

installation
guide

hp StorageWorks SAN switch 2/16

Product Version: V3.0.x

Second Edition (February 2003)

Part Number: AA-RR84B-TE

This installation guide provides basic procedures for setting up, configuring, and managing the SAN switch 2/16 and 2/16 Power Pak models.



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about this guide

This installation guide provides information to help you set up and configure the HP StorageWorks SAN Switch 2/16.

About this Guide topics include:

- [Overview](#), page 10
- [Conventions](#), page 11
- [Rack Stability](#), page 14
- [Getting Help](#), page 15

Overview

This section covers the following topics:

- [Intended Audience](#)
- [Related Documentation](#)

Intended Audience

This book is intended for use by customers who purchased the SAN Switch 2/16, 2/16 Power Pak; and for authorized service providers who are experienced with the following:

- Configuration aspects of customer Storage Area Network (SAN) fabric
- Customer host environments, such as Windows 2000, Windows NT, and IBM AIX
- Web Tools Graphical User Interface (GUI), for configuring the switch via a supported Web browser

Related Documentation

For a list of related documents included with this product, see the Related Documents section of the *hp StorageWorks SAN Switch 2/16 Version 3.0.2k Release Notes*.

For the latest information, documentation and firmware releases, please visit the following HP StorageWorks website:

<http://www.q.c.com/storage/productindexdisk.html>

For information about Fibre Channel standards, visit the Fibre Channel Association web site, located at <http://www.fibrechannel.com>.

Conventions

Conventions consist of the following:

- [Document Conventions](#)
- [Text Symbols](#)
- [Equipment Symbols](#)

Document Conventions

The document conventions included in [Table 1](#) apply in most cases.

Table 1: Document Conventions

Element	Convention
Cross-reference links	Blue text: Figure 1
Key and field names, menu items, buttons, and dialog box titles	Bold
File names, application names, and text emphasis	<i>Italics</i>
User input, command and directory names, and system responses (output and messages)	Monospace font COMMAND NAMES are uppercase monospace font unless they are case sensitive
Variables	<monospace, italic font>
Website addresses	Blue, underlined sans serif font text: http://www.hp.com

Text Symbols

The following 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 death.



Caution: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

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

Equipment Symbols

The following equipment symbols may be found on hardware for which this guide pertains. They have the following meanings.



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 personal 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 personal 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 personal safety 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 personal safety or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

Rack Stability

Rack stability protects personnel and equipment.



WARNING: To reduce the risk of personal safety 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 an HP authorized service provider or access our website: <http://www.hp.com>.

HP Technical Support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

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

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support: <http://thenew.hp.com/country/us/eng/support.html>.

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

HP Storage Website

The HP website has the latest information on this product. Access storage at: <http://thenew.hp.com/country/us/eng/prodsv/storage.html>. From this website, select the appropriate product or solution.

HP Authorized Reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518
- In Canada, call 1-800-263-5868
- Elsewhere, see the HP website for locations and telephone numbers:
<http://www.hp.com>.

Overview



The HP StorageWorks SAN Switch 2/16 is a high-performance, 16-port, 2 gigabit (Gb) Fibre Channel (FC) switches used to interconnect storage devices, hosts, and servers in a SAN.

The hp StorageWorks SAN switch 2/16 is offered in two configurations; the 2/16 and 2/16 Power Pak. Refer to the *hp StorageWorks SAN Switch 2/16 Version 3.0.2k Release Notes* for a complete list of management features enabled on your specific switch.

Note: This guide refers to both models as the SAN Switch 2/16, unless otherwise noted.

This chapter provides the following information:

- [SAN Switch 2/16 Features](#), page 18
- [Firmware](#), page 18
- [Hardware](#), page 19

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 V3.0.2k. (version as of this writing, please refer to the switch Release Notes for exact version number). The firmware supports:

- High-speed data traffic using Interswitch 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, providing 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 *hp StorageWorks zoning version 3.0.x/V4.0.x user guide*.

- Per port statistics to help technicians diagnose and isolate problem ports without disrupting switch operations.
- Error detection 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.

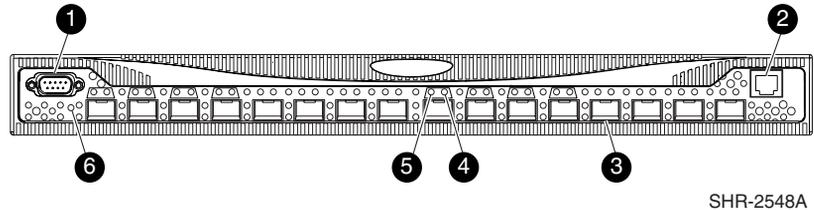
Hardware

The 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 the left of the front panel
 - One Port Status and Port Speed LED for each of the 16 ports
 - One Power Supply LED on the back of the power supply
 - One Port Readiness LED on the back panel
- Universal input power supplies with AC switches and built-in fans. (The power supplies plug 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 1,024 bytes.
- A real-time clock (RTC) with a 10-year battery and 56 bytes of NVRAM.

SFP Media Side

The front panel of the SAN Switch 2/16 is shown in [Figure 1](#). The front panel houses the Serial port, Ethernet port, fiber optic ports with corresponding LEDs, and the power switch LED.



- | | | | |
|-------------------------|--------------------|----------------------|------------------------|
| ❶ Serial port | ❷ Ethernet port | ❸ Optical ports (16) | ❹ Port speed LEDs (16) |
| ❺ Port status LEDs (16) | ❻ Power switch LED | | |

Figure 1: SFP media side

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 HP 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](#),” on page 21). 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

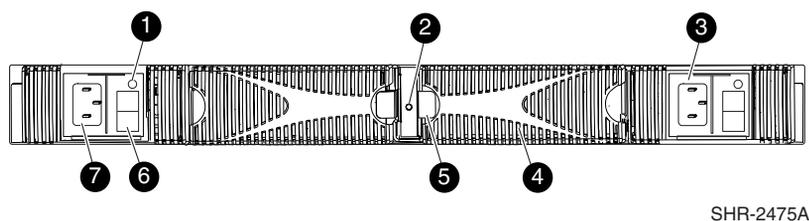
ISL trunking is a Fabric OS feature that enables distribution of traffic over the combined bandwidth of up to four ISLs between two directly adjacent switches, while preserving in-order delivery. For specific information about ISL trunking, refer to the *hp StorageWorks trunking version 3.0.x/V4.0.x user guide*.

SFPs

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

Power Supply Side

Figure 2 shows the rear panel of the switch. The rear panel houses the fan trays, power supplies, and switch status LED. Each power supply also integrates a separate status LED. The power supplies, fan trays, and motherboard are all Field Replaceable Units (FRUs).



