated Switch.



- ❶ AC power cable
- ❷ Power cable channel

SHR-2202A

Figure 2-7: Front and rear views of power cable installation

8. Replace the door of the SAN Integrated Switch.

Chapter 3

Configuring the SAN Integrated Switch

This chapter covers the following topics:

- Items Required for Configuring the SAN Integrated Switch, page 3-2
- Powering Up the Switch Elements, page 3-2
- Connecting the Serial and Ethernet Cables, page 3-2
- Modifying the Domain IDs, page 3-8
- Specifying the Desired Status Policies, page 3-9
- Checking the Fabric for Port or ISL Issues, page 3-9
- Checking Each Switch Element for Port or ISL Issues, page 3-10
- Resetting Factory Defaults, page 3-10
- Saving and Restoring the Switch Element Configuration Settings, page 3-11
- Status Indicators, page 3-17
- Connecting the Fibre Channel Cables, page 3-18

Items Required for Configuring the SAN Integrated Switch

Prior to configuring the SAN Integrated Switch, make sure you have the following:

- Serial cable to connect the workstation to each of the switch elements
- Six unused IP addresses, one for each switch element
- Workstation that has a terminal emulator application (such as HyperTerminal).

NOTE: HyperTerminal is the remote communication program provided with Windows 95/Windows 98/Windows 2000/Windows NT and can be found on the Accessories menu that displays when you click Start then Programs.

- Ethernet connections between the workstation and the SAN Integrated Switch (through a router, hub or concentrator)

Powering Up the Switch Elements

The switch elements do not have power switches. Connect each AC power cord from the switch element in the SAN Integrated Switch to a power source, in order to power up. You will see a steady green light indicating that power is on.

1. Firmly seat each power connector into the power source. If no light is showing, power is not being supplied to the switch element. Check that the power cord is connected at both ends.
2. Each switch element will perform a POST which can take approximately 2.5 to 5 minutes.

NOTE: The SAN Integrated Switch meets IEC 61000-4-5 surge voltage requirements; however, there is no other surge protection built into the AC module.

Connecting the Serial and Ethernet Cables

Each switch element in the SAN Integrated Switch has a serial port connection for initial configuration of the IP address and for service recovery and an Ethernet connection for configuration, remote monitoring, testing and management.

Connecting the Serial Cable

The serial port is used only for initial POST verification, initial IP address configuration, and recovery of factory (default) settings.

NOTE: Do not use the serial port during normal operation or for regular maintenance.

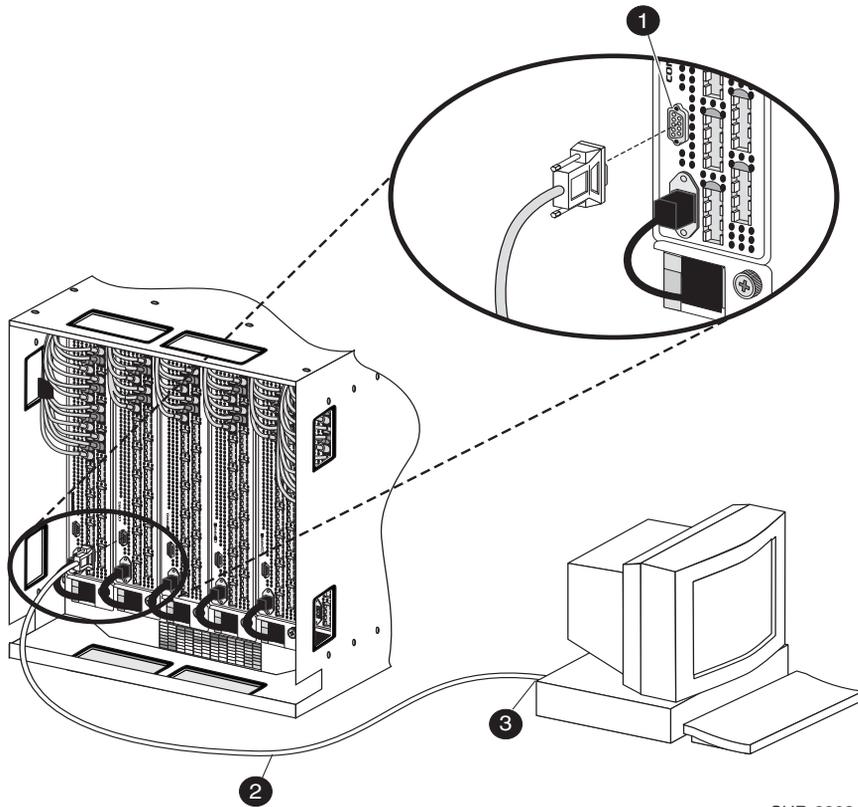
The serial cable is provided with the SAN Integrated Switch. To order a serial cable through your Compaq sales representative or authorized reseller, use part number 230436-B21. (This number replaces 188851-B21.)

IMPORTANT: Keep the serial cable in a safe location. If it is lost, you can order another cable through your Compaq authorized reseller.

Table 3-1 lists the signal and description of the serial port pinouts.

Pin	Signal	Description
2	TxDATA	Transmit Data
3	RxDATA	Receive Data
5	GND	Logic

To make a serial connection, connect the serial cable (provided in the kit) to the switch element serial port on the front panel and a COM port on a workstation (see Figure 3-1).



- ❶ DB9 serial port
- ❷ Serial cable
- ❸ Workstation

SHR-2203A

Figure 3-1: Connecting the serial cable

Connecting Through a Workstation

Use these steps to execute initial switch element operations through a workstation connected to the serial port on the SAN Integrated Switch.

1. Disable any serial communication programs running on the workstation, such as synchronization programs for PDA.
2. Remove the shipping plug from the serial port on switch element #1 (left-most switch element), and insert the serial cable provided with the SAN Integrated Switch.
3. Insert one end of the serial cable into the serial port.
4. Connect the other end of the serial cable to an RS-232 serial port on the workstation.
5. On the workstation, open a terminal emulation program such as HyperTerminal on Windows 95 or NT, or TERM in a UNIX environment. Configure as follows (see Table 3-2).

Table 3-2: Serial Port Settings

Parameter	Value
Bits per second	9600
Databits	8
Parity	None
Stop bits	1
Flow control	None
Function arrows and Ctrl keys act as:	Terminal Keys
Emulation	Autodetect

6. From the terminal emulator application, log on to the first switch element (switch element #1) through the serial connection.

Setting the IP Address

Each switch element must have a valid IP address to enable an IP/network connection. You can set two IP addresses: one for the external, out-of-band Ethernet port and one for in-band Fibre Channel network (IP) access. In-band network access allows you to use IP over Fibre Channel.

3-6 SAN Switch Integrated/32 and Integrated/64 Installation and Hardware Guide

Each switch element has a preset, default Ethernet IP address and a default Ethernet subnet mask. Replace the default IP address and Ethernet subnet mask for each of the six switch elements, with the address using the `ipAddrSet` Telnet command and the address information provided by your LAN administrator (see Step 3 below).

To set the IP address and Ethernet subnet mask through the serial port:

1. After connecting to the switch element through a workstation, enter:

```
login: admin
password: password
```

2. The following prompt confirms the connection:

```
switchName: userName>
```

3. At the prompt, enter the Telnet command `ipAddrSet`. You are prompted for the following:

```
Ethernet IP Address [current]: Enter new Ethernet IP address (defaults
for switches 1 through 6 respectively, are 10.77.77.77, 10.77.77.76, 10.77.77.75,
10.77.77.74, 10.77.77.73, 10.77.77.72)
```

```
Ethernet Subnetmask [current]: Enter new Ethernet subnetmask (default
is 0.0.0.0)
```

```
Fibre Channel IP Address [current]: Enter new Fibre Channel IP
address if desired
```

```
Fibre Channel Subnet Mask [current]: Enter new Fibre Channel
subnet mask if desired
```

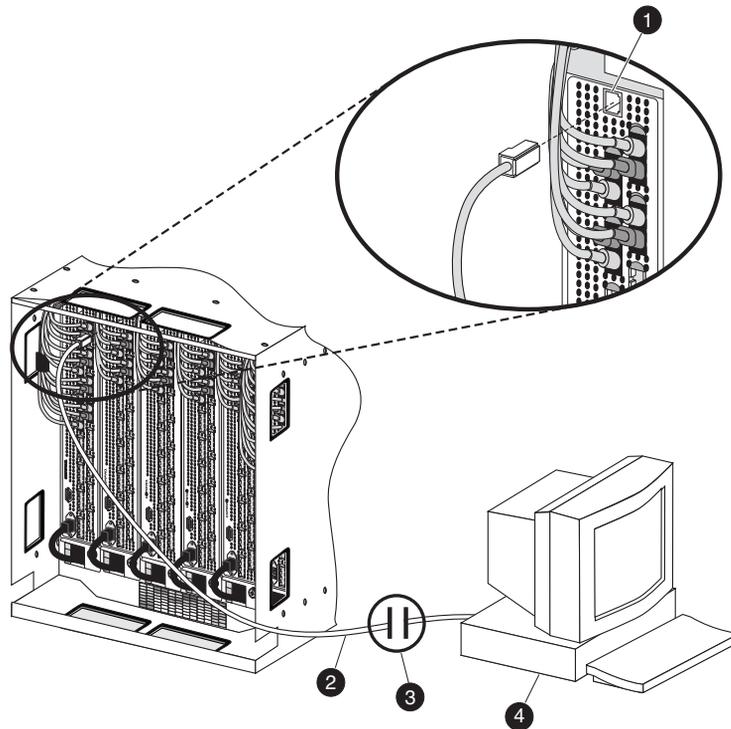
```
Gateway Address [current]: Enter new gateway address (default is
172.17.1.1)
```

```
Set IP Address now? [y = set now, n = next reboot]: Enter "y"
to set now by restarting the switch element
```

4. Type `IPAddressShow` to verify that the address was set correctly.
5. Repeat steps 1 through 4 above for the remaining five switch elements in the SAN Integrated Switch.
6. After you enter the values, disconnect the serial cable and store it in a secure location. Use the dust cover supplied with the switch to protect the serial port connection during normal operation of the switch.

Connecting the Ethernet Cables

To gain access to the internal network SNMP agent in the switch element, and for remote Telnet access, connect to an existing Ethernet 10/100Base-T Local Area Network (LAN) through the front panel RJ-45 connector of the switch element (see Figure 3-2). This connection works for Web, SNMP, and Telnet access and can be used for remote monitoring, testing, and management.



SHR-2204A

- ❶ RJ-45 Ethernet ports for switch element management (6)
- ❷ Ethernet cables (6)
- ❸ Representation of a LAN
- ❹ Remote workstation

Figure 3-2: Connecting the Ethernet cables

1. Connect all six switch elements by Ethernet cable to the LAN.
2. Access each switch element through the network connection. You can manage the individual switch elements using Web Management Tools or Telnet commands.

