StorageWorks by Compaq

Fibre Channel SAN Switch 2/16
Installation Guide

Part Number: AA-RR84A-TE

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Product Version:　　　　3.0

This guide provides procedures for setting up, configuring and
managing the SAN Switch 2/16.

COMPAQ

Contents

2 Installing the Fibre Channel SAN Switch 2/16

3 Managing the Fibre Channel SAN Switch 2/16

Glossary

Index

Figures

Tables

About this Guide

This Installation Guide provides information to help you:

- Install the *StorageWorks*™ Fibre Channel SAN Switch 2/16 by Compaq in a Compaq 9000 Series rack

- Set network addresses

- Backup and restore the configuration

- Upgrade firmware

Intended Audience

This book is intended for use by system administrators and technicians who are experienced with the following:

- Storage Area Network (SAN) technology

- Fibre Channel technology

- managing devices in a SAN.

Related Documentation

In addition to this guide, Compaq provides the following corresponding information:

- *StorageWorks by Compaq SAN Switch 2/16 Release Notes*,
  Part Number: AA-RR85A-TE

- *StorageWorks by Compaq Fabric OS Procedures User Guide*,
  Part Number: AA-RQ6EA-TE

- *StorageWorks by Compaq Fabric OS Reference Guide,*
  Part Number: AA-RQ6FA-TE

- *StorageWorks by Compaq Web Tools User Guid*e,
  Part Number: AA-RQ6GA-TE

- *StorageWorks by Compaq MIB Reference Guide*,
  Part Number: AA-RQ6HA-TE

- *StorageWorks by Compaq ISL Trunking User Guide*,
  Part Number: AA-RR81A-TE

- *StorageWorks by Compaq Advanced Performance Monitoring User Guide*,
  Part Number: AA-RR7UA-TE

- *StorageWorks by Compaq Zoning Guide*,
  Part Number: AA-RQ6YA-TE

- *StorageWorks by Compaq QuickLoop User Guide*,
  Part Number: AA-RR7LA-TE

- *StorageWorks by Compaq Extended Fabric Version 3.0 User Guide*,
  Part Number: AA-RR7QA-TE

- *StorageWorks by Compaq Fabric Watch Version 3.0*,
  Part Number: AA-RR7YA-TE

- *StorageWorks by Compaq Fabric Manager Version 3.0 User Guide*,
  Part Number: AA-RRAUA-TE

Document Conventions

The conventions included in Table 1 apply in most cases.

Table 1: Document Conventions

Element	Convention
Key names, menu items, buttons, and dialog box titles	**Bold**
File names and application names	*Italics*
User input, command names, system responses (output and messages)	`Monospace font` `COMMAND NAMES` are uppercase unless they are case sensitive
Variables	`Monospace, italic font`
Website addresses	Sans serif font (http://www.compaq.com)

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 data.

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

Any enclosed 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. Contact with this surface could result in injury.

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 presence of multiple sources of power.

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

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 manually handling material.

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.**
- **In single rack installations, the stabilizing feet are attached to the rack.**
- **In multiple rack installations, the racks are coupled.**
- **Only one rack component is extended at any time. A rack may become unstable if more than one rack component is extended for any reason.**

Getting Help

If you still have a question after reading this guide, contact service representatives or visit our website.

Compaq Technical Support

In North America, call Compaq technical support at 1-800-OK-COMPAQ, available 24 hours a day, 7 days a week.

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

Outside North America, call Compaq technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the Compaq website: http://www.compaq.com.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)

- Product serial numbers

- Product model names and numbers

- Applicable error messages

- Operating system type and revision level

- Detailed, specific questions.

Compaq Website

The Compaq website has the latest information on this product, as well as the latest drivers. Access the Compaq website at: http://www.compaq.com/storage. From this website, select the appropriate product or solution.

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.

1

Overview

The *StorageWorks* Fibre Channel SAN Switch 2/16 by Compaq is a high-performance, 16-port, 2 gigabit (GB) Fibre Channel switch used to interconnect storage devices, hosts, and servers in a Storage Area Network (SAN).

This chapter provides the following information:

- Features
- Firmware and hardware summaries
- Field-Replaceable Units (FRUs)

SAN Switch 2/16 Features

Read the following sections for feature-specific information.

Firmware

The SAN Switch 2/16 operates using Fabric Operating System™ firmware Version 3.0.x. The firmware supports:

- High-speed data traffic using Inter-Switch Link (ISL) trunking technology
- Automatic re-routing through the Fabric Shortest Path First (FSPF) algorithm
- Application Programming Interface (API); a protocol that allows applications to interface with switch services.

• Zoning functionality, provides a means to allocate storage controllers to groups of computers. Allows you to create logical subsets of the fabric to accommodate closed user groups or to create functional user groups within a fabric.

  For more information refer to the *StorageWorks by Compaq SANworks Zoning User's Guide*, PN AA-RQ6YA-TE.

• Per port statistics help technicians diagnose and isolate problem ports without disrupting switch operations

• Error detections and fault isolation, automatically disables failing ports and restarts when the problem is resolved

• Industry standard Management Information Base (MIB) support

• Automatic self-discovery, discovers and registers host server and storage devices.

Hardware

SAN Switch 2/16 consists of the following components:

• A 1 Unit (U) chassis, designed for mounting in a 19-inch rack, with forced-air cooling that flows from the back of the switch to the front

• 16 optical ports, compatible with Small Form Factor Pluggable media (SFPs)

• One RS-232 Serial port (DB9 connector) on the front panel.

• One IEEE compliant RJ-45 connector on the front panel for use with 10/100 Mbps ethernet or in-band

• A total of 36 LEDs

  — One Power Switch LED on left of the front panel

  — One Port Status and Port Speed LED for each of the sixteen ports

  — One the Power Supply LED on the back of the Power Supply

  — One Port Readiness LED on the Back Panel

• Universal input power supply with AC switches and built-in fans. (The power supply plugs into internal blind-mate connectors when installed in the chassis.)

• Two fan trays, each containing two fans. Air is pulled in through the rear intake and pushed out through the vents in the front panel. The fans provide adequate cooling for the maximum switch power rating.

• Three digital thermometers, capable of sensing a temperature range from -55 °C to +125°C, in 0.5°C increments

- A field-replaceable motherboard completely enclosed in an Electro-Magnetic Interference (EMI) enclosure tray, with logic and chassis ground connected to the chassis, and an embedded processor that processes frames up to 1024 bytes.

- A real-time clock (RTC) with a 10-year battery and 56 bytes of NVRAM.

SAN 2/16 Front Panel

Figure 1–1 shows the front panel of the SAN Switch 2/16. The front panel houses the Serial port, Ethernet port, fiber optic ports with corresponding LEDs, and the power switch LED.

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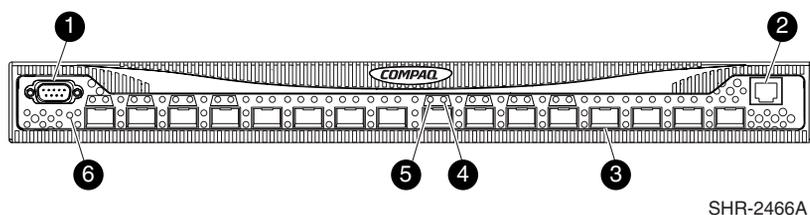
❶	Serial Port	❹	Port Speed LEDs (16)
❷	Ethernet Port	❺	Port Status LEDs (16)
❸	Optical Ports (16)	❻	Power Switch LED

Figure 1–1: SAN Switch 2/16 front panel

Optical Ports

All switch ports support full fabric capability. Full fabric allows the Fibre Channel SAN Switch 2/16 to link or cascade to other StorageWorks Fibre Channel switches running v2.6x and above, building a highly scalable SAN fabric. The Fibre Channel SAN Switch 2/16 supports F-port, FL-port, and E-port connections and Distributed Name Server (DNS).

The ports on the front panel of the SAN Switch 2/16 are color-coded in groups, with four purple ports alternating with four unmarked ports, to indicate which ports can be used in the same ISL trunking group (see "ISL Trunking," described next). Each port automatically negotiates to the highest common speed.

The ports are capable of operating at 2.125 Gbps or 1.0625 Gbps. Each port conforms to the American National Standards Institute (ANSI) Fibre Channel, FC-PI specification for Fibre Channel SFP transceivers.

ISL Trunking

ISL trunking is a Fabric OS feature that enables distribution of traffic over the combined bandwidth of up to four ISLs between two directly adjacent switches, while preserving in-order delivery. For specific information about ISL trunking, refer to the *StorageWorks by Compaq ISL Trunking User Guide*, Part Number AA-RR82A-TE.

SFPs

The ports connect to SFP media. SFPs are universal and self-configuring.

SAN 2/16 Rear Panel

Figure 1–2 shows the rear panel of the SAN Switch 2/16. The rear panel houses the fan trays, power supply, and switch status LED. Each power supply also has an LED that indicates the status. The power supply, fan trays, and motherboard are all Field Replaceable Units (FRUs).

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❶ Power Supply LED
❷ Port Readiness LED
❸ Power Supply
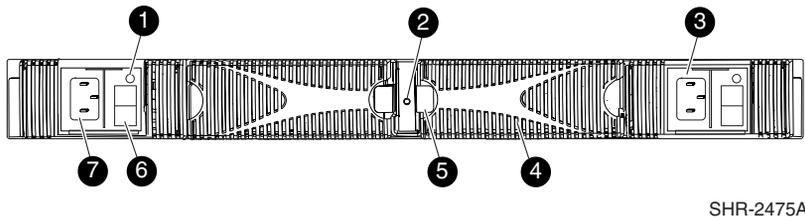
❹ Fan Tray Assembly (inside chassis)
❺ Spring Latch (2)
❻ Power Switch
❼ Power Supply

Figure 1–2: SAN Switch 2/16 rear panel

Field-Replaceable Units

The power supply, fan trays, and motherboard can all be replaced in the field, without the use of special tools. The switch continues operating during the replacement of a fan tray or power supply, if they are replaced one at a time. The switch must be turned off during replacement of the motherboard. To simplify replacement, the switch has a minimum of internal cables and no jumpers or hardware settings. Replacement instructions are provided with all replacement units ordered.

The right and left fan trays are identical and fit into either fan tray slot. The fans in the fan tray on the left (front view) are identified by the Fabric OS as fans #1 and #2. The fans in the fan tray on the right are identified as fans #3 and #4 by the Fabric OS.

2

Installing the Fibre Channel SAN Switch 2/16

This chapter covers the following topics:

- Carton contents

- Installation and Safety Considerations

- Installing the switch as a stand-alone unit or in a 9000 Series Rack

- Installing an SFP module

- Configuring network addressing

Unpack and Verify Carton Contents

Unpack and inspect the SAN Switch 2/16 carton contents as follows.