- | | |
|----------------------|--------------------------------------|
| ① Power supply LED | ④ Fan tray assembly (inside chassis) |
| ② Port readiness LED | ⑤ Spring latch (2) |
| ③ Power supply | ⑥ Power switch |
| | ⑦ Power supply |

Figure 2: Power supply side

Field-Replaceable Units

The power supplies, 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.

Optional Hardware Kits

HP provides the following optional hardware kits in support of the SAN Switch 2/16, see [Table 2](#).

Table 2: SAN Switch 2/16 Orderable Hardware

Accessory	Part Number
Short wavelength SFP	A6515A* or 300834-B21**
Long wavelength SFP, 10 km	A6516A* or 300835-B21**
2m LC-to-LC Fibre Channel (fc) cable	C7524A*
2m LC-to-LC multi-mode fc cable	221692-B21**
16m LC-to-LC fc cable	C7525A*
5m LC-to-LC multi-mode fc cable	221692-B22**
50m LC-to-LC fc cable	C7526A*
15m LC-to-LC multi-mode fc cable	221692-B23**
200m LC-to-LC fc cable	C7527A*
30m LC-to-LC multi-mode fc cable	221692-B26**
50m LC-to-LC multi-mode fc cable	221692-B27**
2m LC-to-SC fc cable	C7529A*
2m LC-to-SC multi-mode fc cable	221691-B21**
16m LC-to-SC fc cable	C7530A*
5m LC-to-SC multi-mode fc cable	221691-B21**
15m LC-to-SC multi-mode fc cable	221691-B23**
30m LC-to-SC multi-mode fc cable	221691-B26**
50m LC-to-SC multi-mode fc cable	221691-B27**
SC female to SC female adapter	C7534A*
2m LC male to SC male adapter kit	C7534A*

* premerger HP part number

** premerger Compaq part number

Installing the SAN Switch 2/16

2

This chapter covers the following topics:

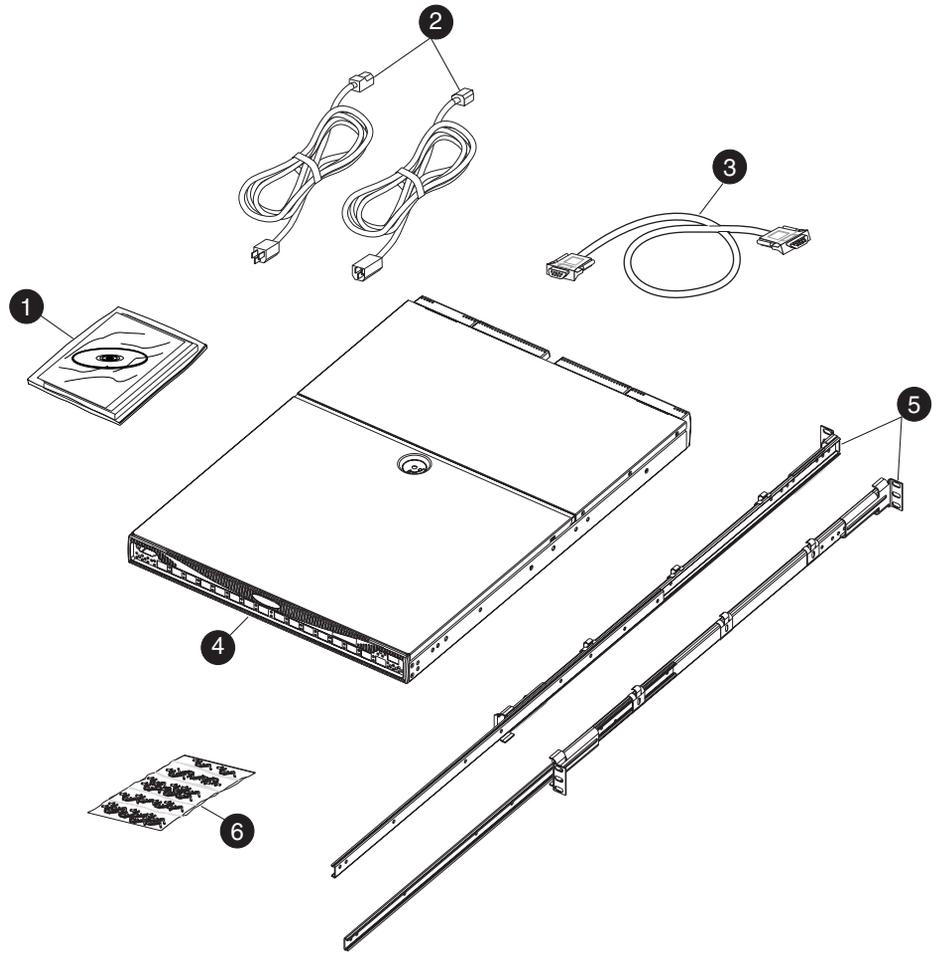
- [Unpack and Verify Carton Contents](#), page 24
- [Installation and Safety Considerations](#), page 27
- [Installing the SAN Switch as a Stand-alone Unit](#), page 29
- [Installing the SAN Switch 2/16 in an HP 9000 Series or Comparable EIA Rack](#), page 30
- [Installing the Switch in the Optional HP System/e Rack](#), page 39
- [Connecting AC Power](#), page 45
- [Configuring Network Addressing](#), page 47
- [Connecting the Switch to the LAN](#), page 51
- [Connecting the Switch to the Fabric](#), page 55
- [Installing Multiple Switches into an Existing SAN](#), page 57
- [Next Steps](#), page 58

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.

Note: The Rack Mount Kit shown in [Figure 3](#) may not represent the kit that shipped with your switch. HP reserves the right to substitute Rack Mount Kits, providing applicable instructions with each switch.



SHR-2489A

Figure 3: Carton contents

Table 3: Shipping Carton Contents

Item Number	Description
1	One HP StorageWorks SAN Switch 2/16 product accessory bag containing CD, license, documentation
2	Two standard AC power cords and two PDU cords
3	One RS-232 Serial cable (convertible to an RJ-45 connector, by removing the adapter on the end of the cable)
4	HP StorageWorks SAN Switch 2/16
5	<p><u>Rack Mount Kit containing:</u> Slide Assembly, includes one Inner and one Outer Slide Rail, with the following items preinstalled:</p> <ul style="list-style-type: none"> • L-Bracket, Slide Mount, 3-hole (4) • Power Cord Clips (6)
6	<p><u>Pouch containing Rack Mount hardware:</u></p> <ul style="list-style-type: none"> • 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 • 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

* Depending on time of purchase, the Fixed Rack Mount Kit items listed in [Table 3](#) may not represent the rail kit that shipped with your switch.