For detailed information on Telnet commands and managing your switch elements, refer to the Compaq *StorageWorks Fibre Channel SAN Switch Management Guide*.

Modifying the Domain IDs

The default domain IDs on the six switch elements shipped with the SAN Integrated Switch are 231, 232, 233, 234, 235, and 236, respectively.

If you are connecting a SAN Integrated Switch in an existing SAN, you may have to change the Domain ID of each switch element. The Domain IDs of the switch elements must be sequential. They must be different from any existing SAN Domain IDs.

NOTE: If the Domain ID (whether the default or a selected ID) is already in use when the switch element is connected to the fabric, the Domain ID is automatically reset to a unique value. The Domain IDs in use can be determined by using the `fabricShow` command on a switch element connected to the larger SAN fabric.

1. Log on with administrative privileges to the first switch element, using a Telnet connection.
login: admin
password: password
2. Disable the switch element by entering `switchDisable`.
3. Enter the `configure` command.
4. Enter `Y` after the prompt.
Fabric parameters (yes, y, no, n): [no] y.
5. Enter a unique domain ID at the prompt.
Domain: (1...239) [1] 3.
6. Complete the remaining prompts (or press **CTRL + D** keys to accept the remaining settings without completing all the prompts).
7. Enable the switch element by entering `switchEnable`.

Specifying the Desired Status Policies

Use these steps to specify the status policies.

1. Log on with administrative privileges to the first switch element, using a Telnet connection.

```
login: admin
password: password
```

2. At the prompt, enter the `switchStatusPolicySet` command.
3. Specify the desired status policies.

NOTE: To completely deactivate the alarm for a particular condition, enter 0 at the prompt for that condition and press the **Enter** key.

4. Repeat steps 1-3 for the remaining five switch elements in the SAN Integrated Switch.

Checking the Fabric for Port or ISL Issues

Use the `islTopoShow` command to make sure all switch elements in the SAN Integrated Switch are displayed. For complete information on the `islTopoShow` Telnet command, enter `help islTopoShow` from a Telnet prompt.

1. Log on with administrative privileges to the first switch element, using a Telnet connection.

```
login: admin
password: password
```

NOTE: These are the only switch elements connected to every other switch element in the group.

2. At the prompt, enter the `islTopoShow` command. This command provides general information about all switch elements in the group. The following example shows a fabric of 6 switch elements.

```
SW1:admin> islTopoShow
Switch ID   Domain           Worldwide Name      Name
-----
01          231              10:00:00:60:69:12:0a:b9  SW1
02          232              10:00:00:60:69:12:09:b0  SW2
03          233              10:00:00:60:69:12:09:c0  SW3
04          234              10:00:00:60:69:12:04:3d  SW4
05          235              10:00:00:60:69:12:09:77  SW5
06          236              10:00:00:60:69:12:0b:c7  SW6
```

Checking Each Switch Element for Port or ISL Issues

Check the switch element by displaying port status and ISL information. For information on the `islTopoCheck` Telnet command, enter `help islTopoCheck` from a Telnet prompt.

1. Log on with administrative privileges to the first switch element, using a Telnet connection.

```
login: admin
password: password
```

2. At the prompt, enter the `islTopoCheck` command.

This command provides detailed information about the local switch element currently being accessed. If there are any problems, the Status column shows an error condition.

3. Repeat steps 1 and 2 for the remaining five switch elements in the SAN Integrated Switch.

Resetting Factory Defaults

If you change a password and forget it, the password can be reset to the factory default. To revert to factory default values.

1. Power down the switch element by unplugging the power cord.
2. Connect the serial cable from the host serial port to the switch element serial port.
3. Power up the switch element by plugging in the power cord.
4. Establish a connection between the host and the switch element using a terminal emulation program such as HyperTerminal.
5. When prompted, enter the `configDefault` command to reset user names and passwords.

IMPORTANT: The `configDefault` command resets the password and many other switch element parameters. Be sure you understand the effects of this command before you issue it.

NOTE: The `configDefault` command does not affect the SNMP agent configuration.

6. Close the terminal emulation program, disconnect the serial cable from the workstation and the switch element, and cover the serial port.

For more information on Telnet commands, refer to the Compaq *StorageWorks Fibre Channel SAN Switch Management Guide*, Part Number AA-RMMJB-TE.

Saving and Restoring the Switch Element Configuration Settings

Save your switch element configuration settings using the `configUpload` Telnet command for a switch element failure emergency. In order to restore your saved configuration settings, use the `configDownload` Telnet command.

When replacing an old switch element with a new one, a `configUpload` should be taken from the old switch element to retain the configuration and parameter settings. Then, download information to the new switch element. Before installing the new switch element, clear the zoning information from the new switch to ensure that a zoning mismatch does not occur. Do this by invoking the `cfgClear` Telnet command on the new switch element, or by inserting the word “clear” into the configuration file immediately before the zoning lines.

Saving Switch Element Configurations to a Host File

The `configUpload` Telnet command saves the switch element configuration to a host file. The upload process uses either File Transfer Protocol (FTP) or the Remote Shell Daemon (RSHD) protocol (TCP service 514). Both of these services are available for UNIX and Microsoft Windows hosts.

On Windows NT, the FTP server may have to be installed from the distribution media and enabled. Alternatively, for Windows NT or Windows 9x, several freeware and shareware FTP servers are available.

An FTP server must be installed and running when performing the `configUpload` command on a Windows NT or Windows 2000 system. If you do not have a Microsoft Windows NT or Windows 2000 FTP service on your system, you need to install it.

Installing an FTP Server

Use these steps to install and configure a Windows NT or 2000 FTP server.

1. Create a folder to hold the switch element firmware and configuration files.
2. Install the Windows NT or 2000 FTP server on your system from your Windows installation CD.

NOTE: If you only use the FTP server for the firmware and configuration loads, you can specify the folder created in step 1 as the FTP Publish Directory.

3. Open the Internet Service Manager Tool.

FTP service employs the standard users defined under Windows NT, so a valid local user and password is required. Create a user with the Windows NT administrative tools.

Appropriate permissions for the created folder (NTFS volumes only) must be set up to allow the user to have read and write privileges.

Uploading a Configuration

Use these steps to upload configuration settings.

1. From the workstation, establish a Telnet connection to the switch element, and log on with administrative privileges.
2. Enter the `switchDisable` command to disable the switch element.
3. Enter the `configUpload` command to upload the configuration to the server.

The two utilities supplied for RSHD, *RSHD.EXE* and *CAT.EXE*, currently do not support uploads, only downloads. In a Windows environment, FTP must be used and the FTP server must be running before an upload can occur.

The command may be invoked without any parameters, in which case the user is prompted for input, including choice of FTP or RSHD. If invoked with three parameters, RSHD is used, otherwise presence of the fourth parameter (FTP password) selects FTP.

Figure 3-3 shows an example of the `configUpload` command.

```

switch:admin>configUpload
Server Name or IP Address [host]:
IP Address for Server:
User Name [user]:
File Name [config.txt]:
Protocol (RSHD or FTP) [rshd]:

```

Figure 3-3: configUpload command example 1

An upload may fail for one of the following reasons:

- The switch element does not recognize the host name.
- The host IP address cannot be contacted.
- The user does not have permission on the host.
- The user runs a script that prints something at login.
- The RSHD or FTP server is not running on the host.

The configuration file contains two types of lines: comments and name: value pairs. Comments are written with a left bracket ([]) as the first character of the line. When read back using configDownload, a line beginning with any punctuation character is treated as a comment (see Table 3-3).

Table 3-3: Syntax of a Name: Value Pair

Name	Value
line	whitespace name whitespace ":" whitespace value
name	component {"." component}
whitespace	{" " " "}
component	{"a"- "z" "A"- "Z" "0"- "9" "_" "-"}
value	{<any character not including ">">}

NOTE: Elements enclosed in braces indicate zero or more occurrences of the enclosed elements.

The configuration file is written as three sections. The first section contains the switch element boot parameters (otherwise known as the switch element's identity), with variables such as the switch element's name and IP address. This section corresponds to the first few lines of output of the cfgShow command.

The second section contains general switch element configuration variables, such as diagnostic settings, fabric configuration settings, and SNMP settings. This section corresponds to the output of the `cfgShow` command (after the first few lines), although there are more lines uploaded than shown by the command.

The third section contains the zoning configuration. It corresponds to the output of the `cfgShow` command.

configUpload Parameters

- **host**—A host name or IP address in quotes, for example “citadel” or “192.168.1.48.” The configuration file is downloaded from this host.
- **user**—A user name in quotes, for example “jdoe.” This user name is used to gain access to the host.
- **file**—A file name in quotes, for example “config.txt.” Absolute path names may be specified using a forward slash (/). Relative path names look for the file in the user's home directory on UNIX hosts and in the directory where the FTP or RSHD server is running on Windows hosts.
- **passwd**—If present, this command selects FTP.

Figure 3-4 shows an example of the `configUpload` command.

```
switch:admin>configUpload
“citadel”, “jdoe”, “config.txt”, “passwd”
upload complete
```

Figure 3-4: `configUpload` command example 2

Restoring Switch Element Configurations from a Host File

The `configDownload` Telnet command restores the switch element configuration from a host file. The download process uses either FTP or the RSHD protocol (TCP service 514) to download a previously saved configuration file from a host system into the switch element. Both of these services are widely available on UNIX hosts, but are less common on Windows hosts. See the `configUpload` command for a description of the configuration file format.

On Windows NT, the FTP server may have to be installed from the distribution media and enabled. Alternatively, on Windows NT or Windows 9x there are several freeware and shareware FTP servers available.

Downloading a Configuration

Use these steps to download a configuration.

1. From the workstation, establish a Telnet connection to the switch element, and log on with administrative privileges.
2. Enter the `switchDisable` command to disable the switch element.
3. Enter the `configDownload` command to download the configuration from the server.

To use RSHD on Windows NT, Windows 9x, or Windows 2000, two utilities are supplied, *RSHD.EXE* and *CAT.EXE*, with instruction on how to install and run them. The FTP server or RSHD must be running before a download can occur.

The command may be invoked without any parameters, in which case the user is prompted for input, including choice of FTP or RSHD. If invoked with three parameters, RSHD is used, otherwise presence of the fourth parameter (FTP password) selects FTP.

Figure 3-5 shows an example of the `configDownload` command.

```
switch:admin>configDownload
Server Name or IP Address [host]:
IP Address for Server:
User Name [user]:
File Name [config.txt]:
Protocol (RSHD or FTP) [rshd]:
```

Figure 3-5: `configDownload` command example 1

A download may fail for one of the following reasons:

- The switch element does not recognize the host name.
- The host IP address cannot be contacted.
- The user does not have permission on the host.
- The user runs a script that prints something at login.
- The file does not exist on the host.
- The file is not a switch element configuration file.
- The RSHD or FTP server is not running on the host.
- The configuration data contains errors.