1. Inspect the shipping container for possible damage caused during transit.

2. Unpack the shipping cartons.

3. Verify that the carton contains the items shown in Figure 2–1and Table 2–1.

IMPORTANT: If any items are damaged or missing, please contact Compaq or a Compaq Authorized reseller.
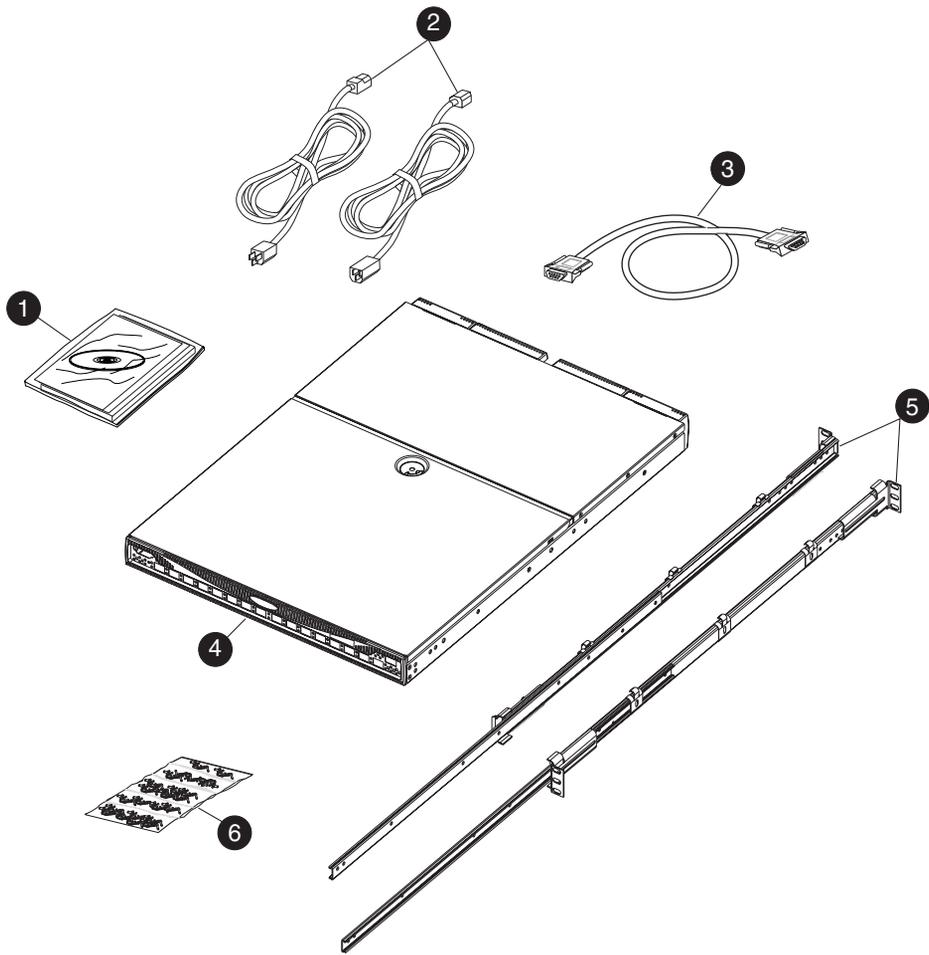
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Figure 2–1: Carton contents

Table 2–1: Shipping carton contents

Number	Item
1	One StorageWorks by Compaq Fibre Channel SAN Switch 2/16 Product accessory bag containing CD, license, documentation and Release Notes
2	Two standard AC Power Cords
3	One RS-232 Serial cable (convertible to an RJ-45 connector)
4	*StorageWorks* SAN Switch 2/16 by Compaq
5	**Rack Mount Kit containing:** Slide Assembly, includes one Inner and one Outer Slide Rail, with the following items preinstalled: • L-Bracket, Slide Mount, 3-hole (4) • Power Cord Clips (6)
6	**Pouch containing Rack Mount hardware** • 3-hole Bar Nuts (4) • 10-32 x 3/8" Phillips Head Screws (10) • 8-32 x 3/16" Phillips Head Screws (10) • Square Alignment Washers (8) • Right and Left Rear Rack Mount Brackets (2), use if installing so that port side slides from the rear of the rack • Right and Left Front Mount Brackets (2), use if installing so that power supply end slides out from the front of the rack • Rubber Mounting Feet (4), use if installing on a flat surface

Installation and Safety Considerations

Read the following sections for installation guidelines. Install the SAN Switch 2/16 in one of the following ways:

- as a stand-alone unit on a flat surface, or

- in the Compaq 9000 Series (or comparable) Rack using the Rack Mount Kit contents as outlined in Table 2–1.

Selecting an Operating Location

To ensure correct operation of the switch, the location where the switch is in use must meet the following requirements:

- Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the switch nameplate.

- An air flow of at least 300 cubic feet per minute, available in the immediate vicinity of the switch.

- If the installing the switch in the Compaq 9000 Series, or comparable Electronics Industries Association (EIA) rack:

  — All equipment installed in the rack should have a reliable branch circuit ground connection, and should not rely on a connection to a branch circuit, such as a power strip.

  — The rack should be balanced and the installed equipment within the rack's weight limits. Ensure the rack is mechanically secured to insure stability in the event of an earthquake.

Cooling Requirements

Cooling air is drawn into the switch chassis by the fans mounted on the rear of the chassis. The air is expelled through vents in the front of the chassis (next to the Compaq logo). Compaq recommends installing the switch so that air intake and exhaust for all components in the rack is flowing in the same direction.

> ⚠ **CAUTION:** Do not block air vents. The switch uses ambient air for cooling.

Power Requirements

Two AC power cords connect to the switch on the either side of the rear panel. 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 75 watts, maximum

The switch has a 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.

Installing the SAN Switch as a Stand-alone Unit

Use these procedures for setting up the switch as a stand-alone unit. The following items are required for this setup:

- SAN Switch 2/16
- AC power cord(s) and cables supplied with the switch
- Rubber Mounting Feet supplied with the switch

1. Place the SAN Switch 2/16 on a flat, sturdy surface like a table or lab bench.

2. Apply the rubber feet as follows.

    a. Clean the four depressions that are at each corner of the bottom of the switch to ensure they are free of dust.

    b. Place a rubber foot in each depression, with the adhesive side against the chassis, and press into place.

> **CAUTION:** Installing the rubber feet on the switch is recommended to help prevent the switch from accidentally sliding off the table or bench.

3. Connect the power cable to the SAN Switch 2/16 power supply and to a power outlet. Ensure the power cable is routed so that it is not exposed to stress.

4. Turn on the power to the switch (flip the AC switch to "1"). The switch automatically runs a Power-On Self-Test (POST).

5. If the SAN Switch 2/16 includes a second power supply, repeat steps 3 through 5 for the remaining power supply.

IMPORTANT: Do not connect the switch to the network until the IP address is correctly set. For instructions on how to set the IP address, see "Configuring SAN Switch 2/16 Network Addressing," later in this chapter.

Installing the SAN Switch 2/16 in a 9000 Series Rack

Read the following sections for complete installation instructions. Obtain the following tools:

- A #2 Phillips screwdriver

- Torque screwdriver.

IMPORTANT: The SAN Switch 2/16 ships with the complete set of rack mount hardware required for installation in the Compaq 9000 Series Rack. The 2/16 switch installs in all Compaq 19-inch racks. However, if installing in Compaq's 41U Rack, you must purchase that specific Rack Mount Kit separately. Contact your authorized Compaq switch supplier.

Installing the Slide Rail Assemblies to the Switch

The SAN Switch 2/16 Rack Mount Kit consists of two Slide Rail Assemblies consisting of an Inner Slide Rail attached to an Outer Slide Rail. Read the following sections for complete instructions on first separating, then installing the the Slide Rail Assemblies.

Separating the Inner Slide Rail Assembly from the Outer Slide Rail Assembly

First, separate the two Inner (smaller) Slide Rails from the two Outer (larger) Slide Rails as follows.

1. Holding one Slide Rail Assembly horizontally, pull the Inner Slide Rail out of the Outer Slide Rail until the Lock Release Lever engages.

2. Press the Lock Release Lever located on the Inner Slide Rail. The Inner Slide Rail separates from the Outer Slide Rail.

3. Repeat steps 1 and 2 to separate the second Slide Rail Assembly.

4. Put the Outer Side Rails aside. Follow the steps in the next section, "Attaching the Inner Slide Rails to the Switch."

Attaching the Inner Slide Rails to the Switch

Use the following steps to secure each Inner Slide Rail to the switch chassis.

> ⚠️ **CAUTION:** It is s important to install the Inner Slide Rails using the Phillips Head, 8-32 x 3/16" screws supplied in the Rack Mount Kit. Installing screws longer than 3/16" can damage the switch.

1. Position the Inner Slide Rails with the flat side against the switch, oriented in one of the following two ways:

   IMPORTANT: Compaq recommends installing the SAN Switch 2/16 so that the port side of the switch slides out the rear of the 9000 Series Rack (as described in step 1a below). In this way, the switch faces the aisle where exhaust air is released. Air intake and exhaust for all components in the rack should flow in the same direction.

   a. To allow the port side of the switch to slide out the rear of the rack:
      Orient the Inner Slide Rail with the end containing the Lock Release Lever towards the power supply end of switch.

   b. To allow the power supply side of the switch to slide out the front of the rack:
      Orient the Inner Slide Rail with the end containing the Lock Release Lever towards the port end of switch.

2. Locate three Phillips head, 8-32 x 3/16" screws provided in the Rack Mount Kit.

   a. Secure the Inner Slide Rail to the switch using the three Phillips head, 8-32 x 3/16" screws contained in the Rack Mount Kit, see Figure 2–2

   b. Tighten the screws and torque to 15-inch pounds..
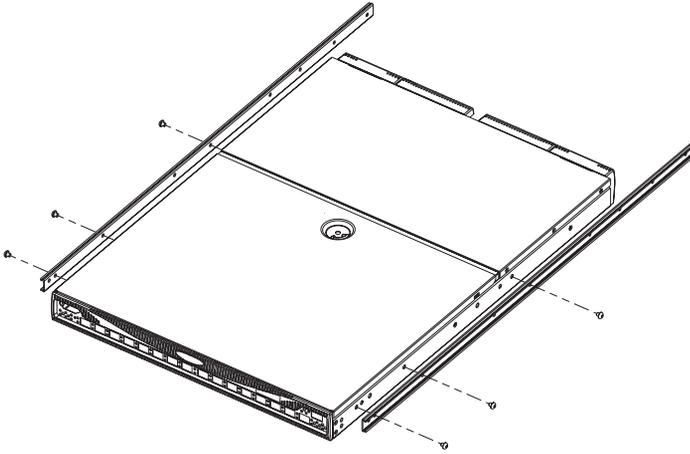
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Figure 2–1: Securing the Inner Slide Rails to the switch

3. Repeat steps 1 and 2 to attach the second Inner Slide Rail to the switch. Make sure to orient the second Inner Slide Rail in the same way you positioned the first (based on 1a or 1b above).