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 HP 9000 Series (or comparable) Rack using the Rack Mount Kit supplied with the switch, contents as outlined in Table 2.
- in an HP System/e Rack

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 installing the switch in the HP 9000 Series, HP System/e 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 (the port/cable side). HP cautions that you must install the switch so that air intake and exhaust for all components in the rack flow 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.

Electrostatic Discharge Precautions

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.

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.

Note: 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 Network Addressing](#),” later in this chapter.

Installing the SAN Switch 2/16 in an HP 9000 Series or Comparable EIA Rack

Read the following sections to install the switch in a rack using the Rack Mount Kit supplied with the switch. Obtain the following tools:

- A #2 Phillips screwdriver
- Torque screwdriver

Installing the Slide Rail Assemblies to the Switch

The Rack Mount Kit supplied with the switch 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 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 rails out of the outer slide rail until the lock release lever engages.
2. Press the lock release lever located on the inner slide rails. 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 slide 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.



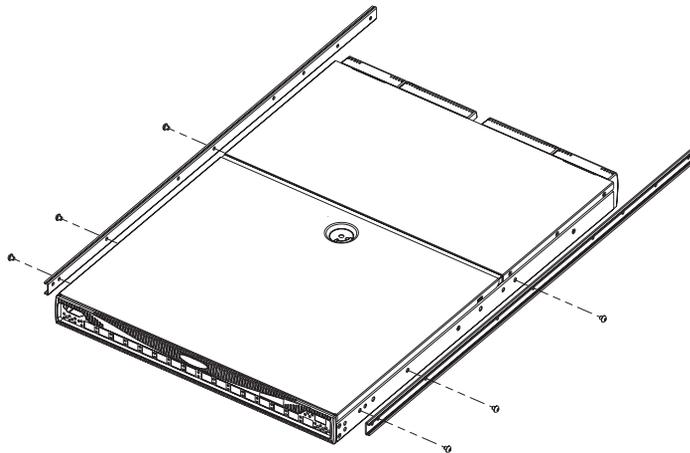
Caution: It is important to install the inner slide rails using the Phillips head, 8-32 x 3/16" screws supplied in the Rack Mount Kit. Installing screws longer than 3/16" can damage the switch.

1. Position the inner slide rails with the flat side against the switch, oriented in one of the following two ways:

Note: HP recommends installing the SAN Switch 2/16 so that the port side of the switch slides out the rear of the HP 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. **HP recommended method:**
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 the 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 the switch.
2. Locate three Phillips head, 8-32 x 3/16" screws provided in the Rack Mount Kit. Secure the inner slide rail to the switch, see [Figure 4](#).

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



SHR-2477A

Figure 4: Securing the inner slide rails to the switch

4. 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 switch 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.

Note: HP recommends installing the switch so that the port side of the switch slides out the back of the HP 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 on page 31.

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 5](#).

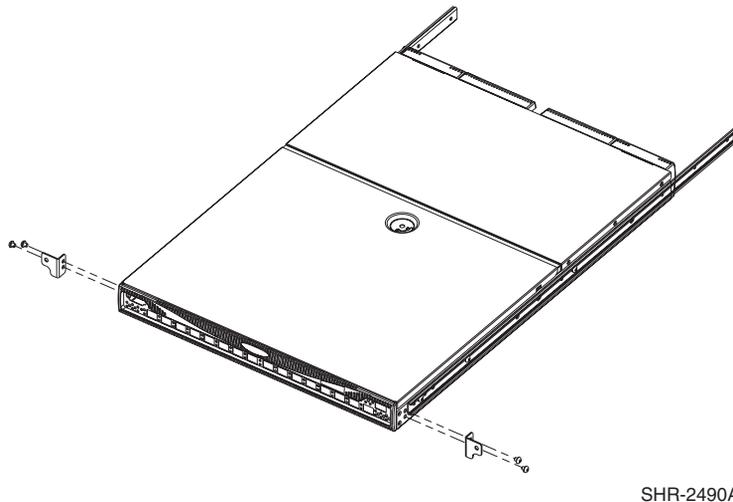


Figure 5: Attaching the rear rack mount brackets

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 5](#).

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 on page 31.

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

Use the following steps to install the outer slide rails in the HP 9000 Series Rack.

Note: This procedure requires two technicians to properly align the outer slide rails in the HP 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

Note: Before starting this procedure, verify that two of the slide mount L-brackets are preinstalled at the end of each outer slide rail. The L-brackets are necessary to attach the outer rails to the HP 9000 Series Rack.

1. Determine the appropriate placement for the switch inside the HP 9000 Series or EIA Rack.
-

Note: The HP 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 HP 9000 Series rack's rails, which 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.

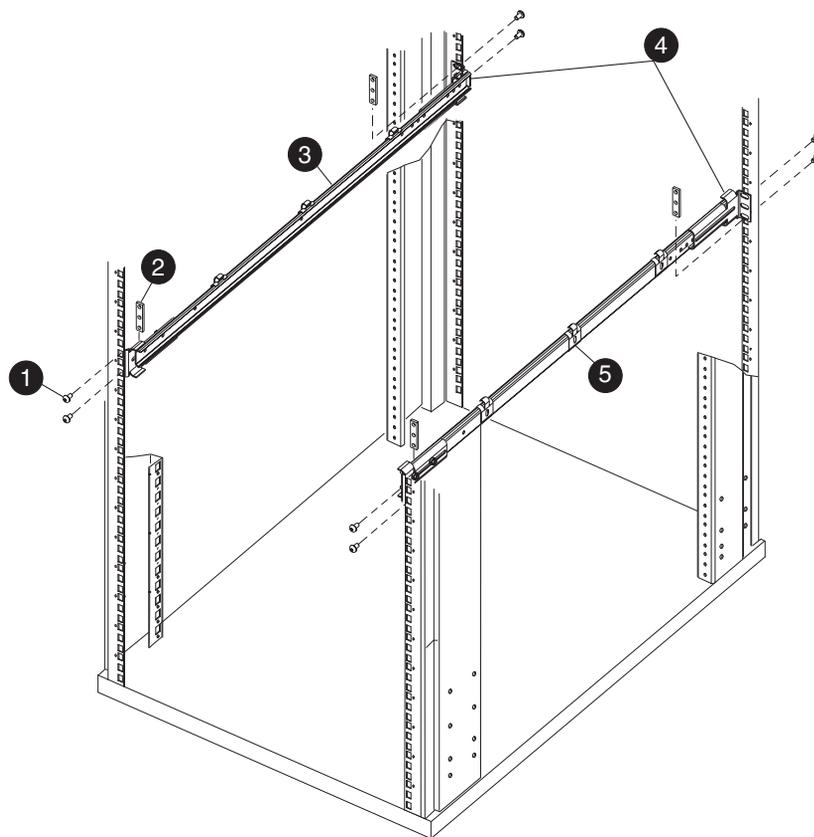
3. Insert one square alignment washer on each of the eight 10-32 x 3/8" Phillips head screws.
-

Note: The square alignment washers are mandatory for proper switch alignment.