NOTE: The switch element's identity cannot be changed by configDownload. Parameters, such as the switch element's name and IP address, are ignored. They are the lines in the configuration file, which begin with "boot".

NOTE: A licenseKey is only accepted if the boot.mac line matches the Worldwide Name of the switch element performing the download; otherwise, it is ignored.

The download process is additive; for example, the lines read from the file are added to the current switch element configuration. Therefore, changing a single configuration variable by downloading a file with a single line is possible. Other variables remain unchanged.

This point is particularly important to understand when downloading a zoning configuration. Because the new zoning information is added to the current configuration, there may not be any conflicts. If the current zoning configuration is to be replaced, then the keyword "clear:" may be inserted into the configuration file immediately before the zoning lines. All licenses that are on the switch element will be retained, and new ones will be added during the configDownload operation.

configDownload Parameters

- **host**—A host name or IP address in quotes, for example "citadel" or "192.168.1.48." The configuration file is downloaded from this host.
- **user**—A user name in quotes, for example "jdoe." This user name is used to gain access to the host.
- **file**—A file name in quotes, for example "config.txt." Absolute path names may be specified using a forward slash (/). Relative path names look for the file in the user's home directory on UNIX hosts and in the directory where the FTP or RSHD server is running on Windows hosts.
- **passwd**—If present, this command selects FTP.

Figure 3-6 shows an example of the configDownload command.

```
switch:admin>configDownload
"citadel","jdoe","config.txt"
Committing configuration...done.
download complete
```

Figure 3-6: configDownload command example 2

Status Indicators

Each port contains an indicator that shows the status for that port (see Table 3-4).

Indicators	Description
No light showing	No light or signal carrier (no module, no cable) for media interface LEDs.
Steady yellow	Receiving light or signal carrier, but not online yet.
Slow yellow (1-second intervals)	Disabled (result of diagnostics or port disable command). Flashes every two seconds.
Fast yellow (1/4-second intervals)	Error or fault with port. Flashes every half-second.
Steady green	Online (connected with device over cable).
Slow green (1-second intervals)	Online, but segmented (loopback cable or incompatible switch). Flashes every two seconds.
Fast green (1/4-second intervals)	Internal loopback (diagnostic). Flashes every half-second.
Flickering green	Online and frames flowing through port.
Interleaving green and yellow	Port is bypassed.

Each switch element AC module contains an indicator that shows its status. Table 3-5 shows descriptions of the AC module status indicators.

Indicators	Description
No light showing	No power is being supplied to the switch element. Check that the power cord is connected to the switch element.
Steady green	Receiving power. Switch element is online.

Connecting the Fibre Channel Cables

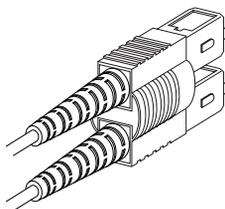
All cables connect at the front of the SAN Integrated Switch. Recommended cabling supports a transfer rate of 1.0625 gigabytes per second (GB/s).

The SAN Integrated Switch product includes fiber-optic cables for the ISL ports. Fiber-optic cables for the user ports are not included.

Standard fiber-optic cables can be used for the user ports. Connections can be made to the GBICs inserted in the user ports using standard dual SC plug connectors, as shown in Figure 3-7. The fiber-optic connectors are keyed and must be inserted into the GBIC module connector in proper alignment.



CAUTION: The fiber-optic cables are fragile and should not be bent to a radius of less than 0.5 inches. Do not force the fiber-optic plug into the GBIC module as this may damage the connector, the GBIC module, or both. Verify that the fiber-optic connector is clean, free of dust or debris, and correctly aligned before inserting the connector into the GBIC module.



SHR-2213A

Figure 3-7: Dual SC fiber-optic plug keyed connector

See Table 3-6 for a list of user ports in the IS/32 and IS/64 models. Refer to Figure 4-5 and Figure 4-6 to see the cable diagram for your respective model.

Table 3-6: User Ports on the SAN Integrated Switch

Switch #	IS/32	IS/64
Switch 1	None	Ports 0-7
Switch 2	Ports 0-7	Ports 0-11
Switch 3	Ports 0-7	Ports 0-11
Switch 4	Ports 0-7	Ports 0-11
Switch 5	Ports 0-7	Ports 0-11
Switch 6	None	Ports 0-7

Cable lengths of 1,641 feet (500m) or less should be multi-mode Fibre Channel cables. Cables that are longer than 1641 feet (500m) should be single-mode.

Multi-mode optical cables are connected to short wave GBIC modules. Single-mode optical cables are connected to long wave GBIC modules. Multi-mode cables should use 50/125 optical fibers, SC Duplex connectors with a PC finish. Use of 62.5/125 should be restricted to situations where 62.5/125 optical fiber was previously installed and the link lengths are kept shorter than 656 feet (200m). Single-mode cables typically use 9/125 optical fibers for distances up to 84,480 feet (10km).

Table 3-7 lists the cabling specifications for Fibre Channel cables.

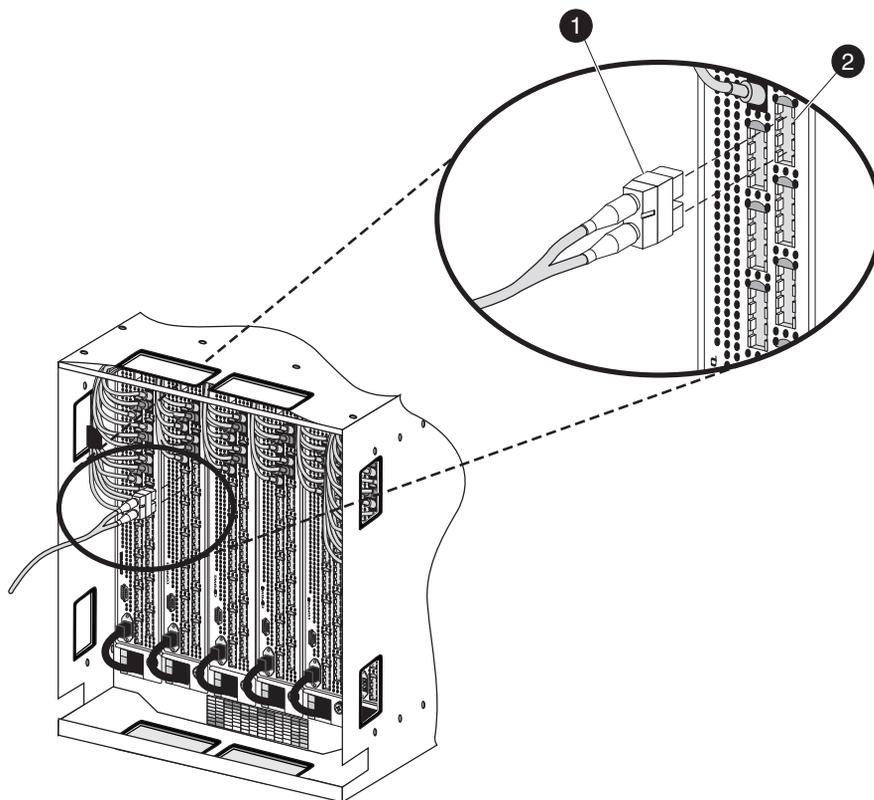
Table 3-7: Fibre Channel Cabling Specifications			
Cable Type	Cable Specifications	Maximum Length	GBIC Module
Multi-mode fiber	SC Duplex plug connectors 50 μm core diameter 125 μm cladding diameter duplex cable	1641 ft (500 m)	780–860 μm without open fiber control (non-OFC) Short wave fiber optic
Single-mode fiber	SC Duplex plug connectors 9 μm core diameter 125 μm cladding diameter duplex cable	84480 ft (10 km)	1270–1350 μm without open fiber control (nonOFC) Long wave fiber optic

Table 3-8 lists the Fibre Channel cable part numbers and length.

Table 3-8: Fibre Channel Cabling Part Numbers		
Compaq Part Number	Cable Type	Cable Length
234457-B21	Multi-mode fiber	6.6 ft (2 m)
234457-B22	Multi-mode fiber	16.4 ft (5 m)
234457-B23	Multi-mode fiber	49.2 ft (15 m)
234457-B24	Multi-mode fiber	98.4 ft (30 m)
234457-B25	Multi-mode fiber	164 ft (50 m)

Connecting Fibre Channel Cables to the GBICs

Connect the Fibre Channel cables to the user GBICs as appropriate to the fabric topology. If you want to install single-mode fiber cables, you will need to replace the factory-installed short wave GBIC modules with long wave GBIC modules. The storage subsystem, host, and other devices connect to the GBIC modules in the SAN Integrated Switch. Cable connectors are keyed and must be inserted properly into the GBIC module connectors. Remove the protective cover from the GBIC connector and make sure that the surfaces of all cable and GBIC module connectors are clean and free of dust and debris. Figure 3-8 shows the cable connections.



SHR-2205A

- ① Optical connector
- ② GBIC module

Figure 3-8: An optical cable connecting to a GBIC module

Chapter 4

Repair and Replacement

This chapter covers the following topics:

- Replacing a GBIC Module, page 4-2
- Replacing the Switch Element, page 4-4
- Replacing ISL Cables, page 4-14



WARNING: Do not attempt to open the switch element. There are no user-serviceable parts inside. Refer all service to a Compaq authorized service provider.

Your switch element contains either an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery. There is risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose to temperatures higher than 140°F (60°C).
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

NOTE: For information on diagnostics and error messages with regard to the switch element, refer to the appropriate chapters in the Compaq *StorageWorks Fibre Channel SAN Switch 16-EL Installation and Hardware Guide*.

Replacing a GBIC Module

Replacement GBIC modules for the Fibre Channel SAN Switches must be ordered separately. The Compaq part number for the shortwave optical GBIC module for multi-mode cable is 380561-B21. Two longwave GBIC modules and a short single-mode test cable can be ordered in a kit (part number 340412-B21).

In the Switch Management Application page of the Web Management Tools, the GBICs are identified differently depending on the type of GBIC and the supplier. Some examples of the displays include “ID” for VIXEL short wave GBICs and “SW” for IBM shortwave GBICs.



CAUTION: The GBIC module contains static-sensitive components. Use electrostatic discharge (ESD) precautions while handling the GBIC module.

Removing a GBIC Module

If you are using a GBIC module with a locking bar, pull down the metal swing bar on the front of the GBIC and pull out the bar. Carefully move the GBIC module slightly from side to side to unseat it. Figure 4-1 shows a GBIC module with locking bar.