Attaching the Rear or Front Rack Mount Brackets

The Rack Mount Kit supplied with the SAN switch 2/16 contains two Rear Rack Mount Brackets and two Front Rack Mount Brackets. Install these Rack Mount Brackets to prevent the switch from accidentally sliding out of the rack, as follows.

IMPORTANT: Compaq recommends installing the SAN Switch 2/16 so that the port side of the switch slides out the back of the 9000 Series Rack. (For example, the switch should face the aisle where exhaust air is released. Air intake and exhaust for all components in the rack should flow in the same direction.)

For Rear Rack Access

Use these steps to attach the Rear Rack Mount Brackets to the switch. The Rear Rack Mount Brackets act as "stops" to prevent the switch from sliding out the rear of the rack. Use these steps if you installed the Inner Slide Rails to the switch using the procedure outlined in "Attaching the Inner Slide Rails to the Switch," step 1a.

1. Align the Right Rack Mount Bracket with the two screw holes at the port end of the switch.

2. Locate two Phillips head 8-32 x 3/16" screws, contained in the Rack Mount Kit. Secure the Right Mount Bracket to the switch, see Figure 2–3.
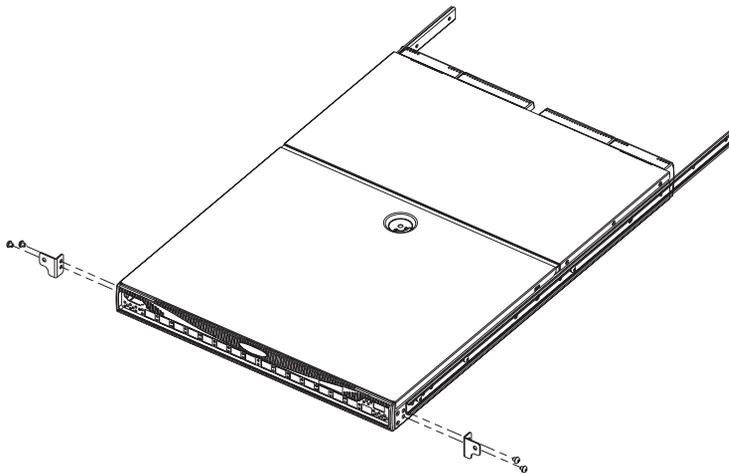
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Figure 2–3: Attaching the Rear Rack Mount Brackets

3. Tighten the screws and torque to 15 inch-pounds.

4. Repeat steps 1 through 3 to install the Left Mount Bracket on the left side of the switch, see Figure 2–3.

For Front Rack Access

Use these steps to attach the Front Rack Mount Brackets to the switch. The Front Rack Mount Brackets act as "stops" to prevent the switch from sliding out the front of the rack. Use these steps if you installed the Inner Slide Rails to the switch using the procedure outlined in "Attaching the Inner Slide Rails to the Switch," step 1b.

1. Align the Right Rack Mount Bracket with the two screw holes at the end of the inner rails on the right, power supply end of the switch.

2. Locate two slotted head Phillips head 8-32 x 3/8" screws and two lock nuts contained in the Rack Mount Kit accessory pouch.

3. Secure the Right Mount Bracket to the end of the inner slide rail using the screws and lock nuts.

4. Tighten the screws and torque to 15 inch-pounds.

5. Repeat steps 1 through 4 to install the Left Mount Bracket onto the second inner slide rail.

Attaching the Outer Slide Rails to the 9000 Series Rack

Use the following steps to install the Outer Slide Rails in the 9000 Series Rack.

NOTE: This procedure requires two technicians to properly align the Outer Slide Rails in the 9000 Series Rack.

Obtain the following items, located in the Rack Mount Kit:

- Four 3-Hole Bar Nuts
- Eight Phillips head 8-32 x 3/8" screws
- Eight Square Alignment Washers
- # 2 Phillips screwdriver with torque capability.

IMPORTANT: Before starting this procedure, verify that two of the slide mount L-Brackets are preinstalled at the end of each Outer Slide Rail, see Figure 2–4. The L-Brackets are necessary to attach the Outer Rails to the 9000 Series Rack.

1. Determine the appropriate placement for the switch inside the 9000 Series Rack.

NOTE: The 9000 Series Rack's rails are divided into Units (Us). Each U is marked with a small, round hole and three square openings for mounting equipment.

2. Locate the small, round marker hole on the 9000 Series rack's rails, that coincides with the location selected in step 1. Each marker hole delineates the beginning of one U.

NOTE: The SAN Switch 2/16 requires one Unit of rack space.

3. Insert one Square Alignment Washer on each of the eight 10-32 x 3/8" Phillips Head screws.

IMPORTANT: The Square Alignment Washers are mandatory for proper switch alignment.

4. Adjust the Outer Slide Rail's length to fit the length of the 9000 Series Rack.

5. Position one of the Outer Slide Rails in the rack, as described below:

    a. To allow the switch's port end to slide out the back of the rack, orient with the closed end of the Outer Slide Rail towards the front of the rack.

    b. To allow the power supply end to slide out the front of the rack, orient the closed end of the Outer Slide Rail towards the back of the rack.

6. Holding the Outer Slide Rail in place, insert one 3-Hole Bar Nut in between the rack's rail and the L-Bracket at the end of the Outer Slide Rail, see Figure 2–4.

IMPORTANT: Before completing the next step (step 7), make sure that you have already installed the Square Alignment washers onto the Phillips head 10-32 x 3/8" screws, as described in step 3. The Square Alignment Washers are mandatory for proper switch alignment.

7. Secure each L-Bracket and 3-Hole Bar Nut to the rack's rails with two Phillips head 10-32 x 3/8" screws (and attached Square Alignment Washers), see Figure 2–4.
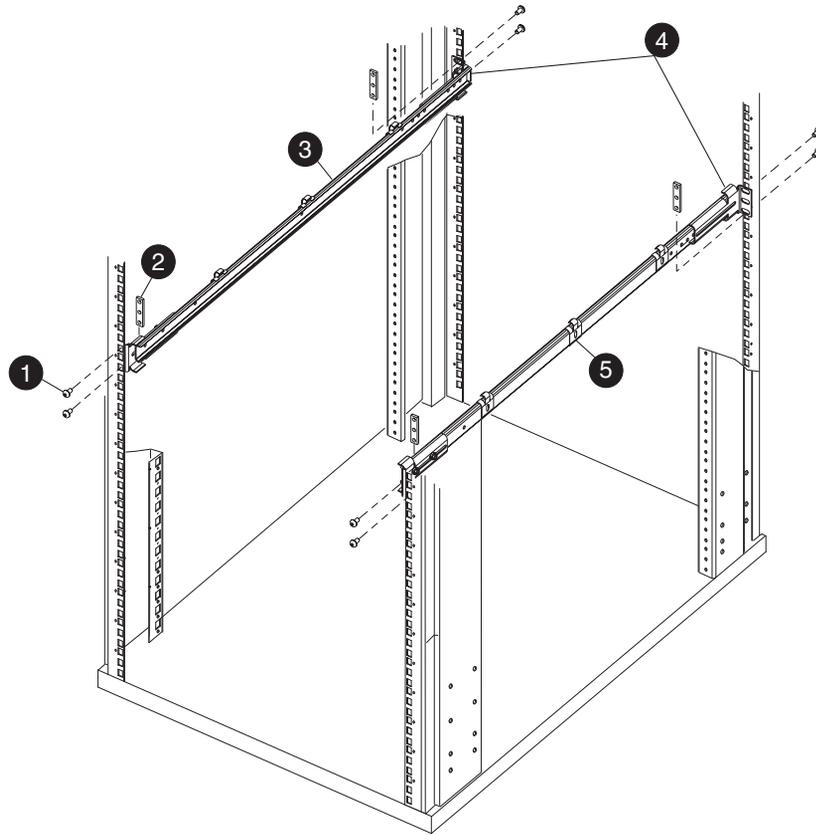
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❶ Phillips head 10-32 x 3/8" screw   ❹ L-Brackets

❷ 3-hole Bar Nut   ❺ Power Cord Clip (1 of 6)

❸ Outer Slide Rail

Figure 2–4: Attaching the Outer Slide Rails to the 9000 Series Rack

NOTE: Remember to position the 3-Hole Bar Nut behind the L-Bracket.

8. Tighten the screws, and torque to 25-inch-pounds.

9. Repeat steps 5 through 7 to secure the other end of the Outer Slide Rail.

10. Repeat steps 3 through 7 to install the second Outer Slide Rail.

Finalizing the Rack Mounting Procedure

Read this section for finalizing the rack mount procedure.

Installing the Switch in a 9000 Series Rack

Follow these steps to install the switch in the rack.

⚠ **CAUTION:** During the install, do not touch the inner section of the Outer Slide Rails. The inner section of each Outer Slide Rail contains sharp edges. If necessary, touch the upper edges of the Outer Slide Rails only

1. Depending on the type of install (front access or rear access) slide the Outer Slide Rails all the way toward the front or back of the rack.

2. Carefully lift the switch into the rear of the rack, inserting the Inner Slide Rails (attached to the switch) into the Outer Slide Rails (attached to the rack). see Figure 2–5.

3. Slide the switch in the rack, see Figure 2–5.

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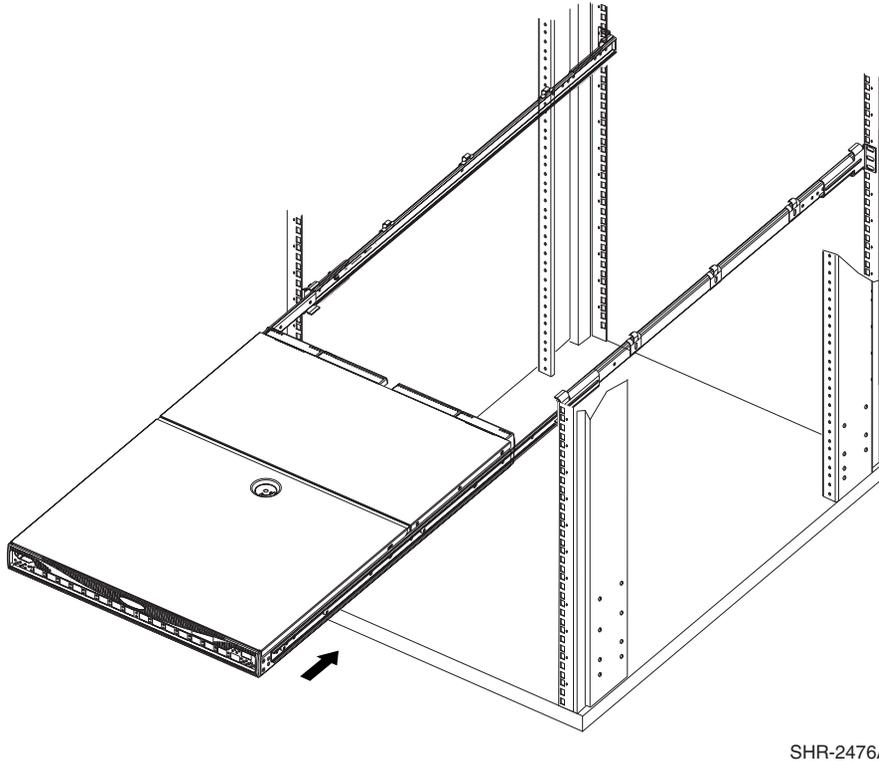
Figure 2–5: Sliding the SAN Switch 2/16 in a 9000 Series Rack

4. To verify proper alignment, slide the switch in and out of the rack. If necessary, pull the switch out of the rack, and realign the slide rails.