4. Adjust the outer slide rail's length to fit the length of the HP 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 6](#).

Note: Position 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 6](#).



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- | | |
|------------------------------------|----------------------------|
| ❶ Phillips head 10-32 x 3/8" screw | ❷ L-Brackets |
| ❸ 3-hole bar nut | ❹ Power cord clip (1 of 6) |
| ❺ Outer slide rail | |

Figure 6: Attaching the outer slide rails to the HP 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.

Sliding the Switch into an HP 9000 Series or EIA Rack

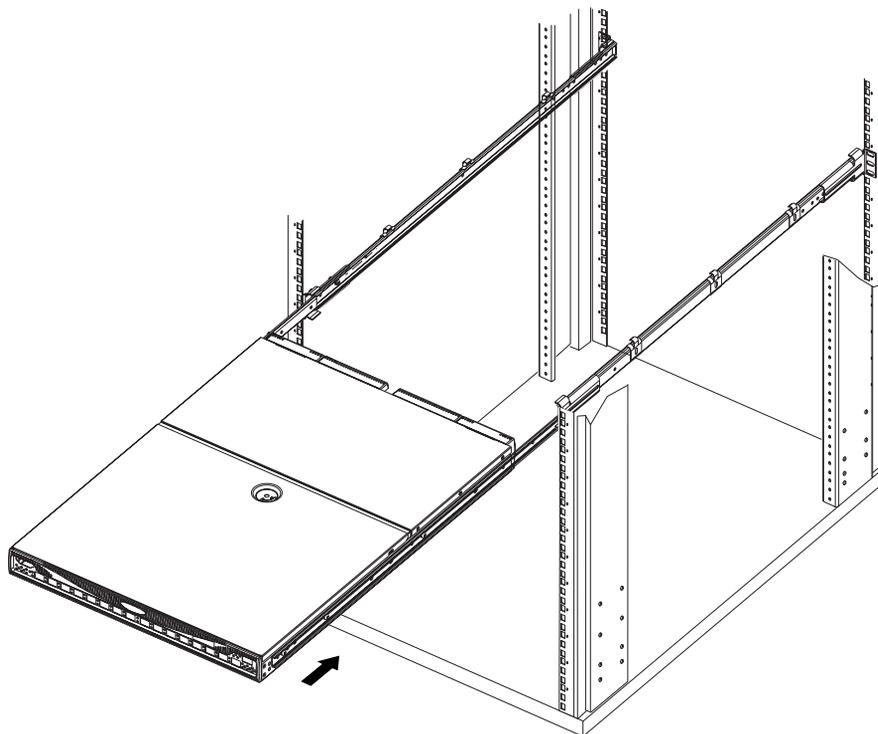
Follow these steps to install the switch in the rack.



WARNING: 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.

1. Depending on the type of install (front 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 7](#).

3. Slide the switch in the rack, see [Figure 7](#).



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Figure 7: Sliding the switch into an HP 9000 Series rack

Securing the Rack Mount Brackets

Secure the rack mount brackets (installed earlier, see “[Attaching the Rear or Front Rack Mount Brackets](#),” on page 32) to the HP 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.
4. See the “[Connecting AC Power](#)” on page 45, for instructions on applying power to the switch.

Installing the Switch in the Optional HP System/e Rack

This section provides instructions for installing the switch in the HP System/e rack.

Items Required for the HP System/e Rack

The HP System/e Rack Kit consists of the following items:

- HP System/e Rack Rail Kit, part number A7340-87901
- Plenum, part number A7346-00001

HP System/e Rack Rail Kit Hardware, part number A7340-87902, shown next

- Rails
- Rear mounting brackets
- Rail mounting hardware, shown next:



(6) #8-32 x 5/16 Phillips pan-head screw with captive star lock washers



(6) #8 Flat washers



(6) M5 Torx head screw with captive lock washers



(2) Rubber washers



(4) M5 U-type Tinnerman clips

Note: For proper airflow, the SFP media side of the SAN Switch 2/16 must face the rear of the rack. This mounting allows air to enter from the front of the rack and to exhaust at the rear of the rack, similar to other rack-mounted equipment. This prevents switch overheating, which may cause it to fail.

Use these steps to install the switch in the HP System/e rack.

1. Verify that all required hardware is available.
2. Choose a mounting location in the rack for the switch.
3. Install each of the two mounting brackets with one M5 Torx head screw with captive lock washers as shown in [Figure 8](#).

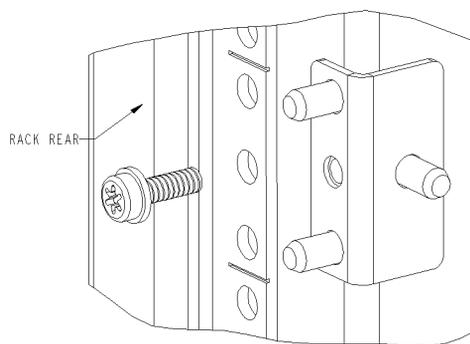


Figure 8: Installing the mounting brackets

4. Install two M5 U-type Tinnerman clips for each of the front columns of the rack in the top and bottom positions of the three-hole pattern as shown in [Figure 9](#).