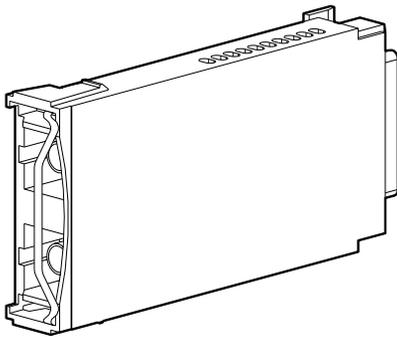


Figure 4-1: GBIC module with locking bar

If you are using any other type of GBIC module, squeeze the side prongs and carefully pull out the GBIC module. Figure 4-2 shows a squeeze-prong GBIC module.

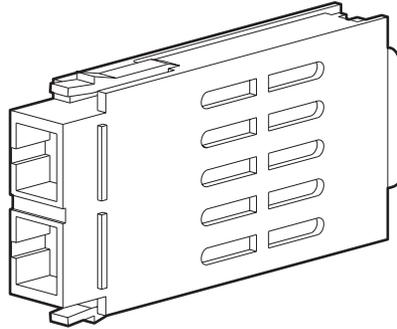


Figure 4-2: Squeeze-prong GBIC module

Installing a GBIC Module

To install a GBIC module:

1. Position the GBIC so that the key (the ridge on one side) on the GBIC is aligned with the slot in the user port.
2. Insert each GBIC module into the port until it is firmly seated and the latching mechanism locks.



CAUTION: The GBIC module is keyed and can only be inserted one way. Do not force the GBIC module into a port if you feel resistance. This can damage the module. Try inverting it. The GBIC D-connector must line up with the D-connector inside the GBIC port.

NOTE: If you are using a GBIC module with a locking bar, lock the module into place with the locking bar. For other GBIC modules, the latch prongs automatically lock to prevent accidental removal of the GBIC module.

3. Repeat steps 1 and 2 for each GBIC module to be installed.
4. Connect fiber-optic cables to the GBICs as appropriate to the fabric topology.

Replacing the Switch Element

Replacing a switch element involves the following:

- Removing the Switch Element, page 4-5.
- Installing the Replacement Switch Element, page 4-9.
- Configuring the Replacement Switch Element, page 4-10.
- Adding the New Switch Element to the Integrated Fabric, page 4-12

IMPORTANT: The replacement switch element must be a Fibre Channel SAN Switch 16-EL with the appropriate firmware version.

NOTE: Please review the Battery Replacement Notice, page A-8

You can access the Compaq website for the latest firmware by logging on to the Internet at <http://www.compaq.com/storage>.

All switch elements in the SAN must be running the same firmware version. To check the version, log on with administrative privileges to the switch element, using a Telnet connection. At the prompt, enter the `version` command.

For more information on this and other Telnet commands, refer to the Compaq *StorageWorks Fibre Channel SAN Switch Management Guide*, or enter the `help` command at the Telnet prompt. For example, to display information about the `version` command, enter `help version`.

Items Required

The following items are required to replace the switch element:

- Replacement Fibre Channel SAN Switch 16-EL
- A workstation from which switch elements in the SAN Integrated Switch can be accessed.
- Number 2 Phillips screwdriver.

NOTE: If replacing more than one switch element at the same time, make sure that all Ethernet, Fibre Channel, and serial cables are clearly labeled before they are disconnected.

Contact your Compaq supplier if you are using a standard Fibre Channel SAN Switch 16-EL and do not already have these items.

Removing the Switch Element

To remove the switch element from the SAN Integrated Switch fabric:

1. Label all cables on the switch element being replaced, prior to disconnecting them.
2. Identify the WWN and the Domain ID of the switch element being replaced. If this information is already recorded, continue with Step 3. If the information is not already recorded, perform the following steps
 - a. From the workstation, establish a Telnet connection to one of the functioning switch elements in the SAN Integrated Switch, and log on with administrative privileges.
 - b. Enter `sgruppShow` at the Telnet prompt to display information about all the switches in the fabric. This command lists the WWNs for each switch element and switch in the SAN. For example, this fabric has four switches with the following information:

```
reg101:admin> sgroupshow
Group Type      Group Name      Member WWN
=====
S64_6_1        East Lab        10:00:00:60:60:10:60:11
                10:00:00:60:60:00:60:22
                10:00:00:60:60:00:60:33
                10:00:00:60:60:00:60:44
                10:00:00:60:60:00:60:55
                10:00:00:60:60:00:60:66
```

NOTE: The `fabricShow` command can be used to retrieve information about all the switches in the larger SAN fabric.

- c. Record the WWNs, domain IDs, IP addresses, and other relevant information for all switch elements in the group.

3. If the switch element being replaced is partly or fully operational, back up the current configuration. Refer to the section on Saving and Restoring the Switch Element Configuration Settings, page 3-11.

NOTE: Creating a backup copy of the switch element configuration is recommended for each switch element in the SAN Integrated Switch.

4. Disconnect the switch element being replaced.
 - a. Disconnect the power cable, first from the power source, then from the switch element. Leave the cable in the power cable channel below the switch element.

NOTE: The switch elements do not have an on/off button; they are powered up or down by connecting or disconnecting the power cord. It is not necessary to power down the other switch elements that were connected to the switch element being replaced.

- b. If the serial cable is connected, disconnect it from the switch element.
 - c. Make sure both ends of each Ethernet cable are labeled with the switch element number, then disconnect the Ethernet cable.



CAUTION: The fiber-optic cables are fragile and should not be bent to a radius of less than 0.5 inches.

- d. Make sure both ends of each Fibre Channel cable are labeled with the port and switch element number before disconnecting.

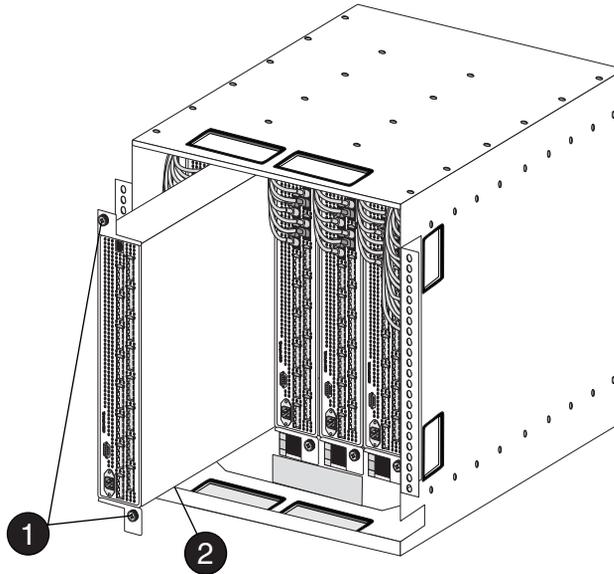
IMPORTANT: Make sure the ISL cables are labeled and connected according to the cable diagram in your SAN Integrated Switch (see Figure 4-5 and Figure 4-6); otherwise, your IS/32 or IS/64 will not operate correctly.

- e. To disconnect each Fibre Channel connector from the port on the switch element being replaced:

- Firmly grasp the connector housing.
- Pull the cable from the GBIC.

NOTE: If you are only replacing one switch element, you need only disconnect the Fibre Channel cables from that switch element being replaced.

5. Remove the faulty switch element from the SAN Integrated Switch (see Figure 4-3).



SHR-2212A

- ❶ Self-retaining screws (2)
- ❷ Switch element

Figure 4-3: Replacing the switch element from the SAN Integrated Switch

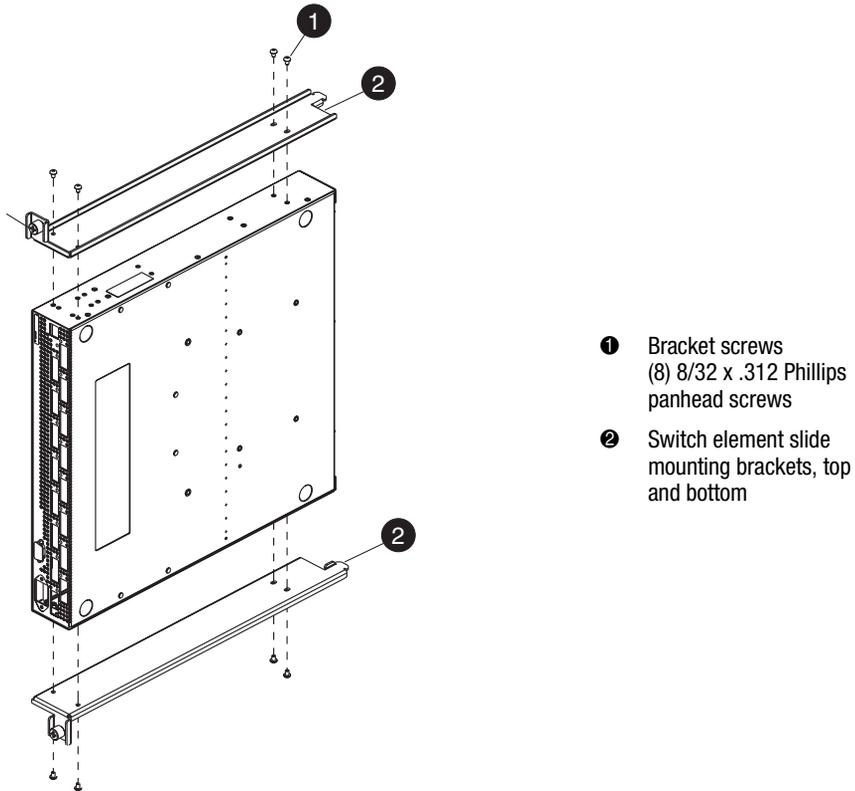
- a. Unscrew the two 1/4-20 self-retaining screws that fasten the switch element brackets to the SAN Integrated Switch (item 1).
- b. Carefully move the wiring harness out of the way so you can slide the switch element forward without bending the cables.



CAUTION: A rack may become unstable if more than one component is extended. Extend only one component at a time.

- c. Slide the switch element forward and remove from the SAN Integrated Switch.

6. Remove the two mounting brackets from the switch element by unscrewing the four 8/32 x .312 Phillips panhead screws in each bracket, setting the brackets and screws aside for the new switch element (see Figure 4-4).



SHR-2207A

Figure 4-4: The switch element with slide mounting brackets

7. Remove all the GBICs from the switch element which is being replaced. See Removing a GBIC Module, page 4-2.

Installing the Replacement Switch Element

To install the replacement switch element in the chassis:

IMPORTANT: To perform step 1, follow the procedure and read the cautionary note in Installing a GBIC Module, page 4-3.