Securing the Rack Mount Brackets

Secure the Rack Mount Brackets (installed earlier, see "Attaching the Rear or Front Mount Brackets") to the 9000 Series rack rails, as follows.

1. Locate two Phillips head 10-32 x 3/8" screws in the Rack Mount Kit accessory pouch.

2. Secure each Rack Mount Bracket to the rack rails.

3. Tighten the screws, and torque to 25-inch-pounds.

Connecting AC Power

Use these steps to power on the SAN Switch 2/16.

⚠ **CAUTION:** Do not plug the power cords into the power source until the switch is completely installed in the rack.

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1. Connect the SAN Switch 2/16 power cords to the power connectors on the switch, see Figure 2–6.

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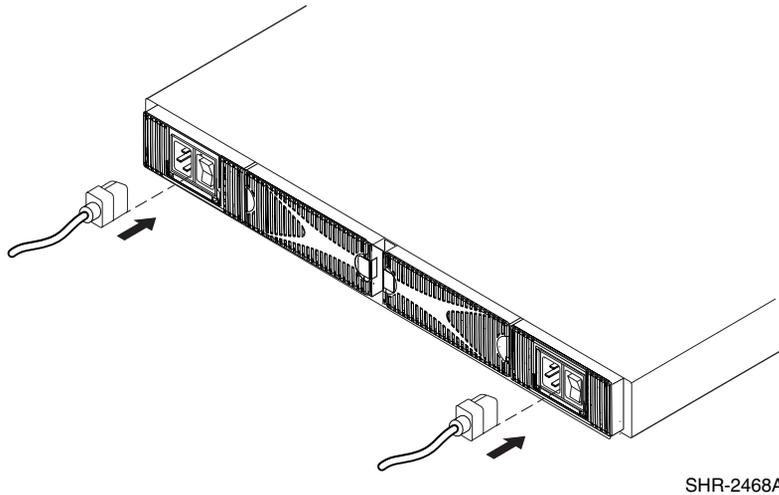
Figure 2–6: Connecting the power cords

2. Locate the six power cord clips, three on each side of the Outer Slide Rails, see Figure 2–6, Item 5.

NOTE: Verify that the power cord clips attach to the outer surface of the Outer Slide Rails, so that they do not impede the sliding motion of the rails. However, the tabs on the clips can be on either side of the rail, provided all the tabs are on the same side.

3. Route the the power cord through the power cord clips.

4. Attach the other end of the power cord to a power outlet.

5. Turn on the Power Switch (the 1 position indicates power on, the O position indicates power off.) The switch automatically runs POST.

> △ **CAUTION:** Do not connect the switch to the network until the IP address is correctly set. For instructions on setting the IP address, see "Configuring SAN Switch 2/16 Network Addressing," later in this chapter.

Power-On Self Test

Each time the switch is powered on, rebooted or reset, the switch automatically runs a Power-On Self Test (POST). During POST the port status LEDs flash, verifying that the switch is operating properly. POST completes in approximately six minutes, with total boot time approximately seven minutes.

POST runs through the following test cycles:

- Preliminary POST diagnostics
- Initialization of operating system
- Initialization of hardware
- Diagnostic tests are run on a number of functions, including circuitry, port functionality, memory, parity, statistics counters, and serialization.

For example, if the switch prompt does not display when POST completes, POST was unsuccessful. Contact your authorized Compaq switch supplier for more information.

To determine whether POST completed without errors, verify that all LEDs return to a normal state after POST is complete. If one or more LEDs do not return to a normal state, (and this is not due to the switch being set to beacon), see "Interpreting LED Activity," in Chapter 3.

NOTE: For more information about beaconing, refer to the *StorageWorks by Compaq Fabric OS Procedures Guide*.

Checking POST Results

Check the success/fail results of the diagnostic tests run during POST via LED activity, the error log, or Command Line Interface (CLI) using the **errShow** command. For more information about error messages, refer to the *StorageWorks by Compaq Fabric OS Reference Guide*., Part Number AA-RQ6FA-TE.

Configuring SAN Switch 2/16 Network Addressing

Read the following sections for information on how to configure the SAN Switch 2/16 addressing scheme.

Requirements

The following items are required to set network addressing.

- An IP address from your Network Administrator
- SAN Switch 2/16 installed and connected to a power source
- Serial cable (supplied with the switch) for connecting the switch to the workstation
- A local workstation (desktop or notebook computer) with:
  — Microsoft Windows 98, Windows 2000, Windows Millennium Edition, or Windows NT 4.0 operating system.
  — RS-232 serial communication software (for example, ProComm Plus or HyperTerminal)
- Ethernet cable for connecting the switch to the workstation or to a network containing the workstation
- SFPs and cables, as required to connect the switch to the fabric

Setting Network Addresses via a Serial Connection

Use the following steps to verify or change the SAN Switch 2/16 IP address, subnet mask, or gateway address.

IMPORTANT: During first time setup, you must replace the factory IP, Subnetmask and Gateway addresses with addresses provided by your Network Administrator.

1. Remove the shipping plug from the SAN Switch 2/16 serial port.

2. Connect the serial cable to the SAN Switch 2/16 serial port, see Figure 2–7.

SHR-2470A
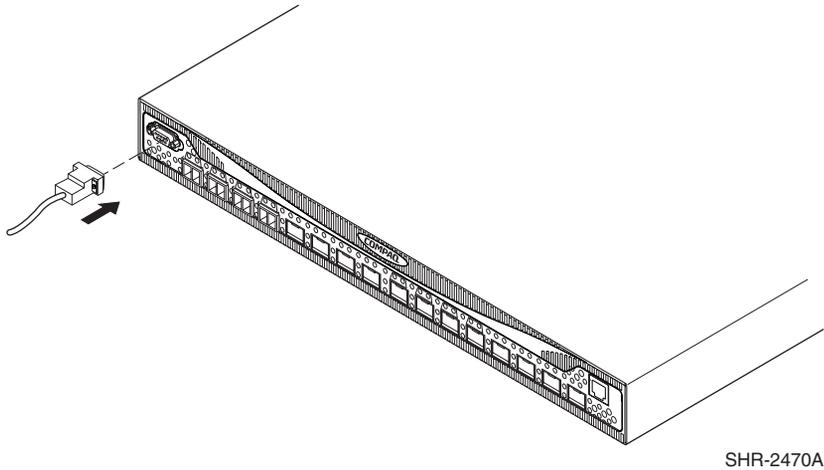
Figure 2–7: Connecting the Serial cable

3. Connect the other end of the serial cable to an RS-232 serial port on the workstation. If no RS-232 serial port is available on the workstation, the adapter on the end of the serial cable can be removed to use the RJ-45 connector to create a serial connection.

4. Verify that the switch power is on and POST is completed. See the "Power-on Self Test" section, earlier in this chapter.

5. Power on the workstation and establish a connection to the switch using a terminal emulator application (such as Hyperterminal).

NOTE: These steps show instructions specific to Hyperterminal. If using a different application, consult the specific application's documentation.

6. Using Hyperterminal (or similar application) configure the Port Settings as follows:

   • Bits per second: 9600

   • Databits: 8

   • Parity: None

   • Stop bits: 1

   • Flow control: None

To configure Port Settings in a UNIX environment, type the following command,

tip /dev/ttyb -9600

7. Log onto the switch (with administrative privileges). The default administrative logon is admin and the default password is password.

a. Enter the following at the prompt:

ipAddrSet

b. Enter the following information at the corresponding prompts, listed below:

— Ethernet IP Address [10.77.77.77]:
Enter the new ethernet IP address.

— Ethernet Subnetmask [0.0.0.0]:
Enter the new ethernet subnetmask.

— Fibre Channel IP Address [none]:
Enter the new fibre channel IP address if desired.

— Fibre Channel Subnetmask [none]:
Enter the new fibre channel subnet mask if desired.

— Gateway Address [172.17.1.1]:
Enter the new gateway address.

— Set IP address now? [y = set now, n = next reboot]:
Enter "y" to set now.

c. To verify that the IP address was entered correctly, type

ipAddrShow

d. Once the IP address is verified as correct, remove the serial cable, and replace the shipping plug in the serial port.

> **CAUTION:** The serial port is intended only for use during the initial setting of the IP address and for service purposes. Using the serial port during normal switch operation or for regular maintenance is not recommended.

8. Record the IP address on the label affixed to the SAN Switch 2/16.

Connecting the SAN Switch 2/16 to the LAN

Use the following steps to connect the SAN Switch 2/16 to the Ethernet Local Area Network (LAN) segment.

1. Remove the shipping plug from the SAN Switch 2/16 Ethernet port.

2. Connect one end of an Ethernet cable to SAN switch 2/16 Ethernet port.

SHR-2469A
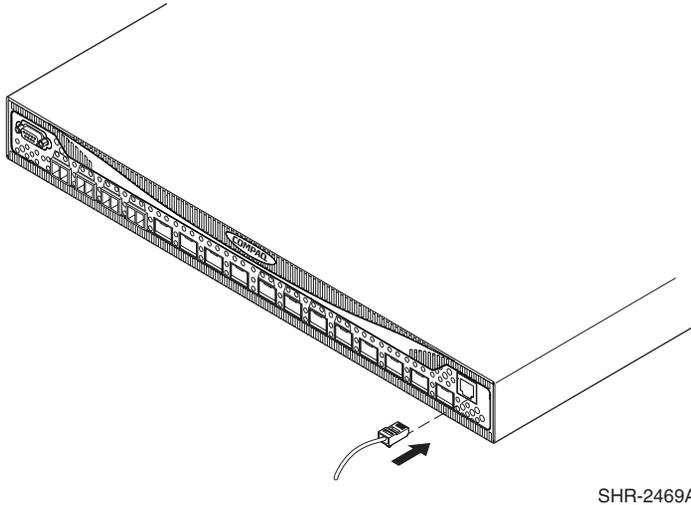
Figure 2–8: Connecting the Ethernet Cable

3. Connect the other end of the Ethernet cable to the workstation or to an Ethernet network containing the workstation.

NOTE: You can now access the switch remotely (and from multiple connections), using telnet or the *StoragWorks* by Compaq Web Tools application. Verify that the switch is not accessed from any other connections during the remaining steps.