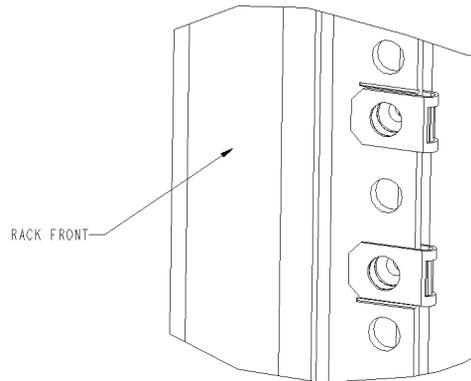
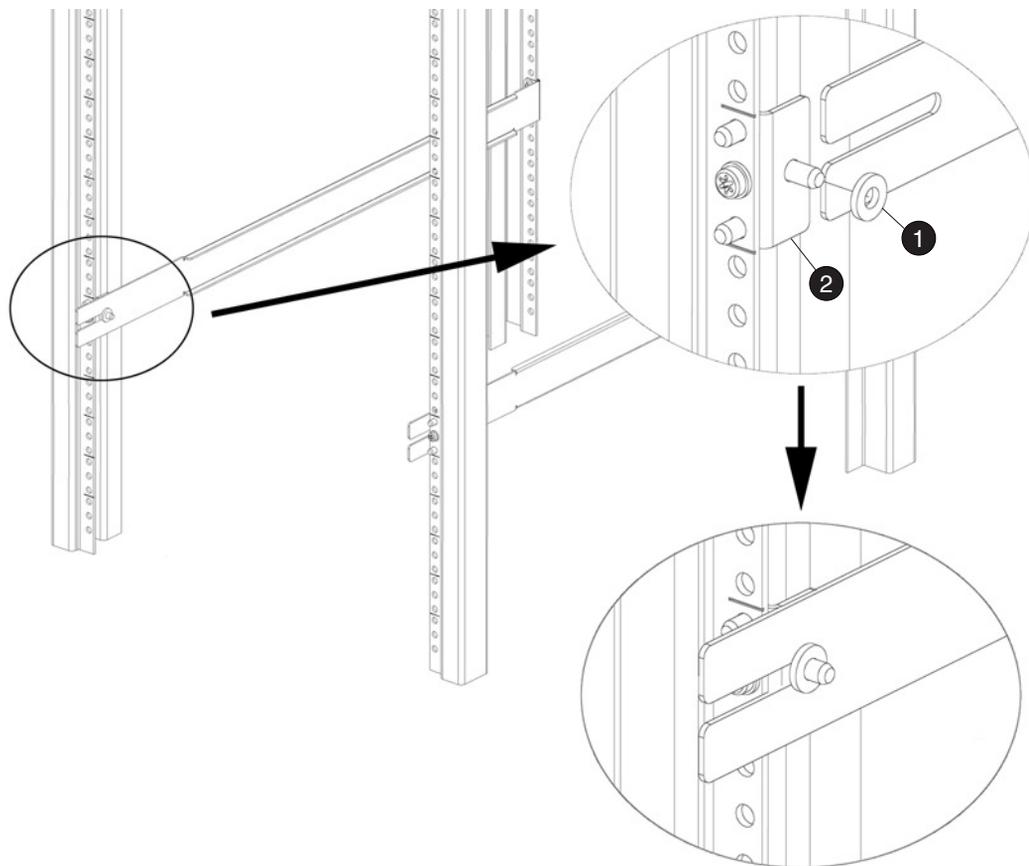


Figure 9: Installing the tinnerman clips

5. Assemble the outer rails by completing the following steps:
 - a. As an aid in assembly, two rubber washers have been included to help keep the rear slotted portion of the outer rail flush against the rear rail-tray brackets. Install them as shown in [Figure 10](#).



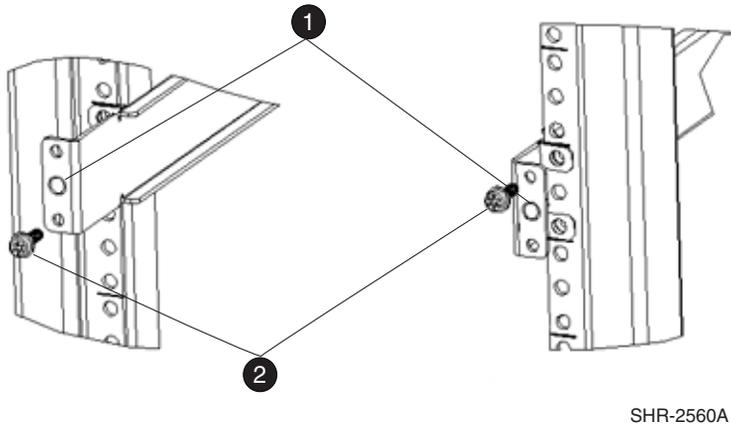
SHR-2559A

- ❶ Rubber washer (1 of 2)
- ❷ Rear rail tray bracket (1 of 2)

Figure 10: Installing the rubber washers

- b. Insert the alignment pins attached to the outer rail front flange into the center opening in the rack.
6. Install one M5 Torx screw in the upper hole location of the right rail. Then, install one M5 Torx screw in the lower location of the left rail. See [Figure 11](#).

Note: Do not install the upper left and the lower right screws until later.



❶ Outer rail alignment pins

❷ M5 torx screws

Figure 11: Assembling the outer rails (HP rack)

7. Assemble the two inner rails (one on each side) to the switch using (6) #8-32 x 5/16 Phillips pan-head screws, and #8 flat washer as shown in [Figure 12](#).

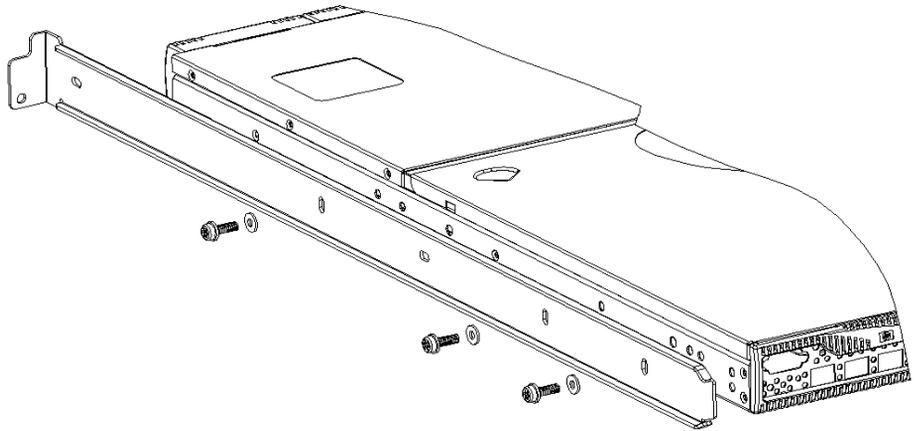
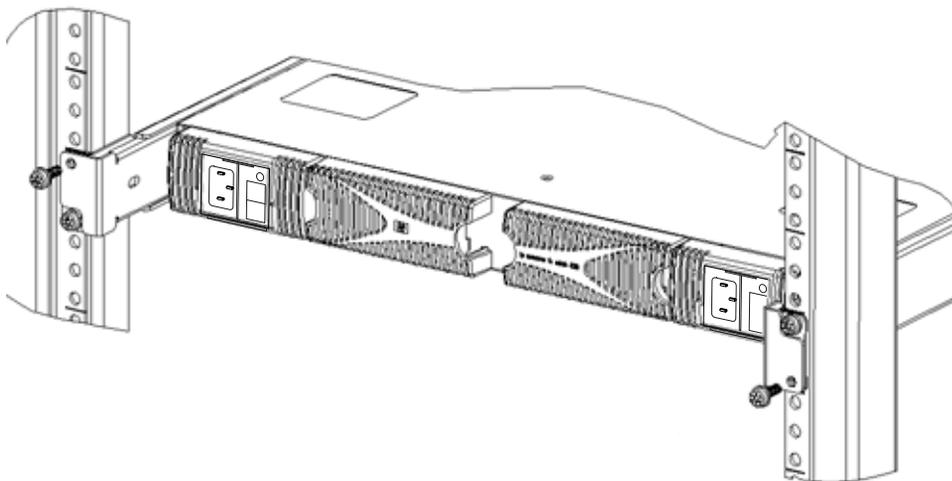


Figure 12: Assembling the inner rails



Caution: Do not use any other screws other than the six that are provided. Use of any longer lengths can cause damage to internal components of the switch. Before tightening screws, make sure that the rails are centered to the overall height of the switch.