1. Insert the GBICs into the new switch element, inserting each GBIC into the port until it is firmly seated and the latching mechanism locks.
2. Install the mounting brackets on the new switch element.
 - a. Position one bracket flat against the top of the switch element, so that the end with the self-retaining screw is at the front of the switch element (see Figure 4-4). Align the holes in the bracket to the holes in the side of the switch element.
 - b. To ensure correct bracket alignment, assemble screws in the following order:
 - i. Position and finger-tighten the first 8/32 x .312 Phillips panhead screw in the smallest hole in the bracket.
 - ii. Phillip screw in the oblong hole (diagonal from the smallest hole).
 - iii. Position and finger-tighten the remaining two 8/32 x .312 Phillips panhead screws in the remaining two holes.
 - iv. Tighten all four screws to a torque of 18 inch-pounds.
 - c. Repeat steps a and b with the second bracket on the other side of the switch element.
3. Install the new switch element in the SAN Integrated Switch chassis.
 - a. Orient the switch element with the power connector at the bottom of the SAN Integrated Switch (see Figure 4-3). Slide the switch element into the available slot.
 - b. Tighten the two self-retaining screws that fasten the switch element brackets to the SAN Integrated Switch, using the screwdriver to tighten to 40 inch-pounds.
4. Connect the following:
 - a. Serial cable from the serial port in the new switch element to the workstation.
 - b. Power cables to the power connectors on the switch element and the power source.

NOTE: Do not connect the Ethernet cables, ISL or user fiber-optic cables until after the switch element is configured, because the settings in the replacement switch may be incompatible with your network.

Configuring the Replacement Switch Element

To configure the replacement switch element:

1. Log on with administrative privileges to the new switch element, using a Telnet connection.
2. Clear the configuration settings in the replacement switch element with the `cfgClear` command. The new switch element will acquire the configuration settings from the other switches in the SAN once the Fibre Channel cables are reattached.
3. Replace the factory IP address with the address information used by the previous switch.
 - a. On the workstation, open a terminal emulation program such as HyperTerminal on Windows 95 or NT, or TERM in a UNIX environment. Configure as shown in Table 3-2, Page 3-5.
 - b. At the prompt, specify the new IP address by entering the `ipAddrSet` command. You are prompted for the address configuration information shown in Step 3, Page 3-6.
 - c. Verify that the address was set correctly by entering the `IPAddressShow` command.
4. Set the Domain ID to the value used by the previous switch element, if still available.

The default Domain IDs on the six switch elements shipped with the SAN Integrated Switch are 231, 232, 233, 234, 235 and 236, respectively.

NOTE: If the Domain ID (whether the default or a selected ID) is already in use when the switch element is connected to the fabric, the Domain ID is automatically reset to a unique value. The Domain IDs in use can be determined by using the `fabricShow` command on a switch element connected to the larger SAN fabric.

- a. Disable the switch element by entering the `switchDisable` command.
- b. Enter the `configure` command.
- c. Enter Y after the prompt.
Fabric parameters (yes, y, no, n): [no] y.
- d. Enter a unique Domain ID (such as the Domain ID used by the previous switch element, if still available) at the prompt. Domain: (1..239) [1] 3.
- e. Complete the remaining prompts (or press CTRL + D keys to accept the remaining settings without completing all the prompts).
- f. Enable the switch element by entering the `switchEnable` command.

5. Install firmware version 2.1.9g or later on the new switch element

IMPORTANT: All switch elements in the SAN must be running at the same firmware version level, and all fabric parameters must be the same, except for the Fibre Channel IP Address and the Domain ID.

- a. Ensure that the firmware version 2.x.x is available on the workstation or network. (Copy it from the StorageWorks SAN Switch Software V2.x.x CD, if you do not already have this file.)
- b. Enter the `firmwareDownload` command to download the firmware from the server to the switch element.
- c. Enter the requested information at the prompts:

Server Name or IP Address [host]: Enter name or IP address of computer on which firmware is located.

IP Address for Server: Enter IP address.

User Name [user]: Enter login name required to access computer.

File Name [/usr/switch/firmware]: Enter filename or absolute path of firmware.

Protocol (RSHD or FTP) [rshd]: Press **Enter** to use RSHD, or enter FTP to use FTP protocol.

Password: FTP password (only displays if FTP protocol was selected).

- d. Restart the switch element by entering the `Reboot` command.

6. Restore any unsaved switch element configuration. If you saved the switch element configuration with the `configUpload` Telnet command, continue to step 7.

If you did not save the configuration using the `configUpload` command (see Saving and Restoring the Switch Element Configuration Settings, page 3-11), verify that the replacement switch element parameters are the same as those of the other switch elements in the SAN Integrated Switch:

- a. Enter the `configShow` command on another switch element in the SAN Integrated Switch.
- b. Do not change the zoning configuration information. It will be automatically acquired by the replacement switch when it is incorporated into the SAN.

7. Restore saved switch element configuration.

If you saved the switch configuration information to a server, you must restore it.

- a. Disable the switch element by entering the `switchDisable` command.
- b. Enter the `configDownload` command at the Telnet prompt to download the configuration from the server to the switch element.
- c. Enter the requested information at the prompts.

Server Name or IP Address [host]: Enter name or IP address of computer on which firmware is located.

IP Address for Server: Enter IP address.

User Name [user]: Enter login name required to access computer.

File Name [/usr/switch/firmware]: Enter filename or absolute path of firmware.

Protocol (RSHD or FTP) [rshd]: Press **Enter** to use RSHD, or enter FTP to use FTP protocol.

Password: FTP password (only displays if FTP protocol was selected).

- d. Reenable the switch element by entering the `switchEnable` command.
- e. Restart the switch element to implement the new profile and configuration, by entering the `reboot` command.

Adding the New Switch Element to the Integrated Fabric

Use these steps to add a new switch element.

1. Connect the Ethernet cables, as labeled previously.
2. Connect the ISL fiber-optic cables to the appropriate ISL ports.

IMPORTANT: Connecting the ISL cables to ports other than those identified in the diagram and matrix prevents the SAN Integrated Switch from operating correctly.

- a. Select a cable end and determine the appropriate ISL port, according to the switch element and port number indicated on the label on the cable.
- b. Verify the ISL cable configuration using the matrix and cable diagram appropriate to your SAN Integrated Switch or the color ISL Cabling Diagram located on the front panel of your SAN Integrated Switch. The following table lists the matrix and diagram.

SAN Integrated Switch Model	Matrix	Diagram
IS/32	Table 4-2, Page 4-16	Figure 4-5, Page 4-18
IS/64	Table 4-3, Page 4-17	Figure 4-6, Page 4-18

- c. Line up the keyed (ridged) side of the cable-end with the notch in the GBIC.
 - d. Insert the cable-end into the GBIC until the cable-end is firmly seated.
 - e. Repeat steps a through d for the other end of the cable.
 - f. Verify the LED for the port displays a steady green. If a green light is not displayed, try reinserting the GBIC into the switch element, and then reinsert the cable end into the GBIC.
 - g. Repeat steps a through f for the remaining cables.
3. Place the ISL cables in the cable guide at the top of the SAN Integrated Switch for organized cable management.
 4. Connect the user fiber-optic cables to the user ports according to the switch and port number indicated on the label, as appropriate to the fabric topology. For a listing of user ports, as opposed to ISL ports, see Table 3-6, Page 3-18.
 5. Enter the existing group information.
 - a. Log on to the new switch element with administrative privileges, using a Telnet connection.
 - b. At the prompt, enter the `sgroupSet` command.
 - c. Enter the requested information at the prompt.

Table 4-1: Group Information

Prompt	Action
Please Enter Group Type: [S64_6_1]	Indicates the number of user ports (case-sensitive). Press Enter to accept the default S64_6_1. (If you have an IS/32 rather than IS/64, the default will be S32_6_1.)
Please Enter Group Name: []	Enter the name of the existing group. The group name cannot be null or contain spaces, and can be up to 32 characters in length.
Enter member list by domain#? (yes, y, no, n): [yes]	Enter y to specify members by domain ID, or n to specify members by WWN.
For Group Member #1 enter its Domain ID: (1..239) [0]	Enter the domain ID for switch element #1 (the far left switch element).

- d. Continue until all six switch elements are added to the group.

6. Provide the WWN of the new switch element to each of the existing switch elements in the group.
 - a. Log on to one of the other switch elements in the group with administrative privileges, using a Telnet connection.
 - b. To determine the current group information, at the prompt enter the `sgroupShow` command.
 - c. Enter the `sgroupSet` command.
 - d. Enter the requested information at the prompts. See Table 4-1, Page 4-13.
 - e. Continue until all six switch elements are added to the group.
 - f. A prompt confirms that you want to overwrite the existing group definition. Enter Y at the prompt.
 - g. Repeat steps a through e for each of the remaining switch elements in the group.

NOTE: Once the group has been set up on all six switch elements, the group members are identified by WWN, and changes in the domain IDs do not affect the group definition.
7. Check the Fabric and Switch Element for Port or ISL issues.
 - See Checking the Fabric for Port or ISL Issues, page 3-9
 - See Checking Each Switch Element for Port or ISL Issues, page 3-10

Replacing ISL Cables

Replacing the ISL cable involves the following:

- Disconnecting the Faulty Fiber-Optic Cable, page 4-15
- Connecting the New ISL Cable to the Appropriate Ports, page 4-15
- Checking the Switch Element and Fabric for Port or ISL Issues, page 4-15

Items Required

The following items are required to replace an ISL cable:

- The new ISL cable
- A workstation computer with access to switch elements in the SAN Integrated Switch
- The color-coded ISL cabling diagram (located inside the SAN Integrated Switch)

Disconnecting the Faulty Fiber-Optic Cable

NOTE: To replace the ISL cable, it is not necessary to power down the switch elements before disconnecting ISL cables.

1. Disconnect each end of the damaged ISL cable by firmly grasping the connector housing and pulling the cable from the GBIC. Do not remove the GBIC.
2. Remove the damaged ISL cable from the switch element.
3. Check the switches and the fabric to ensure correct operation.

Connecting the New ISL Cable to the Appropriate Ports

Use these steps to connect the new ISL cable.

1. Determine the switch element and port number for connecting each end of the new ISL cable. You can find this information by:
 - a. Checking the labels from the removed cable.
 - b. Looking at the SAN Integrated Switch to physically locate the open ISL ports and the associated switch elements.
 - c. Checking the color-coded cable diagram inside your SAN Integrated Switch (see Figure 4-5 and Table 4-2 for the IS/32; and Figure 4-6 and Table 4-3 for the IS/64).
2. Make sure both ends of the new cable are labeled correctly.
3. Line up the keyed cable connector with the notch in the GBIC of the appropriate port and switch element.
4. Insert the cable connector into the GBIC until the cable connector is firmly seated.
5. Repeat steps 3 and 4 for the other end of the cable.
6. Place the new ISL cable in the cable guide at the top of the SAN Integrated Switch, for organized cable management.

Checking the Switch Element and Fabric for Port or ISL Issues

To check that the proper connections have been made, and the switch elements and fabric are operating correctly, follow the procedures documented in Chapter 3.