4. Log on to the switch with administrative privileges by telnet. The default administrative logon is admin and the default password is password.

Modifying Domain IDs

Modify the domain IDs if desired, as follows.

NOTE: The default domain ID is 1. If the default domain ID is already in use when the switch is connected to the fabric, the domain ID for the new switch is automatically reset to a unique value. The domain IDs that are currently in use can be determined using the telnet command `fabricShow`.

1. Disable the switch by entering the following:

   `switchDisable`

2. Enter the following:

   `configure`

3. Enter "y" after the "`Fabric parameters`" prompt.

   `Fabric parameters (y, n)`

4. Enter a unique domain ID (such as the domain ID used by the previous switch, if still available).

   `Domain: (1..239) [1] 3`

5. Complete the remaining prompts (or press CTRL+D to accept the remaining settings without completing all the prompts).

6. Re-enable the switch by entering the following:

   `switchEnable`

Specifying Custom Status Policies

If desired, specify any custom status policies for the fabric as follows *(optional step)*.

1. Enter the following at the prompt.

   `switchStatusPolicySet`

2. Specify the desired status policies. To completely deactivate the alarm for a particular condition, enter "0" at the prompt for that condition.

Connecting SFPs

Use these steps to connect the SFPs and cables to SAN Switch 2/16 ports as required.

NOTE: The ports and cables used in trunking groups must meet specific requirements. For a list of these requirements, refer to the *StorageWorks by Compaq ISL Trunking User's Guide.*

1. Remove the shipping plug from the appropriate ports.

2. Position the SFP so that the key (the tab near the cable-end of the SFP) is on top.

3. Insert the SFP into the port until it is firmly seated and the latching mechanism clicks see Figure 2–9.

SHR-2467A
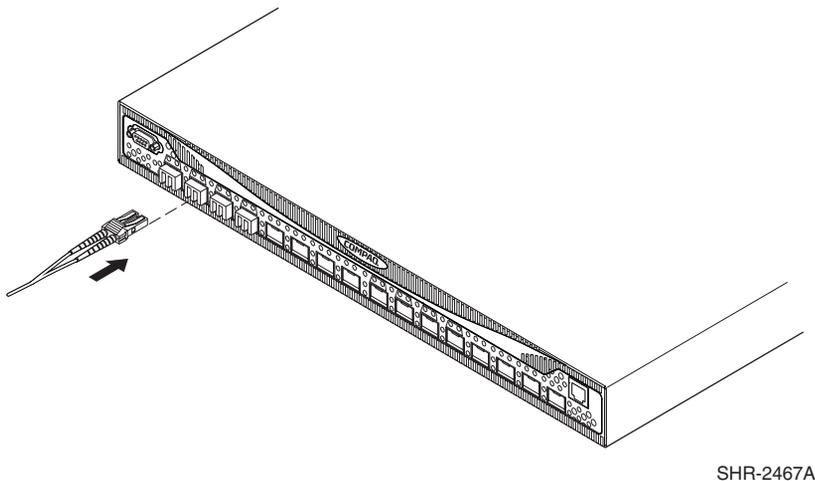
Figure 2–9: Installing an SFP

NOTE: The SFP is keyed so that it can only be inserted with the correct orientation into the port. If the SFP does not slide in easily, check the orientation.

4. Connect the cables to the SFPs as appropriate to the fabric topology, by positioning each cable so that the key (the ridge on one side of the cable connector) is aligned with the slot in the SFP.

5. Next, insert the cable into the SFP until it is firmly seated and the latching mechanism clicks.

NOTE: The cable is keyed so that it can only be inserted correctly into the SFP. If the cable does not slide in easily, check the orientation.

Verifying Operation

After making the appropriate connections, as outlined in this chapter, use these steps to verify that the switch is running properly.

1. Access your browser.

2. At the URL address window, type **http://your switch IP address**.

3. If connected properly, the name of your switch appears (in green) at the prompt, indicating Healthy/OK.

IMPORTANT: Backing up the configuration is strongly recommended. This ensures that a complete configuration is available if required for a replacement switch. For instructions on how to back up the configuration, refer to Chapter 5, "Backing Up Configuration Data and Upgrading Firmware."

Installing Multiple Switches into an Existing SAN

Use these steps to set up more than one SAN Switch 2/16 in an existing SAN.

1. Connect the appropriate components as outlined in the installation section of this chapter.

2. Connect the serial cable, provided in the package contents, between a host computer and the serial port of the switch. See the "Setting Network Addresses via a Serial Connection," earlier in this chapter, to make a serial connection through a workstation and to set the IP address.

3. Set the switch Domain Address using the configure command to the next unused domain in the SAN. The default domain setting is 1.

4. Connect the power cord to the AC connector on the switch. The switch performs POST.

   If a malfunction occurs during POST, error messages are written to the switch error log and can be viewed by a telnet or terminal session when the POST session completes.

   If the malfunction prohibits the switch from completing the boot process (fatal error), the switch stops the boot process. If the switch does not fully boot, the switch prompt will not be displayed when the serial port is connected.

NOTE: If a switch boot failure occurs, the switch must be taken offline for repair or replacement. Contact your Compaq Technical Support for assistance.

5. Power off the new switch and connect one Fibre Channel cable from the SAN to the new switch.

Cascading Switches

The Domain ID number uniquely identifies a switch in a fabric. Normally, the switch automatically assigns the Domain ID when a switch is first powered on or when the switch disable/enable command is executed. When two switches are cascaded together, there might be an initial Domain ID conflict if the switches had been assigned the same Domain ID prior to being cascaded. This can be avoided by changing the Domain ID with the configure command. The Domain address may change when disabling and enabling one of the switches, or rebooting one of the switches if the Domain is not set using the configure command. Refer to the *StorageWorks by Compaq Fibre Channel SAN Switch Management Guide* for more information.

Switch parameters for all switches in a SAN must be the same, or the switch may not join the SAN.

3

Managing the Fibre Channel SAN Switch 2/16

This chapter covers the following topics:

- Interpreting LED Activity
- Management Overview
- Optional Management Features
- Running Basic Switch Operations Using Telnet
- Diagnostic Tests

Interpreting LED Activity

SAN Switch 2/16 activity and status can be determined through the activity of the LEDs on the switch. The LEDs will flash green, yellow, or orange while the switch is booting and while POST or other diagnostic tests are running. This is normal, and does not indicate a problem.

NOTE: Any errors related to LED activity are listed in the error log. For information about the error log, refer to the *StorageWorks by Compaq Fabric OS Procedures Guide*, Part Number AA-RQ6EA-TE.

Front Panel LEDs

The SAN Switch 2/16 front panel includes the following LEDs:

- One Switch Power LED on the front panel.

- One Port Status LED above and to the left of each of the sixteen ports

- One Port Speed LED above and to the left of each of the sixteen port

Table 3–1 describes front panel LEDs, and their functionality.

Table 3–1: Front Panel LED Patterns During Normal Operation

Location of LED	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
Above Each Port, on Left	Indicates port status	No light	No light or signal carrier (media or cable) is detected.	Check media and cable.
		Steady green	Port is online (connected to an external device) but has no traffic.	No action required.
		Slow-flashing green (on 1 second; off 1 second)	The port is online but segmented, indicating a loopback cable or incompatible switch.	Verify correct device is connected to port.
		Fast-flashing green (on 1/4 second; off 1/4 second)	The port is in internal loopback (diagnostic).	No action required.
		Flickering green	Port is online, with traffic flowing through port.	No action required.
		Flashing or steady yellow	POST is running.	No action required.
		Steady orange	Port is receiving light or signal carrier, but is not yet online.	No action required.

Table 3–1: Front Panel LED Patterns During Normal Operation (Continued)

Location of LED	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
		Slow-flashing orange (on 1 second; off 1 second)	The port is disabled (result of diagnostics or portDisable command).	Reset the port from a management station.
		Fast-flashing orange (on 1/4 second; off 1/4 second)	The port is faulty.	Reset the switch from a management station.
		Alternating green and yellow	Port is bypassed.	Reset the port from a management station.
Above Each Port, on Right	Indicates port speed	No light	The port is transmitting/receiving at 1 Gbps.	No action required.

Table 3–1: Front Panel LED Patterns During Normal Operation (Continued)

Location of LED	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
		Steady green	The port is transmitting/receiving at 2 Gbps.	No action required.
Below Serial Port	Indicates switch power	No light	Either the switch is off, or boot is not complete, or boot has failed.	Verify that the switch is on and boot has had time to complete. If there is still no light, contact the switch supplier.
		Steady green	Switch is on and boot has successfully completed.	No action required.
		Slow-flashing green	Diagnostic failure on one or more ports.	Errors may be listed in the error log. Refer to the *StorageWorks by Compaq Fabric OS Procedures Guide* for more information.

Rear Panel LEDs

The SAN Switch 2/16 rear panel includes the following LEDs:

- One power supply LED for each power supply
- One Port Readiness LED

Table 3–2 describes the LEDs on the rear panel of the switch.

Table 3–2: Rear Panel LED Patterns During Normal Operation

Location of LED	Purpose of LED	Color of LED	Status of Hardware	Recommended Action
On each power supply	Indicates status of related power supply	No light	Power supply is not providing power.	Verify power supply is on and power cable is connected to a valid power source.
		Steady green	Power supply is providing power.	No action required.
Center of Back Panel	Indicates port status	No light	Either the switch is off, or boot is not complete, or boot has failed.	Verify that the switch is on and boot has had time to complete. If there is still no light, contact the switch supplier.
		Steady green	Switch is on and boot has successfully completed.	No action required.
		Steady yellow	Diagnostic command is in progress, or one or more ports are faulty.	If no diagnostic tests are running, check the Port Status LEDs for fault indicators.
		Slow-flashing yellow	Diagnostic failure on one or more ports.	Errors may be listed in the error log. Refer to the *Brocade Fabric OS Procedures Guide* for more information.

Management Overview

The SAN Switch 2/16 can be managed using TCP/IP protocol, in-band over fibre channel, or out-of-band by connecting to the ethernet port. The management functions allow the administrator to monitor fabric topology, port status, physical status, and other information to aid in system debugging and performance analysis.

The SAN Switch 2/16 is compatible with the following management interfaces:

- Command Line Interface (CLI) via a telnet connection — For more information refer to the *Fabric OS Procedures Guide* Part Number AA-RQ6EA-TE and the *Fabric OS Reference Guide*, Part Number AA-RQ6FA-TE

- Standard SNMP applications — For more information refer to the *MIB Reference Guide*, Part Number AA-RQ6HA-TE

- Web Tools — Provides an easy-to-use Graphical User Interface (GUI), allowing the SAN administrator to monitor and manage entire fabrics and individual switches and ports from a standard workstation. Provides you with the advantage of being "virtually" in front of any fabric, switch, or port. For more information refer to the *StorageWorks by Compaq Web Tools User Guide*, Part Number AA-RRTYA-TE.

Optional Management Features

In addition, Compaq provides the following optional management tools in support of the SAN switch.