8. Insert the switch with the attached inner rails into the outer rails.
9. Install the two remaining M5 Torx screws to complete the installation. See [Figure 13](#).



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Figure 13: Installing switch into the HP rack

10. See the next section, “[Connecting AC Power](#)” for instructions on applying power to the switch.

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.

1. Connect the switch power cords to the power connectors on the switch, see [Figure 14](#).

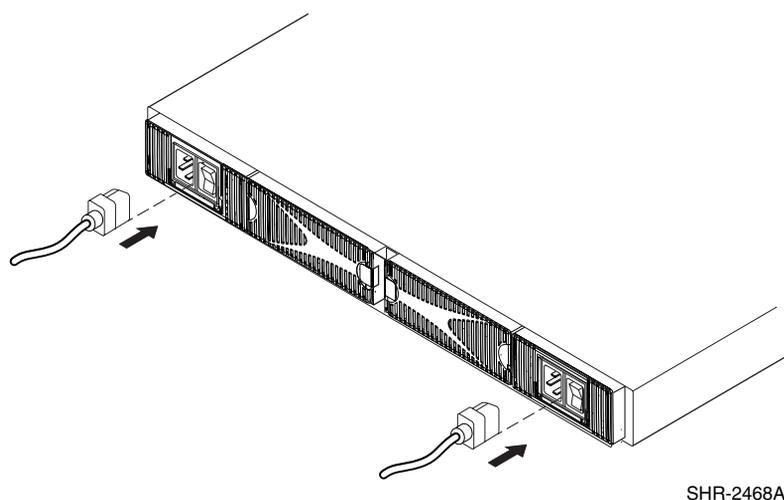


Figure 14: Connecting the power cords

2. *Six power cord clips ship with the Slide Rail Assembly Kit only. If using the Slide Rail Assembly Kit supplied with the switch:*
Locate the six power cord clips, three on each side of the outer slide rails, see [Figure 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. *If using the slide rail assembly kit supplied with the switch,* 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 0 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 Network Addressing,”](#) on page 47.

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 on 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 HP 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”](#) on page 62 in Chapter 3.

Note: For more information about beaconing, refer to the *hp StorageWorks fabric os version 3.0x/V4.0x 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 *hp StorageWorks fabric OS version 3.0.x/4.0.x reference guide*.

Configuring Network Addressing

Read the following sections for information on how to configure addressing for the switch.

Requirements

The following items are required to set network addressing.

- An IP address from your Network Administrator
- The switch 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 switch IP address, subnetmask, or gateway address.

Note: 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 Serial port.
2. Connect the Serial cable to the Serial port, see [Figure 15](#).

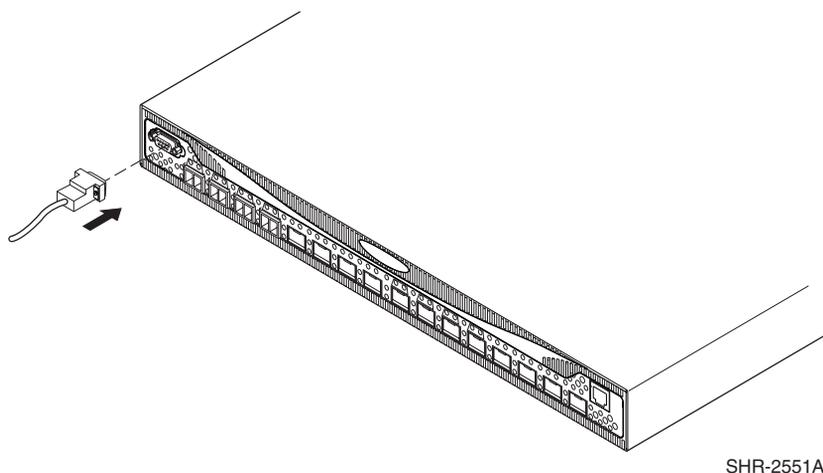


Figure 15: Connecting the Serial cable

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:

```
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 subnetmask 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 switch.

Connecting the Switch to the LAN

Use the following steps to connect the switch to the Ethernet Local Area Network (LAN) segment.

1. Remove the shipping plug from the Ethernet port.
2. Connect one end of an Ethernet cable to the Ethernet port, see [Figure 16](#).

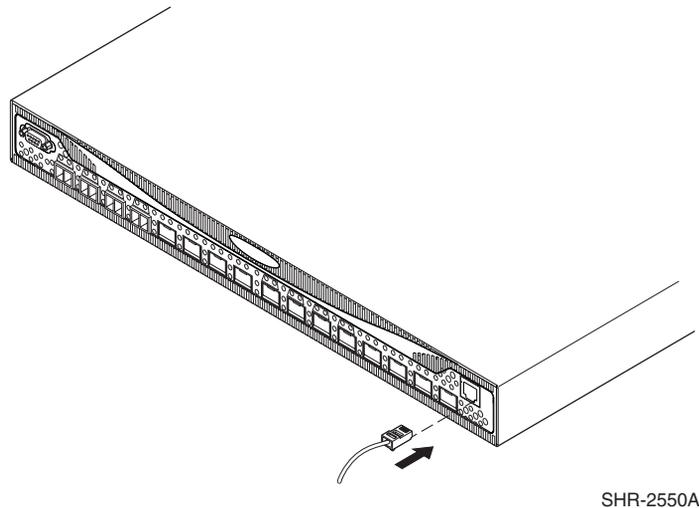


Figure 16: Connecting the Ethernet cable

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 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`.

Important Information on Setting the CORE PID Format

After you connect the switch via Ethernet, you must verify that all switches you intend to connect to the SAN use the same Core PID (Port Identifier) format. A PID is one of two addressing mechanisms used in Fibre Channel. The PID is analogous to specifying the physical switch and port a device is attached to in data networks. It is not analogous to an IP address. PIDs are assigned by a Fibre Channel switch when a device logs into the fabric.

An example PID might look like this:

011F00

In new installations, where both edge and Core switches reside, you must verify that the edge switch's (SAN Switch 2/16 in this case) Core PID format matches the Core switch's PID format, before connecting to the SAN.

For example, switches with firmware V3.0.2f or later have the PID set to 1. For a SAN to work correctly, all HP StorageWorks SAN switches or HP Surestore FC switches must have the same PID format setting, either 0 or 1. If a switch is introduced to an existing SAN with a setting that differs from the setting on the SAN, the switch will segment.

How to Check the Current Core PID Setting

To determine a switch's current Core PID format, connect directly to a switch in your SAN and complete the following steps via a telnet session or the serial cable supplied with the switch.

Note: All switches in the SAN require the same PID format setting.

1. Type `configShow` and press Enter.
2. About 15 lines down (press Enter to display more information on the page), locate the following line:

```
fabric.ops.mode.pidFormat:
```
3. Type `switchDisable` and press Enter.
4. Type `configure` and press Enter.
5. Type `y` at the Fabric parameters prompt, (yes, y, no, n): [no] y.

- To view the Core Switch PID setting, press Enter until you reach the Core Switch PID format line, similar to the following.