- Checking Each Switch Element for Port or ISL Issues, page 3-10
- Checking the Fabric for Port or ISL Issues, page 3-9

The following tables show ISL port interconnectivity in a SAN Integrated Switch. Use the corresponding table for your model: IS/32 (Table 4-2) or IS/64 (Table 4-3).

Table 4-2: Cable Configuration for IS/32		
Cable Color	Connect from	Connect to
Lavender	SW 1 - PORT 0	SW 2 - PORT 8
	SW 1 - PORT 1	SW 2 - PORT 9
	SW 1 - PORT 2	SW 2 - PORT 10
	SW 1 - PORT 3	SW 2 - PORT 11
Yellow	SW 1 - PORT 4	SW 3 - PORT 8
	SW 1 - PORT 5	SW 3 - PORT 9
	SW 1 - PORT 6	SW 3 - PORT 10
	SW 1 - PORT 7	SW 3 - PORT 11
Blue	SW 1 - PORT 8	SW 4 - PORT 8
	SW 1 - PORT 9	SW 4 - PORT 9
	SW 1 - PORT 10	SW 4 - PORT 10
	SW 1 - PORT 11	SW 4 - PORT 11
Red	SW 1 - PORT 12	SW 5 - PORT 8
	SW 1 - PORT 13	SW 5 - PORT 9
	SW 1 - PORT 14	SW 5 - PORT 10
	SW 1 - PORT 15	SW 5 - PORT 11
Green	SW 6 - PORT 0	SW 5 - PORT 12
	SW 6 - PORT 1	SW 5 - PORT 13
	SW 6 - PORT 2	SW 5 - PORT 14
	SW 6 - PORT 3	SW 5 - PORT 15
Grey	SW 6 - PORT 4	SW 4 - PORT 12
	SW 6 - PORT 5	SW 4 - PORT 13
	SW 6 - PORT 6	SW 4 - PORT 14
	SW 6 - PORT 7	SW 4 - PORT 15
Orange	SW 6 - PORT 8	SW 3 - PORT 12
	SW 6 - PORT 9	SW 3 - PORT 13
	SW 6 - PORT 10	SW 3 - PORT 14
	SW 6 - PORT 11	SW 3 - PORT 15
Dark Blue	SW 6 - PORT 12	SW 2 - PORT 12
	SW 6 - PORT 13	SW 2 - PORT 13
	SW 6 - PORT 14	SW 2 - PORT 14
	SW 6 - PORT 15	SW 2 - PORT 15

Table 4-3: Cable Configuration for IS/64

Cable Color	Connect from	Connect to
Lavender	SW 1 - PORT 8	SW 2 - PORT 12
	SW 1 - PORT 9	SW 2 - PORT 13
Yellow	SW 1 - PORT 10	SW 3 - PORT 12
	SW 1 - PORT 11	SW 3 - PORT 13
Blue	SW 1 - PORT 12	SW 4 - PORT 12
	SW 1 - PORT 13	SW 4 - PORT 13
Red	SW 1 - PORT 14	SW 5 - PORT 12
	SW 1 - PORT 15	SW 5 - PORT 13
Green	SW 6 - PORT 8	SW 5 - PORT 14
	SW 6 - PORT 9	SW 5 - PORT 15
Grey	SW 6 - PORT 10	SW 4 - PORT 14
	SW 6 - PORT 11	SW 4 - PORT 15
Orange	SW 6 - PORT 12	SW 3 - PORT 14
	SW 6 - PORT 13	SW 3 - PORT 15
Dark Blue	SW 6 - PORT 14	SW 2 - PORT 14
	SW 6 - PORT 15	SW 2 - PORT 15

Following are representations of the ISL cabling diagrams for the SAN Integrated Switch. See Figure 4-5 for the IS/32 and Figure 4-6 for the IS/64. Refer to the color-coded ISL cabling diagram on the front of your switch. The color diagram, in conjunction with the Cable Configuration matrix (Table 4-2 and Table 4-3), indicates the interconnectivity between the ports. The cables themselves are also labeled with their port and switch numbers.

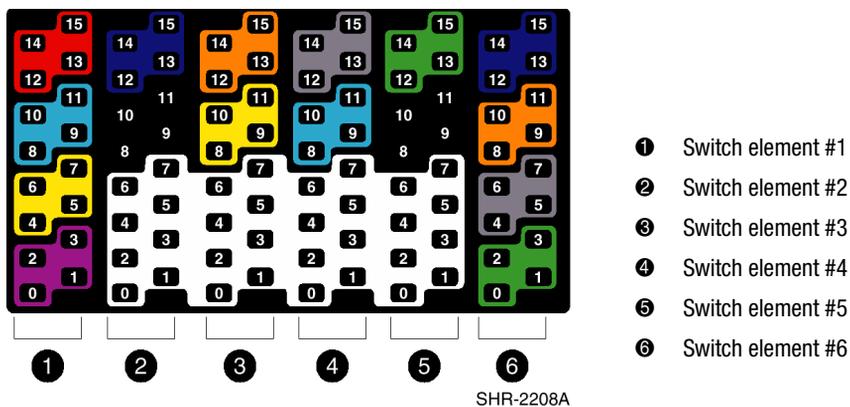


Figure 4-5: The ISL cabling diagram for an IS/32

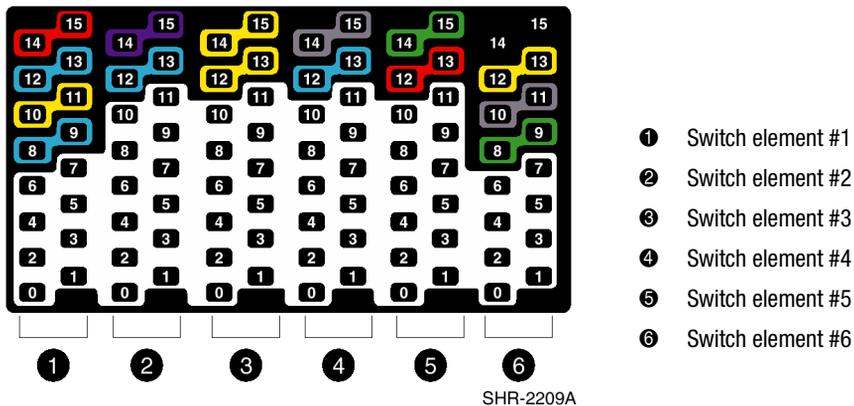


Figure 4-6: The ISL cabling diagram for an IS/64

Chapter 5

Upgrading Firmware

This chapter covers the following topics:

- Downloading Firmware from the Compaq Website, page 5-1
- Upgrading Firmware Using Web Management Tools, page 5-2
- Upgrading Firmware Using a Telnet Command, page 5-4

Each switch element in the SAN Integrated Switch comes with preloaded firmware. In most cases there is no need to update the firmware on the new switch. The firmware version can be determined by using

- The `version` command in Telnet
- The Switch Management Application page in Web Management Tools

Refer to the Compaq *StorageWorks Fibre Channel SAN Switch Management Guide* for more information on Telnet commands and Web Management Tools.

Downloading Firmware from the Compaq Website

To download the firmware from the Compaq website, go to <http://www.compaq.com/storage>.

The website contains the required instructions for downloading the firmware into a switch element.

Upgrading Firmware Using Web Management Tools

The SAN Integrated Switch should be running firmware Version 2.x.x. In the event a firmware upgrade is needed, use the following procedure.

IMPORTANT: All switch elements in the SAN must be running at the same firmware version level, and all fabric parameters must be the same, except for the Fibre Channel IP Address and the Domain ID.

Use the Firmware Upgrade page in Web Management Tools to download firmware upgrades.

To download the firmware:

1. Copy the files *RSHD.EXE* and *CAT.EXE* to the root directory (for example, C) on the host system. These files are found in

D:\DSGGB\FIRMWARE\INTEL\RSHD.EXE

D:\DSGGB\FIRMWARE\INTEL\CAT.EXE

D:\DSGGB\FIRMWARE\INTEL\2.x.x

where D\ is the drive letter for the CD and version 2.x.x is the latest version of firmware.

2. Double-click *RSHD.EXE*. RSHD is a server program that allows the switch to request the firmware from the host over an Ethernet connection. Leave RSHD running in a separate window.
3. Click the switch for which you want to upgrade the firmware. The Switch Management Application page displays.
4. Click the Admin button on the Switch Management Application page.
5. Click the Firmware upgrade tab. The following screen is displayed.

Switch Admin	User Admin	Firmware Upgrade	Reboot Switch	SNMP Admin	License Admin	Config Admin
--------------	------------	-------------------------	---------------	------------	---------------	--------------

Firmware Upgrade (Flash Download) on Switch it3:

Host Name or Host IP: Remote User Name:

Download File From:

Select Protocol: Password Required for FTP:

Figure 5-1: Firmware upgrade page example

- Enter the host name or host IP address in the Host Name or Host IP field.

NOTE: For Windows 9x, Windows 2000, Windows NT only, enter the IP address.
- Enter a user name in the Remote User Name field.

NOTE: For Windows 9x, Windows 2000, and Windows NT only, enter the default name user.
- In the Download File From field, enter the path name where the firmware resides.

IMPORTANT: You must use the UNIX style of forward slash (/) for the path name.

NOTE: When the firmware file is located in the same directory as the *CAT.EXE* and *RSHD.EXE* files, the directory path can be omitted.

- Click the Download Firmware button. The firmware is downloaded.

IMPORTANT: Prior to downloading the firmware, the *RSHD.EXE* program must be running from the same directory that contains the *CAT.EXE* program or the FTP server must be running.

- Repeat this procedure for each switch element to be upgraded in the SAN Integrated Switch.

Upgrading Firmware Using a Telnet Command

Use the `firmwareDownload` command in a Telnet session to download new firmware. The command downloads firmware into flash memory. This command can be executed on an operational switch. Use the `reboot` command to restart the switch element and initiate the new firmware after the download has completed.

The firmware can be downloaded from a UNIX host, Windows 95 host, or Windows NT host. For a UNIX host, no special software is needed. For Windows 95 or Windows NT, a daemon to support a Remote Shell is required. Firmware is downloaded through an RCP command running on top of TCP between the switch and the host.

To upgrade the firmware in a switch element, use the StorageWorks SAN Switch Software V2.x.x CD. Use one of the following three procedures, either Windows NT Intel, Windows NT Alpha, or Compaq Tru64 UNIX.

Windows NT Intel Host

To load the firmware from a Compaq PC running Windows NT Intel:

1. Copy the files *RSHD.EXE* and *CAT.EXE* to the root directory (for example, C) on the host system. These files are found in

D:\DSGGB\FIRMWARE\NTINTEL\RSHD.EXE

D:\DSGGB\Firmware\NTIntel\CAT.EXE

D:\DSGGB\FIRMWARE\NTINTEL\2.x.x

where D:\ is the drive letter for the CD and Version 2.x.x is the latest version of firmware.