QuickLoop

The optional QuickLoop application allows arbitrated loops to attach to a fabric. Without modifying their drivers, private target on the arbitrated loops can be accessed by public or private hosts elsewhere on the fabric. Advantages to integrating QuickLoop into your SAN include,

- Supports communication between devices that are not fabric-aware. For example, QuickLoop allows the SAN Switch 2/16 to emulate a hub environment, while offering the additional benefit of fabric connectivity.

- The QuickLoop and Zoning combination allows a private host to fully participate in a SAN.

NOTE: A license may have been installed on the switch at the factory. If not, contact your switch supplier to obtain a license key.

For more information refer to the *StorageWorks by Compaq QuickLoop User's Guide*, PN AA-RR7LA-TE.

Fabric Watch

The optional Fabric Watch software allows you to monitor the performance and status of *StorageWorks* Fibre Channel SAN Switches by Compaq. Advantages to integrating Fabric Watch into your SAN include,

- Real-time alerts to potential problems within the SAN

- Monitoring of fabric events (like reconfiguration and zone changes), physical switch conditions, and individual port status

NOTE: A license may have been installed on the switch at the factory. If not, contact your switch supplier to obtain a license key.

For more information refer to the *StorageWorks by Compaq Fabric Watch Version 3.0 User's Guide*, PN AA-RR7YA-TE.

Advanced Performance Monitoring

The optional Advanced Performance Monitoring (APM) software provides SAN performance management through an end-to-end monitoring system. Advantages to integrating APM into your SAN include,

- Adds increased end-to-end fabric visibility

- Provides more accurate reporting for service level agreements and charged access applications

NOTE: A license may have been installed on the switch at the factory. If not, contact your switch supplier to obtain a license key.

For more information refer to the *StorageWorks by Compaq Advanced Performance Monitoring, Version 3.0 User's Guide*, PN AA-RR7UA-TE.

Extended Fabrics

The optional Extended Fabrics software increases the maximum bandwidth between two switches (at extended distances). Advantages to integrating Extended Fabrics into your SAN include,

- Provides the highest possible performance of data transfer between switches.

- Provides maximum buffering between E_Ports connected over an extended distance

NOTE: A license may have been installed on the switch at the factory. If not, contact your switch supplier to obtain a license key.

For information refer to the *StorageWorks by Compaq Extended Fabric User Guide Version 3.0*, PN AA-RR7QA-TE.

ISL Trunking

The optional ISL Trunking software allows up to four ISLs to merge logically into a single link. Advantages to integrating ISL Trunking into your SAN include,

- Load shares traffic across all ISLs in a trunk.

- Simplifies management by implementing fewer ISLs

NOTE: A license may have been installed on the switch at the factory. If not, contact your switch supplier to obtain a license key.

For information refer to the *StorageWorks by Compaq ISL Trunking User Guide Version 3.0*, PN AA-RR82A-TE.

Displaying the Optional Feature Licenses

Use these steps to display optional features installed on your switch.

1. Login to the switch as the admin user.

2. At the command line enter the following command:

   licenseShow

   This command displays the license keys that have been entered for the switch and the features enabled by those licenses.

Enabling Licensed Features

Licensed features such as QuickLoop and Fabric Watch are already loaded onto the switch firmware, but must be enabled with a license key. Once you have purchased these features you are provided with a key to unlock the feature.

Uses these steps to enable a licensed feature.

1. Login to the switch as the admin user.

2. At the command line enter the following command:

   licenseAdd "aaaBbbCcc"

   (where aaaBbbCcc is the license key for a particular feature.)

NOTE: You must enter a license key for each feature to activate. License keys are case sensitive.

Running Basic Switch Operations Using Telnet

Read the following sections to run common switch operations.

Logging into the SAN Switch 2/16

Use these steps to log into the SAN Switch 2/16.

1. Open a telnet connection to the switch. The login prompt is displayed if the telnet connection successfully found the switch in the network.

NOTE: The switch must be connected to your IP network through the RS-232 port to enable connection through telnet.

2. At the login prompt enter the user ID you are logging in as. For example:

```
login: admin
```

The password prompt is displayed if the user exists.

3. Enter the password for the user:

```
password: xxxxxx
```

The default password is `password`.

4. If the login was successful a prompt is displayed showing the switch name and user ID you are logged in as. For example:

```
switch55>admin:
```

Changing the Admin Password and User ID

Use these steps to change the Admin user ID and password.

NOTE: For security reasons, the first time you log into the Fabric OS you are requested to change the admin user ID and system password.

1. Login to the switch as the admin user.

2. At the command line enter the following command:

Password "admin"

An interactive session is opened and you are prompted for configuration values.

3. At the New username prompt, enter a new name for the admin user. You can change the name of the admin user without changing the password. Press **Enter** to leave the name as is.

4. At the Old Password prompt, enter the old password.

5. At the New password prompt, enter the new password. The new password must be from 8 to 40 characters in length.

6. At the new password prompt, enter the new password exactly as entered to the previous prompt.

7. Press the **Enter** to commit the configuration to the firmware.

Configuring the IP and Fibre Channel Address

The SAN Switch 2/16 is shipped with a default IP address of `10.77.77.77`. Use these steps to change the default IP Address and configure the Fibre Channel IP address of the switch.

1. Login to the switch as the admin user.

2. At the command line enter the following command:

   ipAddrSet

   An interactive session is opened and you are prompted for configuration values. Press the **Enter** to skip over a prompt and leave the parameter value as is.

3. At the Ethernet IP Address prompt, enter the new IP address for the ethernet port on the switch. Press the **Enter** to continue.

4. At the Ethernet Subnetmask prompt, enter the address of the subnetmask, if applicable. Press **Enter** to continue.

5. At the Fibre Channel IP address prompt, enter the Fibre Channel IP address for the switch. Press **Enter** to continue.

6. At the Fibre Channel Subnetmask prompt, enter the address of the subnetmask, if applicable. Press **Enter** to continue.

7. At the Gateway Address prompt, enter the IP address of the gateway system if applicable. Press **Enter** to continue.

   The configuration is then committed to the switch firmware.

8. You are then prompted whether to make the IP address changes active now or at the next reboot. Enter **y** at the prompt to have the IP address changes take effect immediately.

Displaying Devices within the Fabric

To verify that you have fabric wide connectivity when you install a new switch, display the fabric wide device count from the newly installed switch. Use these steps to display the fabric.

1. Login to the switch as the admin user.

2. At the command line enter the following command:

    nsAllShow

    This command displays all the connected devices in the fabric.

Checking the Firmware Version

Use these steps to display the SAN Switch 2/16 firmware version.

1. Login to the switch as the admin user.

2. At the command line enter the following command:

    version

    This command displays the Kernel version, and Fabric OS release number.

Setting the Switch Date and Time

All switches maintain current date and time in non-volatile memory. Date and time are used for logging events. Switch operation does not depend on the date and time; a switch with an incorrect date and time value still functions properly.

Uses these steps to set the date and time of a switch.

1. Login to the switch as the admin user.

2. At the command line enter the following command:

    date "MMDDhhmmYY"

    where:

    — MM is the month, valid values are 01-12.

    — DD is the date, valid values are 01-31.

    — hh is the hour, valid values are 00-23.

    — mm is minutes, valid values are 00-59.

    — YY is the year, valid values are 00-99.

NOTE: Year values greater than 69 are interpreted as 1970-1999, year values less than 70 are interpreted as 2000-2069. The date function does not support daylight saving time or time zones.

Displaying Switch Configuration Settings

Use these steps to display the system configuration settings.

1. Login to the switch as the admin user.

2. At the command line enter the following command:

   configShow

   The system configuration settings are displayed.

SAN Switch 2/16 Diagnostic Tests

Read the following sections for information on using POST and diagnostic tests.

Interpreting POST Results

Each time the switch is powered on or reset, the switch automatically performs POST, a one minute system check during which the port status LEDs flash different colors.

To determine whether POST completed without errors, verify that all LEDs return to a normal state after POST is complete. If one or more LEDs do not return to a normal state, and this is not due to the switch being set to beacon, refer to the *StorageWorks by Compaq Fabric OS Procedures User Guide Version 3.0*, Part Number AA-RQ6EA-TE.

NOTE: If the switch prompt does not display when POST completes, POST was not successfully completed and the switch should be returned to your switch supplier for repair.

Any errors detected during POST are written to the system log, accessible through the errShow command. For more information about error messages, refer to the *StorageWorks by Compaq Fabric OS Procedures User Guide Version 3.0*, Part Number AA-RQ6EA-TE.

Diagnostic Tests

Diagnostic tests are provided to help troubleshoot the hardware and the firmware. The diagnostic tests provided on the switch include tests of internal connections and circuitry, fixed media, and any SFP modules and fiber optic cables in use. The tests are implemented by command, either through a telnet session or through a terminal set up

for a serial connection to the switch. Some tests require the ports to be connected by external cables, to allow diagnostics to verify the serializer/deserializer interface, as well as the attached SFP and cable.

All diagnostic tests are run at link speeds of both 1 Gbps and 2 Gbps. For information about the specific diagnostic tests and how to run them, refer to the *StorageWorks by Compaq Fabric OS Procedures User Guide Version 3.0*, Part Number AA-RQ6EA-TE.

NOTE: The transmit and receive speed of the links may be temporarily locked to a specific speed during diagnostic testing.

4

Backing Up Configuration Data and Upgrading Firmware

This chapter provides the following information

- Backing Up System Configuration Settings
- Restoring Configuration Settings
- Upgrading or Restoring the Switch Firmware

Backing Up System Configuration Settings

The two supplied utilities RSHD.EXE and CAT.EXE, currently support Windows downloads only. Windows uploads are not supported by RSHD.EXE and CAT.EXE. Therefore, it is necessary to use FTP to backup switch configurations.

Use these steps to upload a backup copy of the configuration settings to a host computer.

1. Verify that the RSHD service (on a UNIX machine) or the FTP service (on a Windows or UNIX machine) is running on the host workstation.

2. Login to the switch as the admin user.

3. At the command line enter the following command:

   **configUpload "hostIPaddr", "user",
   "path_filename","password"**

   For example, host IPaddr is the IP address of the host computer, user is the User ID used to log into this computer, path_filename is the path location and filename of the configuration file, and password is the password for the user ID specified.

Restoring the System Configuration Settings

Use these steps to restore the system configuration settings from a backup.

1. Verify that the RSHD service (on a UNIX machine) or the FTP service (on a Windows or UNIX machine) is running on the host workstation.

2. Login to the switch as the admin user.

3. Shut down the switch by entering the following command:

   switchDisable

4. At the command line enter the following command:

   **configDownload "hostIPaddr", "user",
   "path_filename","password"**

   For example, host IPaddr is the IP address of the host computer, user is the User ID used to log into this computer, path_filename is the path location and filename of the system configuration file, and password is the password for the user ID specified.

   NOTE: The password operand is only required if you are using FTP.