```
Core Switch PID Format: (0..1) [0]
```

Note: The [0] value shown above indicates the Core Switch PID parameter set on this particular switch.

- Continue to press Enter until you completed the configure section and have returned to the admin prompt.
- Type `switchEnable` and press Enter.

If necessary, proceed to the next section to change the Core PID setting to match all switches that will reside in the SAN.

How to Change the Core PID Format

Note: HP switches ship with the Core switch PID set to 1. HP recommends that if you are in the process of creating a new SAN, set the PID to 1 for all switches in the SAN.

In order for the switches to interoperate properly, all of them must have the same Core PID format. Use these steps to change the Core PID format, if necessary.



Caution: If you need to change the PID format on this new switch, change the PID format before connecting the fiber cables.

- If the switch is configured for zoning, type the following command to disable zoning, `cfgDisable`.
- Disable the switch type, `SwitchDisable`.
- To reset the PID format, use the “configure” telnet command. Type `configure`. The following displays,
Configure...
- Type `y` at the Fabric parameters prompt,
Fabric parameters (yes, y, no, n): [no] y

5. Locate the line, "Core Switch PID Format: (0..1) [0] 1," and select 1.
6. Press Enter until the following prompt appears.

```
Committing configuration...Done
```
7. At the prompt type, `SwitchEnable`.
8. After setting the Core PID to match the the other switches in the fabric, see [“Connecting the Switch to the Fabric”](#) on page 55 in this chapter for instructions on connecting Fibre Channel cables.
9. If necessary, type `cfgEnable` to re-establish zoning.

Note: Once the switch PID format is set, it is stored in the flash memory of the switch and it is NOT necessary to set it again during subsequent firmware upgrades.

Modifying Domain IDs

Optional. 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

Optional. If desired, specify any custom status policies for the fabric as follows.

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.

Note: Configure each port to match the topology of each host or target before connecting to the device. The default port configuration is fabric, not private loop. The switch does not auto-sense topology.

Connecting the Switch to the Fabric

Use these steps to connect the SFPs and cables to switch 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 *hp StorageWorks ISL trunking version 3.0.x/4.0.x 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.

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, see [Figure 17](#).

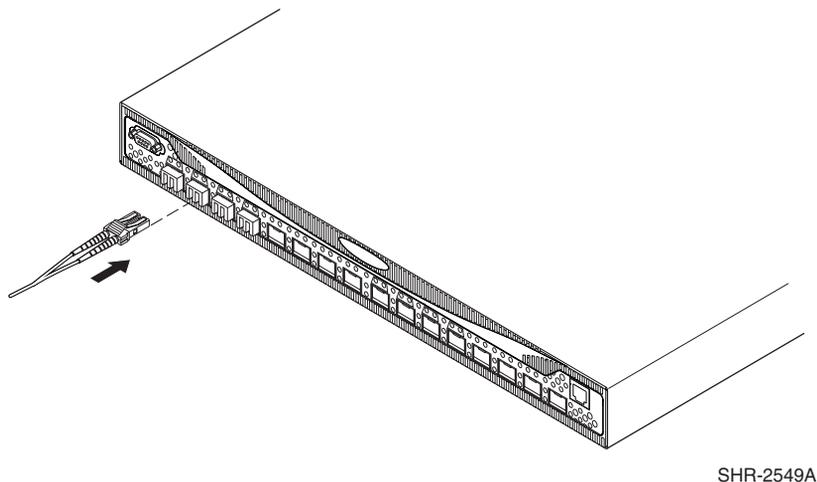


Figure 17: Inserting a cable into an SFP

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.

Note: 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 “[Backing Up System Configuration Settings](#)” in Chapter 4.

Installing Multiple Switches into an Existing SAN

Use these steps to set up more than one edge switch in an existing SAN.

1. Connect the appropriate components as outlined in the installation section of this chapter.
2. 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.

3. 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.

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

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

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

Next Steps

Specific tasks remain to be completed before the switch is fully operational and manageable in your network with your equipment. These tasks and the associated tools are described in the remaining documents shipped with the product on the documentation CD-ROM.

Setting QuickLoop Mode on Ports

The default configuration for a port is fabric mode. QuickLoop is used to connect private hosts to private storage using the Fibre Channel network. A QuickLoop zone, connecting two switches, may be used to expand the number of private hosts and storage connected. An entire switch can be set to operate in QuickLoop mode using the `qlEnable` telnet command. A port on a switch operating in Mixed mode can be set to or removed from QuickLoop using the telnet commands `qlPortEnable` and `qlPortDisable`. See the *hp StorageWorks quickloop fabric assist version 3.0.x/4.0.x user guide* for more details.

Setting Up Speed Negotiation

The switch ports can operate at three different speed levels: auto-sensing mode, 1 Gbps mode, or 2 Gbps mode. Use the telnet command `switchCfgSpeed` to set the speed level for all ports in a switch. Use the `portCfgSpeed` to set the speed level for a single port. Depending on your environment you may need to force a port to use a specific speed level. Auto negotiation may not be supported by the

device. Check the configuration information for your network components for specific requirements. See the *hp StorageWorks fabric os version 3.0.x/4.0.x procedures user guide*, for a detailed command description.

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.

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

Managing the SAN Switch 2/16



3

This chapter covers the following topics:

- [Interpreting LED Activity](#), page 62
- [Management Overview](#), page 68
- [Running Basic Switch Operations Using Telnet](#), page 69
- [Diagnostic Tests](#), page 73

Interpreting LED Activity

SAN Switch 2/16 status is determined through LED activity. 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 *hp StorageWorks fabric os version 3.0.x/4.0.x procedures guide*.

Front Panel LEDs

The 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 16 ports
- One Port Speed LED above and to the left of each of the 16 port

[Table 4](#) describes front panel LEDs, and their functionality.

Table 4: Front Panel LED Patterns During Normal Operation

LED	LED Location	Color Display	Hardware Status	Recommended Action
Port Status LED	Above each port, on left	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	The port is online but segmented, indicating a loopback cable or incompatible switch.	Verify correct device is connected to port.
		Fast-flashing green	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.
		Slow-flashing orange	The port is disabled (result of diagnostics or portDisable command).	Reset the switch from a management station.

Table 4: Front Panel LED Patterns During Normal Operation (Continued)

LED	LED Location	Color Display	Hardware Status	Recommended Action
Port Status LED (continued)		Fast-flashing orange	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.
Port Speed LED	Above each port, on right	No light	The port is transmitting/receiving at 1 Gbps.	No action required.
		Steady green	The port is transmitting/receiving at 2 Gbps.	No action required.

Table 4: Front Panel LED Patterns During Normal Operation (Continued)

LED	LED Location	Color Display	Hardware Status	Recommended Action
Power Switch LED	Below Serial port	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 <i>hp StorageWorks fabric OS version 3.0.x/4.0.x procedures guide</i> for more information.

Rear Panel LEDs

The rear panel includes the following LEDs:

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

Table 5 describes the LEDs on the rear panel of the switch.

Table 5: Rear Panel LED Patterns During Normal Operation

LED	LED Location	Color Display	Hardware Status	Recommended Action
Power Supply LED	On each 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.
Port Status LED	Center of Back Panel	No Light	Either the switch is off, or boot is not complete, or boot has failed.	Verify that the switch is on and boot had time to complete. If there is still no light, contact the switch supplier.

Table 5: Rear Panel LED Patterns During Normal Operation (Continued)

LED	LED Location	Color Display	Hardware Status	Recommended Action
		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 <i>hp StorageWorks fabric os version 3.0.x/4.0.x procedures guide</i> for more information.

Management Overview

The switch is 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 switch is compatible with the following management interfaces:

- Command Line Interface (CLI) via a telnet connection — For more information refer to the *hp StorageWorks fabric os version 3.0.x/V4.0.x procedures guide*, and the *hp StorageWorks fabric os version 3.0.x/V4.0.x reference guide*.
- Standard SNMP applications — For more information refer to the *hp StorageWorks MIB reference guide version 3.0.x/4.0.x*.
- 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 *hp StorageWorks web tools version 3.0.x/V4.0.x user guide*.

Optional Management Features

Refer to the *hp StorageWorks SAN Switch 2/16 Version 3.0.2k Release Notes* for a complete list of management features enabled on the switch.

Displaying the Optional Feature Licenses

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

1. Log in 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.

Use these steps to enable a licensed feature.

1. Log in 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 Switch

Use these steps to log into the switch.

1. Open a telnet connection to the switch. The login prompt displays 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: xxxxxxx
```