2. Double-click *RSHD.EXE*. RSHD is a server program that allows the switch to request the firmware from the host over an Ethernet connection. Leave RSHD running in a separate window.
3. Click Start, then Run and enter the TELNET command.
4. Click Connect, then Remote System.
5. In the Host Name field, type the IP address of your switch element and click the Connect button.
6. Log in as
login: admin
password: password

- At the prompt, type

```
firmwareDownload "192.168.60.200", "administrator", "V2.x.x"
```

where "192.168.60.200" is the IP address of your host computer, "administrator" is the account you are using to run *RSHD.EXE*, and "V2.x.x" is the firmware image to be downloaded to the switch.

NOTE: *RSHD.EXE* must be run from the directory that contains the *CAT.EXE* file.

The output displays as follows:

```
1330320+203572+427356
writing flash 0 .....
writing flash 1 .....
download complete
switch:admin>
```

- Click the RSHD window and click File, then Exit.
- Click the Telnet window and enter the **reboot** command. The switch restarts and copies the firmware into RAM.

Windows NT Alpha Host

To load the firmware from an NT Alpha machine:

- Copy the files *RSHD.EXE* and *CAT.EXE* to the root directory (for example, C) on the host system. These files are found in

```
D:\DSGGB\FIRMWARE\NTALPHA\RSHD.EXE
D:\DSGGB\FIRMWARE\NTALPHA\CAT.EXE
D:\DSGGB\FIRMWARE\NTALPHA\V2.x.x
```

where D\ is the drive letter for the CD and Version 2.x.x is the latest version of firmware.

- Double-click *RSHD.EXE*. RSHD is a server program that allows the switch to request the firmware from the host over an Ethernet connection. Leave RSHD running in a separate window.
- Click Start, then Run and enter the TELNET command.
- Click Connect, then Remote System.

In the Host Name field, type the IP address of your switch element and click the Connect button.

5. Log in as

```
login: admin  
password: password
```

6. At the prompt, type

```
firmwareDownload "192.168.60.200", "administrator", "V2.x.x"
```

where "192.168.60.200" is the IP address of your host computer, "administrator" is the account you are using to run *RSHD.EXE*, and "V2.x.x" is the firmware image to be downloaded to the switch.

NOTE: *RSHD.EXE* must be run from the directory that contains the *CAT.EXE* file.

The output displays as follows:

```
1330320+203572+427356  
writing flash 0 .....  
writing flash 1 .....  
download complete  
switch:admin>
```

7. Click the RSHD window and click File, then Exit.
8. Click the Telnet window and enter the `reboot` command. The switch restarts and copies the firmware into RAM.

Compaq Tru64 UNIX Host

To load the firmware from a host running Compaq Tru64 UNIX:

1. Mount the CD device by using the following command:

```
mount -t cdfs -r /dev/rz5c /mnt
```

where *rz5c* is the device name for the CD.

2. Change to the CD directory by entering

```
cd /mnt
```

3. To copy the firmware to the host system, enter the following command:

```
cp dsqgb/firmware/v2.x.x mary/tmp/v2.x.x
```

where *mary* is the user name on the Tru64 host system and *V2.x.x* is the firmware image to be downloaded to the switch.

NOTE: The switch element-uses the remote shell capabilities of UNIX to log in to the Tru64 UNIX host and copy the firmware image. The user (*mary*) and the switch's IP address must be in the *.rhosts* file on the Tru64 UNIX host to allow login without a password.

4. Telnet to the switch by entering:

```
telnet <switch_hostname>  
user: admin  
pswd: <password>
```

NOTE: You can substitute the IP address of the switch for <switch_hostname>.

5. To download the firmware from the host system to the switch flash memory, enter the following command line at the <switch>:admin> prompt:

```
firmwareDownload "16.140.32.60", "mary", "/tmp/V2.x.x"
```

where “16.140.32.60” is the IP address of the host system with the firmware image, “mary” is the user to RSH, and “/tmp/V2.x.x” is the firmware image to be loaded into the switch flash ROM.

NOTE: The quotation marks are very important in the firmwareDownload command line.

RSH without a password must be enabled for the user that RSH is executing under. To enable RSH without a password, add the switch IP name to ~<user>/.rhosts). The format of .rhosts is: hostname [user].

6. Enter the `reboot` command at the Telnet prompt. The switch restarts and copies the firmware into RAM.

Appendix **A**

Regulatory Compliance Notices

This appendix covers the following topics:

- Regulatory Compliance Identification Numbers, page A-1
- Federal Communications Commission Notice, page A-2
- Canadian Notice (Avis Canadien), page A-4
- European Union Notice, page A-5
- Japanese Notice, page A-5
- Taiwanese Notice, page A-6
- Laser Devices, page A-6
- Battery Replacement Notice, page A-8

Regulatory Compliance Identification Numbers

For the purpose of regulatory compliance certifications and identification, your Compaq StorageWorks SAN Integrated Switch is assigned a Compaq series number. The Compaq series number for this product is Series NA2104. The SAN Integrated Switch series number can be found on the product label, along with the required approval markings and information. When requesting certification information for this product, always refer to this series number. This series number should not be confused with the marketing name or model number for your SAN Integrated Switch.

Federal Communications Commission Notice

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (for example, personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device as well as additional operating instructions for the user.

The rating label on the device shows the classification (A or B) of the equipment. Class B devices have an FCC logo or FCC ID on the label. Class A devices do not have an FCC logo or ID on the label. After the class of the device is determined, refer to the corresponding statement in the sections below.

Class A Equipment

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 instructions, may cause harmful 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 personal expense.

Class B Equipment

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or

television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

**Declaration of Conformity for Products Marked
with FCC Logo – United States Only**

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

For questions regarding your product, contact

Compaq Computer Corporation
P. O. Box 692000, Mail Stop 530113
Houston, Texas 77269-2000

or call 1-800-652-6672 (1-800-OK COMPAQ).

NOTE: For continuous quality improvement, calls may be recorded or monitored.

For questions regarding this FCC declaration, contact

Compaq Computer Corporation
P. O. Box 692000, Mail Stop 510101
Houston, Texas 77269-2000

or call (281) 514-3333

To identify this product, refer to the part, series, or model number found on the product.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Compaq Computer Corporation may void the user's authority to operate the equipment.

Network and Serial Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

Canadian Notice (Avis Canadien)

Class A Equipment

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Class B Equipment

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union Notice

Products with the CE Marking comply with both the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European Norms (the equivalent international standards are in parenthesis):

- EN55022 1998 (CISPR 22)—Electromagnetic Interference
- EN55024 1998 (IEC61000-4-2, IEC61000-4-3, IEC61000-4-4, IEC61000-4-5, IEC61000-4-6, IEC61000-4-8, IEC61000-4-11)—Electromagnetic Immunity
- EN60950 (IEC950)—Product Safety
- Power Quality: (IEC61000-3-2)—Harmonics and (IEC61000-3-3)—Voltage Fluctuations and Flicker
- Also approved under UL 1950, 3rd Edition/CSA C22.2 No. 950-95, Safety of Information Technology Equipment

Japanese Notice

ご使用になっている装置にVCCIマークが付いていましたら、次の説明文をお読み下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。取扱説明書に従って正しい取り扱いをして下さい。

VCCIマークが付いていない場合には、次の点にご注意下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Taiwanese Notice

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Laser Devices

All Compaq systems equipped with a laser device comply with safety standards, including International Electrotechnical Commission (IEC) 825. With specific regard to the laser, the equipment complies with laser product performance standards set by government agencies as a Class 1 laser product. The product does not emit hazardous light; the beam is totally enclosed during all modes of customer operation and maintenance.

Laser Safety Warnings



WARNING: To reduce the risk of exposure to hazardous radiation:

- Do not try to open the laser device enclosure. There are no user-serviceable components inside.
 - Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.
 - Allow only Compaq authorized service technicians to repair the laser device.
-

Compliance with CDRH Regulations

The Center for Devices and Radiological Health (CDRH) of the US Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States.

Compliance with International Regulations

All Compaq systems equipped with laser devices comply with appropriate safety standards including IEC 825.

Laser Product Label

The following label or equivalent is located on the surface of the Compaq supplied laser device.



This label indicates that the product is classified as a CLASS 1 LASER PRODUCT. This label appears on a laser device installed in your product.

Laser Information

Laser Type	Semiconductor GaAIAs
Wave Length	780 nm \pm 35 nm
Divergence Angle	53.5 degrees \pm 0.5 degrees
Output Power	Less than 0.2 mW or 10,869 W·m-2 sr-1
Polarization	Circular 0.25
Numerical Aperture	0.45 inches \pm 0.04 inches

Battery Replacement Notice

Your switch is equipped with either a lithium manganese dioxide, a vanadium pentoxide, or an alkaline internal battery or battery pack. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated. Replacement is to be done by a Compaq authorized service provider using the Compaq spare designated for this product. For more information about battery replacement or proper disposal, contact your Compaq authorized reseller or your authorized service provider.

WARNING: Your switch contains either an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery. There is risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
 - Do not expose to temperatures higher than 140°F (60°C).
 - Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
-

Batteries, battery packs, and accumulators should not be disposed of with general household waste. To forward them for recycling or proper disposal, please use the public collection system or return them to either Compaq, your authorized Compaq partners, or their agents.



Electrostatic Discharge

This appendix covers the following topics:

- Precautions Against Electrostatic Discharge, page B-1
- Grounding Methods, page B-2

Precautions Against Electrostatic Discharge

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until the parts arrive at static-free workstations.
- Place parts on a grounded surface before removing the parts from their containers.
- Avoid touching pins, leads, or circuitry.
- Always make sure you are properly grounded when touching a static-sensitive component or assembly.

Grounding Methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts.

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm plus or minus 10 percent resistance in the ground cords. To provide proper grounding, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or static dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have your Compaq authorized reseller install the part.

NOTE: For more information on static electricity, or for assistance with product installation, contact your Compaq authorized reseller.

Appendix **C**

Specifications

This appendix covers the following topics:

- Weight Specifications, page C-1
- Physical Dimensions, page C-2
- Environmental Specifications, page C-2
- GBICs, page C-3
- Switch Element Specifications, page C-3
- Factory Default Settings, page C-5

Weight Specifications

Table C–1 describes the weight specifications of each aspect of the SAN Integrated Switch.

Table C–1: Weight Specifications	
Hardware	Weight
Chassis (empty)	~ 65 Pounds
Individual Switch Elements	~ 20 Pounds
Chassis with all six switch elements installed (fully loaded with GBICs and fiber-optic cables)	~ 200 Pounds

Physical Dimensions

The SAN Integrated Switch has a 14 Unit (25-inch) rack height, 19-inch rack width, and is 24 inches deep, fitting in a 30-inch deep rack.