5. Reboot the switch by entering the following command:

   fastBoot

Upgrading or Restoring the Switch Firmware

The SAN Switch 2/16 ships 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 Telnet command
- The Switch Management Application page in Web Management Tools

Use these steps to upgrade or restore the switch firmware.

1. Verify that the RSHD service (on a UNIX machine) or the FTP service (on a Windows or Unix machine) is running on the host workstation.

2. Login to the switch as the admin user.

3. At the command line enter the following command:

   ```
   firmwareDownload "hostIPaddr", "user", "path_filename",
   "password"
   ```

   For example, where host IPaddr is the IP address of the host computer, user is the User ID used to log into this computer, path_filename is the path location and filename of the new firmware file, and password is the password for the user ID specified.

   NOTE: The password operand is only required if you are using FTP.

4. Reboot the switch by entering the following command:

   ```
   fastBoot
   ```

Downloading Firmware from the Compaq Website

To download the firmware from the Compaq website, go to www.compaq.com/products/storageworks. The website contains the required loaders and instructions for downloading the firmware to a switch.

A

Regulatory Compliance Notices

Regulatory Compliance Identification Numbers

For the purpose of regulatory compliance certifications and identification, your Compaq StorageWorks SAN Switch 2/16 is assigned a Compaq series number. The Compaq series number for this product is: Series NA2107. The 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 Compaq StorageWorks SAN Switch 2/16.

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 the 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). (For continuous quality improvement, calls may be recorded or monitored.)

For questions regarding this FCC declaration, contact:

Compaq Computer Corporation
P. O. Box 661
Marlboro, MA 01752

Or call 1-800-OK COMPAQ

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 (CISPR 22)—Electromagnetic Interference

■ EN50082-1 (IEC801-2, IEC801-3, IEC801-4)—Electromagnetic Immunity

■ EN60950 (IEC950)—Product Safety

■ 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

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 U.S. 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.


```
CLASS 1 LASER PRODUCT
```

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 ± 35 nm
Divergence Angle	53.5 degrees ± 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 ± 0.04 inches

Battery Replacement Notice

Your switch is equipped with 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 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 the general household waste. In order to forward them to recycling or proper disposal, please use the public collection system or return them to Compaq, your authorized Compaq partners, or their agents.

B

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 they arrive at static-free workstations.

- Place parts on a grounded surface before removing them 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 ± 10 percent resistance in the ground cords. To provide proper ground, 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 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 a Compaq authorized reseller install the part.

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

C

Technical Specifications

This appendix covers the following topics:

- Dimensions
- Power supply specifications
- Environmental specifications
- Memory specifications
- Serial port specifications

Dimensions

Table C–1 lists SAN Switch 2/16 dimensions.

Table C–1: Physical Specifications

Dimension	Value
Height	1.72 +/- 0.01 inches (4.37 +/- 0.03 cm)
Depth	24.5 +/- 0.03 inches (62.2 +/- 0.1cm)
Width	17 inches (43.2 cm)
Weight (with both power supplies installed)	28.0 lbs (12.7 kg)

Power Supply Specifications

Table C–2 lists power supply specifications. The power supply is universal and capable of functioning worldwide without using voltage jumpers or switches. It meets IEC 61000-4-5 surge voltage requirements The power supply has its own built-in fan for cooling, pushing the air towards the front of the switch.

Table C–2: Power Supply Specifications

Specification	Value
Outlet	Correctly wired and earth-grounded
Total power available from each power supply	126 Watts, with fans operating
Max. switch power	90 - 102 Watts (depending on SFP media vendor)
Input voltage	100 - 240 VAC
Input line frequency	47 - 63 Hz
Harmonic distortion	Active power factor correction per IEC1000-3-2

Table C–2: Power Supply Specifications (Continued)

Specification	Value
BTU rating	170 Watts x 3.412 BTU/Hr/Watts = 580 BTU/hr
Inrush current	10 Amps Peak, > 300 usec - hot/cold start
Input line protection	Fused in both hot & neutral lines
Maximum dimensions	3.5" wide, 1.5" high, 13.5" long

Environmental Requirements

Table C–3 lists the environmental ranges that are acceptable when the SAN switch 2/16 is operating, and the acceptable ranges when the switch is not operating.

Table C–3: Environmental Requirements

Condition	Acceptable Range
Temperature (operating)	10°C to 40 °C
Temperature (non-operating)	-35°C to 65 °C
Humidity (operating)	20% to 85% RH non condensing, at 40°C
Humidity (non-operating)	0% to 90% RH non-conducting, at 40°C
Altitude (operating)	0 to 3 kilometers above sea level
Altitude (non-operating)	0 to 12 kilometers above sea level
Shock (operating)	4G, 11MS duration, half sine
Shock (non-operating)	20G, 11MS duration, sq.wave
Vibration (operating)	5G, 0-3 kHz at 1.0 octave/minute
Vibration (non-operating)	10G, 0-5kHz at 1.0 octave/minute

Memory Specifications

The SAN Switch 2/16 utilizes the following memory.

- Main Memory (SDRAM): 32 MB per switch

- Flash Memory: Dual 8 MB

- Boot Flash: 512K bytes of 8-bit for system boot

The centralized memory maximizes the overall switch throughput by guaranteeing full transmit and receive bandwidth to all fibre channel ports at all times.

NOTE: For dust and ESD (electrostatic discharge) protection, a cover is provided for the serial port and should be kept on the port whenever the serial port is not in use.

The serial port can be used to connect to a computer workstation to configure the switch IP address without connecting to the fabric. The serial port's parameters are 9600 baud, 8 data bits, no parity, 1 stop bit, and no flow control.

The port requires a straight serial cable with a female 9-pin subminiature-D connector. Only pins 2, 3, and 5 are supported; if pin 7 is used, the signal must always be driven high, using the pinouts listed in Table C–4.

Table C–4: Cabling Pinouts if Pin 7 is Used

PIN	Signal	Description
1		
2	TxData	Transmit Data
3	RxData	Receive Data
4		
5	GND	Logic Ground
6		
7	CTS	Clear to Send
8		
9		

Glossary

This glossary defines terms used in this guide or related to this product and is not a comprehensive glossary of computer terms.

AL_PA
Arbitrated Loop Physical Address; a unique 8-bit value assigned during loop initialization to a port in an arbitrated loop.

Alias Address Identifier
An address identifier recognized by a port in addition to its standard identifier. An alias address identifier may be shared by multiple ports.

Alias AL_PA
An AL_PA value recognized by an L_Port in addition to the AL_PA assigned to the port.

Alias Server
A fabric software facility that supports multicast group management.

API
Application Programming Interface; defined protocol that allows applications to interface with a set of services.

Arbitrated Loop
A shared 100 MBps or 200 MBps Fibre Channel transport structured as a loop. Can support up to 126 devices and one fabric attachment. See also *Topology*.

ASIC
Application Specific Integrated Circuit.

ATM
Asynchronous Transfer Mode; a transport used for transmitting data over LANs or WANs that transmit fixed-length units of data. Provides any-to-any connectivity, and allows nodes to transmit simultaneously.

AW_TOV

Arbitration Wait Time-out Value; the minimum time an arbitrating L_Port waits for a response before beginning loop initialization.

Bandwidth

The total transmission capacity of a cable, link, or system. Usually measured in bps (bits per second). May also refer to the range of transmission frequencies available to a network. See also *Throughput*.

BB_Credit

Buffer-to-buffer credit; the number of frames that can be transmitted to a directly connected recipient or within an arbitrated loop. Determined by the number of receive buffers available.

BER

Bit Error Rate; the rate at which bits are expected to be received in error. Expressed as the ratio of error bits to total bits transmitted. See also *Error*.

Block

As applies to Fibre Channel, upper-level application data that is transferred in a single sequence.

Bridge

Hardware that connects incompatible networks by providing translation for both hardware and software. For example, an ATM gateway can connect a Fibre Channel link to an ATM connection.

Broadcast

The transmission of data from a single source to all devices in the fabric, regardless of zoning.

Buffer-to-buffer Flow Control

Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop. See also *BB_Credit*.

Cascade

Two or more interconnected Fibre Channel switches. The recommended number of interswitch links is seven. See also *Fabric*, *ISL*.

Chassis

The metal frame in which the switch and switch components are mounted.

Circuit
An established communication path between two ports. Consists of two virtual circuits capable of transmitting in opposite directions. See also *Link*.

Command Line
Interface that depends entirely on the use of commands, such as through telnet or SNMP, and does not involve a GUI.

Community (SNMP)
A relationship between a group of SNMP managers and an SNMP agent, in which authentication, access control, and proxy characteristics are defined. See also *SNMP*.

Connection Initiator
A port that has originated a Class 1 dedicated connection and received a response from the recipient.

Connection Recipient
A port that has received a Class 1 dedicated connection request and transmitted a response to the originator.

CRC
Cyclic Redundancy Check; a check for transmission errors included in every data frame.

Credit
As applies to Fibre Channel, the number of receive buffers available for transmission of frames between ports. See also *BB_Credit*, *EE_Credit*.

Disparity
The relationship of ones and zeros in an encoded character. "Neutral disparity" means an equal number of each, "positive disparity" means a majority of ones, and "negative disparity" means a majority of zeros.

DLS
Dynamic Load Sharing; dynamic distribution of traffic over available paths. Allows for recomputing of routes when an Fx_Port or E_Port changes status.

Domain ID
As applies to SAN switches, a unique number between 1 and 239 that identifies the switch to the fabric and is used in routing frames. Usually automatically assigned by the switch, but can be manually assigned.

E_D_TOV

Error Detect Time-out Value; the minimum amount of time a target waits for a sequence to complete before initiating recovery. Can also be defined as the maximum time allowed for a round-trip transmission before an error condition is declared.

E_Port

Expansion Port; a type of switch port that can be connected to an E_Port on another switch to create an ISL. See also *ISL*.

EE_Credit

End-to-end Credit; the number of receive buffers allocated by a recipient port to an originating port. Used by Class 1 and 2 services to manage the exchange of frames across the fabric between source and destination. See also *End-to-end Flow Control*, *BB_Credit*.

EIA Rack

A storage rack that meets the standards set by the Electronics Industry Association.

Enabled Zone Configuration

The currently enabled configuration of zones. Only one configuration can be enabled at a time.

End-to-end Flow Control

Governs flow of class 1 and 2 frames between N_Ports. See also *EE_Credit*.

Error

As applies to Fibre Channel, a missing or corrupted frame, time-out, loss of synchronization, or loss of signal (link errors).

Exchange

The highest level Fibre Channel mechanism used for communication between N_Ports. Composed of one or more related sequences, and can work in either one or both directions.

F_Port

Fabric Port; a port that is able to transmit under fabric protocol and interface over links. Can be used to connect an N_Port to a switch.

Fabric Name

The unique identifier assigned to a fabric and communicated during login and port discovery.

Fabric

A Fibre Channel network containing two or more switches in addition to hosts and devices. May also be referred to as a switched fabric. See also *Topology*, *SAN*, *Cascade*.

FC-AL-3

The Fibre Channel Arbitrated Loop standard defined by ANSI. Defined on top of the FC-PH standards.

FC-FLA

The Fibre Channel Fabric Loop Attach standard defined by ANSI.

FCIA

Fibre Channel Industry Association. An international organization of Fibre Channel industry professionals. Among other things, provides oversight of ANSI and industry developed standards

FCP

Fibre Channel Protocol; mapping of protocols onto the Fibre Channel standard protocols. For example, SCSI FCP maps SCSI-3 onto Fibre Channel.

Fibre Channel Transport

A protocol service that supports communication between Fibre Channel service providers.

FL_Port

Fabric Loop Port; a port that is able to transmit under fabric protocol and also has arbitrated loop capabilities. Can be used to connect an NL_Port to a switch.

FLOGI

Fabric Login; the process by which an N_Port determines whether a fabric is present, and if so, exchanges service parameters with it.

Frame

The Fibre Channel structure used to transmit data between ports. Consists of a start-of-frame delimiter, header, any optional headers, the data payload, a cyclic redundancy check (CRC), and an end-of-frame delimiter. There are two types of frames: Link control frames (transmission acknowledgements, etc.) and data frames.

FS_ACC

Fibre Channel Services Accept. The information unit used to indicate acceptance of a request for a Fibre Channel service.

FSP

Fibre Channel Service Protocol; the common protocol for all fabric services, transparent to the fabric type or topology.

FSPF

Fabric Shortest Path First; the routing protocol for Fibre Channel switches.

Full Fabric

The licensing that allows multiple E_Ports on a switch, making it possible to create multiple ISL links.

Full-duplex

A mode of communication that allows the same port to simultaneously transmit and receive frames.

Fx_Port

A fabric port that can operate as either an F_Port or FL_Port.

G_Port

Generic Port; a port that can operate as either an E_Port or F_Port. A port is defined as a G_Port when it is not yet connected or has not yet assumed a specific function in the fabric.

Gateway

A device such as a switch that connects different subnets together. A switch can be used as a gateway from the Ethernet to the Fibre Channel. Set the gateway address on one switch to the Fibre Channel IP address of another switch to enable the other switch to forward IP traffic to the ethernet port on the second switch.

Gbps

Gigabits per second (1,062,500,000 bits/second).

GBps

GigaBytes per second (1,062,500,000 bytes/second).

HBA

Host Bus Adapter; the interface card between a server or workstation bus and the Fibre Channel network.

Hub

A Fibre Channel wiring concentrator that collapses a loop topology into a physical star topology. Nodes are automatically added to the loop when active and removed when inactive.

Idle

Continuous transmission of an ordered set over a Fibre Channel link when no data is being transmitted, to keep the link active and maintain bit, byte, and word synchronization.

ISL

Interswitch Link; a Fibre Channel link from the E_Port of one switch to the E_Port of another. See also *E_Port*, *Cascade*.

Isolated E_Port

An E_Port that is online but not operational due to overlapping domain IDs or nonidentical parameters (such as E_D_TOVs).

IU

Information Unit; a set of information as defined by either upper-level process protocol definition or upper-level protocol mapping.

L_Port

Loop Port; a node port (NL_Port) or fabric port (FL_Port) that has arbitrated loop capabilities. An L_Port can be in one of two modes:

- *Fabric mode* Connected to a port that is not loop capable, and using fabric protocol.

- *Loop mode* In an arbitrated loop and using loop protocol. An L_Port in loop mode can also be in participating mode or non-participating mode.

Latency

The period of time required to transmit a frame, from the time it is sent until it arrives.

Link Services

A protocol for link-related actions.

Link

As applies to Fibre Channel, a physical connection between two ports, consisting of both transmit and receive fibres.

LIP

Loop Initialization Primitive; the signal used to begin initialization in a loop. Indicates either loop failure or resetting of a node.

Looplet

A set of devices connected in a loop to a port that is a member of another loop.

MIB
Management Information Base; an SNMP structure to help with device management, providing configuration and device information.

Monitoring State
The state in which a port is monitoring the flow of information for data relevant to the port.

Multicast
The transmission of data from a single source to multiple specified N_Ports (as opposed to all the ports on the network).

Multimode
A fiber optic cabling specification that allows up to 500 meters between devices.

N_Port
Node Port; a port on a node that can connect to a Fibre Channel port or to another N_Port in a point-to-point connection.

NAA
Network Address Authority. An identifier that indicates the format of a network address.

Name Server
Frequently used to indicate Simple Name Server.

NL_Port
Node Loop Port; a node port that has arbitrated loop capabilities. Used to connect an equipment port to the fabric in a loop configuration through an FL_Port.

Node Name
The unique identifier for a node, communicated during login and port discovery.

Node
A Fibre Channel device that contains an N_Port or NL_Port.

Open Originator
The L_Port that wins arbitration in an arbitrated loop and sends an OPN ordered set to the destination port, then enters the Open state.

Open Recipient
The L_Port that receives the OPN ordered set from the open originator, and then enters the Open state.

Phantom Address
An AL_PA value that is assigned to an device that is not physically in the loop. Also known as phantom AL_PA.

A twenty-bit public address created for an 8-bit loop device to allow public devices to access it.

Phantom Device
A device that is not physically in an arbitrated loop, but is logically included through the use of a phantom address.

PLOGI
Port Login; the port-to-port login process by which initiators establish sessions with targets.

Point-to-point
A Fibre Channel topology that employs direct links between each pair of communicating entities. See also *Topology*.

Port Cage
The metal casing extending out of the optical port on the switch, and in which the SFP can be inserted.

Port_Name
The unique identifier assigned to a Fibre Channel port. Communicated during login and port discovery.

POST
Power On Self-Test; a series of tests run by a switch after it is turned on.

Private Device
A device that supports arbitrated loop protocol and can interpret 8-bit addresses, but cannot log into the fabric.

Private Loop
An arbitrated loop that does not include a participating FL_Port.

Private NL_Port
An NL_Port that communicates only with other private NL_Ports in the same loop and does not log into the fabric.

Protocol
A defined method and a set of standards for communication.

Public NL_Port

An NL_Port that logs into the fabric, can function within either a public or a private loop, and can communicate with either private or public NL_Ports.

Public Device

A device that can log into the fabric and support 20-bit addresses (or has 20-bit phantom addresses created for it by the switch).

Public Loop

An arbitrated loop that includes a participating FL_Port, and may contain both public and private NL_Ports.

QuickLoop

A feature that makes it possible to allow private devices within loops to communicate with public and private devices across the fabric through the creation of a larger loop.

May also refer to the arbitrated loop created using this software. A QuickLoop can contain a number of devices or looplets; all devices in the same QuickLoop share a single AL_PA space.

R_A_TOV

Resource Allocation Time-out Value; the maximum time a frame can be delayed in the fabric and still be delivered.

Route

As applies to a fabric, the communication path between two switches. May also apply to the specific path taken by an individual frame, from source to destination.

Routing

The assignment of frames to specific switch ports, according to frame destination.

RR_TOV

Resource Recovery Time-out Value; the minimum time a target device in a loop waits after a LIP before logging out a SCSI initiator.

RSCN

Registered State Change Notification; a switch function that allows notification of fabric changes to be sent from the switch to specified nodes.

RX_ID

Responder Exchange Identifier. A 2-byte field in the frame header used by the responder of the Exchange to identify frames as being part of a particular exchange.

SAN

Storage Area Network; a network of systems and storage devices that communicate using Fibre Channel protocols. See also *Fabric*.

Sequence

A group of related frames transmitted in the same direction between two N_Ports.

Service Rate

The rate at which an entity can service requests.

Single Mode

The fiber optic cabling standard that corresponds to distances of up to 10 km between devices.

SNMP

Simple Network Management Protocol. An internet management protocol that uses either IP for network-level functions and UDP for transport-level functions, or TCP/IP for both. Can be made available over other protocols, such as UDP/IP, because it does not rely on the underlying communication protocols.

Switch Name

The arbitrary name assigned to a switch.

Switch Port

A port on a switch. Switch ports can be E_Ports, F_Ports, or FL_Ports.

Switch

Hardware that routes frames according to Fibre Channel protocol and is controlled by software.

Target

A storage device on a Fibre Channel network.

Tenancy

The time from when a port wins arbitration in a loop until the same port returns to the monitoring state. Also referred to as loop tenancy.

Throughput

The rate of data flow achieved within a cable, link, or system. Usually measured in bps (bits per second).

Topology
As applies to Fibre Channel, the configuration of the Fibre Channel network and the resulting communication paths allowed. There are three possible topologies:

- Point to point - A direct link between two communication ports.

- Switched fabric - Multiple N_Ports linked to a switch by F_Ports.

- Arbitrated loop - Multiple NL_Ports connected in a loop.

Transfer State
The state in which a port can establish circuits with multiple ports without reentering the arbitration cycle for each circuit. This state can only be accessed by an L_Port in the Open state.

Translative Mode
A mode in which private devices can communicate with public devices across the fabric.

Transmission Character
A 10-bit character encoded according to the rules of the 8B/10B algorithm.

Transmission Word
A group of four transmission characters.

Trap (SNMP)
The message sent by an SNMP agent to inform the SNMP management station of a critical error.

Tunneling
A technique for enabling two networks to communicate when the source and destination hosts are both on the same type of network, but are connected by a different type of network.

U_Port
Universal Port; a switch port that can operate as a G_Port, E_Port, F_Port, or FL_Port. A port is defined as a U_Port when it is not connected or has not yet assumed a specific function in the fabric.

UDP
User Datagram Protocol; a protocol that runs on top of IP and provides port multiplexing for upper-level protocols.

ULP_TOV
Upper-level Time-out Value; the minimum time that a SCSI ULP process waits for SCSI status before initiating ULP recovery.

ULP
Upper-level Protocol; the protocol that runs on top of Fibre Channel. Typical upper-level protocols are SCSI, IP, HIPPI, and IPI.

Well-known Address
As pertaining to Fibre Channel, a logical address defined by the Fibre Channel standards as assigned to a specific function, and stored on the switch.

Workstation
A computer used to access and manage the fabric. May also be referred to as a management station or host.

WWN
Worldwide Name; an identifier that is unique worldwide. Each entity in a fabric has a separate WWN.

Xmitted Close State
The state in which an L_Port cannot send messages, but can retransmit messages within the loop. A port in the XMITTED CLOSE state cannot attempt to arbitrate.

Zone Configuration
A specified set of zones. Enabling a configuration enables all zones in that configuration.

Zone
A set of devices and hosts attached to the same fabric and configured as being in the same zone. Devices and hosts within the same zone have access permission to others in the zone, but are not visible to any outside the zone.

Zoning
A feature that runs on Fabric OS and allows partitioning of the fabric into logical groupings of devices. Devices in a zone can only access and be accessed by devices in the same zone.

Index