Table C-2: Dimensions for the SAN Integrated Switch

Dimension	Size	Smallest Rack Space
Height of SAN Integrated Switch	62.2 cm (24.5 in)	14 Units
Width	4.5 cm (17.5 in)	19 inches
Depth	62.2 cm (24.5 in)	30 inches

Environmental Specifications

The acceptable environmental ranges for the SAN Integrated Switch are shown in Table C-3. These environmental ranges also apply to each individual switch element.

Table C-3: Environmental Specifications

Specification	Value
Temperature (operating)	50°F to 104°F (10°C to 40 °C) at 3 km (9800 ft)
Temperature (non-operating)	-31°F to 147°F (-35°C to 63.89 °C)
Operating humidity	5% to 85% noncondensing @ 104°F (40°C)
Non-operating humidity	95% RH noncondensing @ 104°F (40°C)
Operating altitude	0 to 3 km (1.9 mi) above sea level
Non-operating altitude	0 to 12 km (7.5 mi) above sea level
Operating shock	4g, 11MS duration, half sine
Non-operating shock	20g, 11MS duration, sq. wave
Operating vibration	5G, 0–3kHz
Non-operating vibration	10G, 0–5 kHz

GBICs

The SAN Integrated Switch is compatible with the following types of GBICs:

- Shortwave
- Longwave
- Shortwave serial ID
- Longwave serial ID

The SAN Integrated Switch product includes short wavelength GBICs for all ports, both ISL and user ports.

Switch Element Specifications

The specifications for the switch element (Fibre Channel SAN Switch 16-EL) are listed in Table C-4.

Specification	Description
Fabric initialization	Complies with FC-SW 3.2
IP over Fibre Channel (FC-IP)	Complies with FC-IP 2.3 of the FCA profile
System architecture	Nonblocking shared-memory switch
System processor	Superscalar 33-MHz Intel i960RP
Number of Fibre Channel ports	16 GBIC ports
Fibre Channel port speed	1.0625 GB/s, full duplex
Modes of operation	Fibre Channel Class-2 service and Fibre Channel Class-3 connectionless service
Aggregate switch I/O bandwidth	16 Gigabytes per second, full duplex
Frame buffers	16 buffers per port at 2112 bytes per frame
Port to port latency	Less than 2 microseconds with no contention
Data transmission range	Up to 500 m (1,640 ft) for short wavelength optical link Up to 10 km (84,480 ft) for long wavelength optical link
Chassis type	Back-to-front airflow (AC power connection out front)

Switch Element Memory

The available memory for the switch element is as follows.

- Main Memory: 16 MB per switch
- Flash Memory: 4 MB per bank, with 2 banks, mirrored for redundancy

Power Supply

See Table C-5 for power supply requirements.

Specification	Value
Total P/S power	70W to 120W (70W convection, without fan; 120W with 30 CFM forced air, with fan)
Max. power	60-70W
Input voltage	85 VAC minimum autoranging to 264 VAC maximum
Input line frequency	47 Hz minimum to 63 Hz maximum
Harmonic distortion	Power factor correction per IEC1000-3-2
BTU rating	110W x 3.412 BTU/hr/W = 375 BTU/hr

Factory Default Settings

The factory default settings for the switch are listed in Table C-6.

Table C-6: Factory Default Settings

Parameter	Compaq Default
Ethernet IP address	Domain/Switch Name
10.77.77.77	231/ SW1
10.77.77.76	232 /SW2
10.77.77.75	233 /SW3
10.77.77.74	234 /SW4
10.77.77.73	235 /SW5
10.77.77.72	236 /SW6
Ethernet Subnetmask	255.255.255.0
Fibre Channel IP address	0.0.0.0.
Fibre Channel Subnetmask	none
Gateway address	Varies with model
Domain	1
BB credit	16
R_A_TOV	10000
E_D_TOV	2000
Data field size	2112
Non-SCSI Tachyon mode	0
Disable device probing	0
VC-Encoded address mode	0
Per-frame route priorities	0
VC priorities	0,1,2,2,2,2,3,3
Disable fan frames	0
Reset to default	N/A
Command name	default setting
Switch name	switch
WorldWide Name	unique to each switch

Table C-6: Factory Default Settings (Continued)

Parameter	Compaq Default
Firmware version	v2.4.x or later
Firmware date	N/A
Flash date	N/A
Boot prom date	N/A
Licenses	Web Tools, Fabric Zoning
diag.postDisable	0
fabric.ops.mode.fcpProbeDisable	0
fabric.ops.mode.isolate	0
fabric.ops.mode.unicastOnly	0
fabric.ops.mode.SeqSwitching	
fabric.ops.mode.longDistance	
fabric.ops.mode.useCsCtl	0
route.delayReroute	iodset 1
route.embeddedPortBcast	1
route.stickyRoutes	0
rpc.rstatd	0
rpc.rusersd	0
Flags	0000
Syslogd_ip	0.0.0.0
op_mode	0000
vc_link_ctl	0000
vc_class2	0002
vc_class3	0003
vc_config	C0
vc_multicast	0007
Frm collection	piling
Alt bb_credit	0000
Open bb_credit	0004
Send FAN frames	yes
Always resend RSCN	1
Diag_alpa	1

Table C-6: Factory Default Settings (Continued)

Parameter	Compaq Default
Csum	5150
Text off	00000020
Text addr	10330000
Text size	0000d990
Data off	0000d9b0
Data addr	1033d9c0
Data size	00001b48
Magic	2112
OemLogoSet	1
Fakemodel	2
Software readable serial number	Compaq switch serial number
Supress F class	0
SYNC IO mode	0
Disable RLS probe	OFF
Open send CLS	0
rpc.rapid	1
Translative mode Disable	0

Index

A

AC module status indicators 3-17

AC power

connecting 3-2

cord 2-3, 2-8

B

battery

recycling or disposal A-8

replacement notice A-8

warning 4-1, A-8

C

cables

FCC compliance statement A-4

multi-mode 3-19

serial 3-20

single-mode 3-19

Canadian Notice (Avis Canadien) A-4

CE marking A-5

cfgClear 3-11, 4-10

cfgShow 3-13, 3-14

COM port 3-3, 3-4

Compaq series number A-1

configDefault 3-10

configDownload 3-11, 3-14, 3-15, 3-16

failure reasons 3-15

parameters 3-14

configUpload 3-11, 3-12

failure reasons 3-12

connecting the storage subsystem and host 3-20

connections

E-port 1-2

Ethernet 1-3

FL-port 1-2

F-port 1-2

GBIC module 3-20

serial port 1-3

conventions

naming xi

text xii

cooling requirements 2-2

cut-through routing 1-1

D

DB9 serial port 1-3

Declaration of Conformity A-3

default

password 3-6

user ID 3-6

determining firmware revision 5-6

Distributed Name Server 1-2

documents

related xii

- E**
- E-port connection 1-2
- Ethernet
 - connection 3-7
 - IP address 3-6
 - port 1-3, 3-5
- European Union Notice A-5
- F**
- fast green indicator 3-17
- fast yellow indicator 3-17
- FCC class
 - A compliance notice A-2
 - B compliance notice A-2
- Federal Communications Commission (FCC)
 - notice A-2
- Fibre Channel
 - network connection 3-7
- File Transfer Protocol 3-12, 3-13, 3-14, 3-15, 3-16
- firmware
 - determining current version 5-1
 - downloading from the Compaq website 5-1
 - upgrading using a Telnet command 5-4
 - upgrading using Web Management Tools 5-2
- flickering green indicator 3-17
- FL-port connection 1-2
- F-port connection 1-2
- front panel 1-3, 3-7
 - illustration 1-3
- full fabric capability 1-2
- G**
- getting help xv
- Gigabit Interface Converter 1-1
 - removing 4-2
 - replacing 4-2
 - slots 1-1
 - squeeze-prong 4-3
 - squeeze-prong illustrated 4-3
 - with a locking bar 4-2
- GND signal 3-3
- H**
- help xv
- host, remote
 - Tru64 UNIX 5-6
 - Window NT Alpha 5-5
 - Windows NT Intel 5-4
- HyperTerminal 3-2, 3-10
- I**
- illustrations
 - connecting a cable to a GBIC module 3-20
 - connecting the Ethernet cable 3-7
 - front panel 1-3
 - package contents 2-7
- indicators
 - AC module 3-17
 - descriptions 3-17
 - fast green 3-17
 - fast yellow 3-17
 - flickering green 3-17
 - interleaving green and yellow 3-17
 - no light showing 3-17
 - port 3-17
 - slow green 3-17
 - slow yellow 3-17
 - status 3-17
 - steady green 3-17
 - steady yellow 3-17
- installing
 - a GBIC module 4-3
- interleaving green and yellow indicator 3-17
- IP address 3-15, 5-3
- ipAddrSet 3-6
- L**
- laser devices A-6
- laser information A-7
- laser product label A-7
- laser safety warnings A-6
- licenseKey 3-16
- loading firmware

- Tru64 UNIX 5-6
- Windows NT Alpha 5-5
- Windows NT Intel 5-4
- locking bar Gigabit Interface Converter 4-2

M

- modifications
 - FCC compliance statement A-4

N

- naming conventions xii
- no light showing indicator 3-17

P

- password
 - default 3-6
- port status indicators 3-17
- power
 - maximum capability 2-4
 - requirements 2-3
- power supply requirements C-4

R

- Regulatory Compliance Identification Numbers A-1
- related documents xii
- remote host
 - Tru64 UNIX 5-6
 - Windows NT Alpha 5-5
 - Windows NT Intel 5-4
- remote host communication 3-2
- replacing a Gigabit Interface Converter module 4-2
- requirements
 - cooling 2-2
 - power 2-3
- resetting factory defaults 3-10
- resetting IP address 3-10
- RSHD protocol 3-11, 3-13, 3-14, 3-15
- RxData signal 3-3

S

- serial cable 3-3

- serial port 1-3
 - connecting 3-3
 - pinouts 3-3
- series number A-1
- slow green indicator 3-17
- slow yellow indicator 3-17
- specifications
 - dimensions C-4
 - switch C-3
- squeeze-prong Gigabit Interface Converter 4-3
- status indicators 3-17
- steady green indicator 3-17
- steady yellow indicator 3-17
- Storage Area Network 1-1
- support xv
- symbols xiii

T

- technical support xv
- Telnet commands
 - cfgClear 3-11, 4-10
 - cfgShow 3-13
 - configDownload 3-11, 3-16
 - configUpload 3-11, 3-13, 3-14
 - ipAddrset 3-6
 - sgroupSet 4-13, 4-14
 - sgroupShow 4-14
 - switchStatusPolicySet 3-9
- Tru64 UNIX, downloading firmware 5-6
- TxData signal 3-3

V

- voltage capability 2-4

W

- website xvi

Z

- zoning configuration 3-14