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. Log into 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 **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. Log in 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. Log in 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 firmware version.

1. Log in 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. Log into 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. Log into the switch as the admin user.
2. At the command line enter the following command:

```
configShow
```

The system configuration settings are displayed.

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 *hp StorageWorks fabric os procedures version 3.0.x/4.0.x user guide*.

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 *hp StorageWorks fabric os procedures version 3.0.x/4.0.x user guide*.

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 *hp StorageWorks fabric os procedures version 3.0.x/4.0.x user guide*.

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

Backing Up the Configuration and Upgrading Firmware



This chapter covers the following topics:

- [Backing Up System Configuration Settings](#), page 76
- [Upgrading or Restoring the Switch Firmware](#), page 78
- [Downloading Firmware from the HP Website](#), page 79

Backing Up System Configuration Settings

HP strongly recommends saving the configuration after the initial configuration changes and periodically thereafter.

FTP must be used on Windows workstations to backup the system configuration. The FTP server must be running before an upload can occur. Use the RSHD service or FTP on a UNIX machine.

Note: The two supplied utilities, RSHD.EXE and CAT.EXE currently do not support uploads for Windows, only downloads. These utilities are available from the support website: <http://www.hp.com/support>.

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. Log into the switch as the admin user.
3. At the command line enter the following command:

```
configUpload hostIPAddr user path_filename password
```

For example, *hostIPAddr* 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.

If only `configupload` is entered, the system will prompt you for each parameter, as follows:

Example:

```
switch:admin> configupload
Server Name or IP Address [host]: 123.45.678.901
User Name [user]: kelev
File Name [config.txt]: switch1
Protocol (RSHD or FTP) [rshd]: ftp
Password:
upload complete
```

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. Log into 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, `hostIPAddr` 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. Log into the switch as the admin user.
3. At the command line enter the following command:

```
firmwareDownload hostIPAddr, user, path_filename, password
```

For example, where *hostIPAddr* 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.

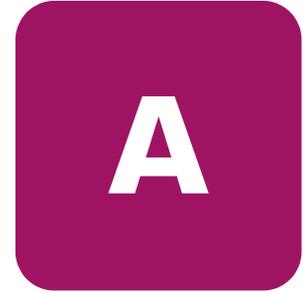
4. Reboot the switch by entering the following command:

```
fastBoot
```

Downloading Firmware from the HP Website

To download the firmware from the HP website, go to <http://www.hp.com/support>. The website contains the required loaders and instructions for downloading the firmware to a switch.

Regulatory Compliance Notices



FCC EMC Statement (USA)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, 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 his own expense. The end user of this product should be aware that any changes or modifications made to this equipment without the approval of Hewlett-Packard could result in the product not meeting the Class A limits, in which case the FCC could void the user's authority to operate the equipment.

EMC Statement (Canada)

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.

EMC Statement (European Union)

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

Spécification ATI Classe A (France)

DECLARATION D'INSTALLATION ET DE MISE EN EXPLOITATION d'un matériel de traitement de l'information (ATI), classé A en fonction des niveaux de perturbations radioélectriques émis, définis dans la norme européenne EN 55022 concernant la Compatibilité Electromagnétique.

Germany Noise Declaration

Schalldruckpegel $L_p = 46.1$ dB(A) Am Arbeitsplatz (operator position) Normaler Betrieb (normal operation) Nach ISO 7779:1999 (Typprüfung)

VCCI EMC Statement (Japan)

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。

Harmonics Conformance (Japan)

高調波ガイドライン適合品

BSMI EMC Statement (Taiwan)

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。

RRL EMC Statement (Korea)

사용자 안내문 : A 급기기

이 기기는 업무용으로 전자파 적합등록을 받은 기기 이오니, 판매자 또는 사용자는 이점을 주의하시기 바라며, 만약 잘못 구입하셨을 때에는 구입한 곳에서 비업무용으로 교환하시기 바랍니다.

Laser Safety

A. Certification and Classification Information

When equipped with native Fibre Channel adapters, this product contains a laser internal to the small form factor pluggable (SFP) transceiver modules.

In the USA, the SFP module is certified as a Class 1 Laser product, conforming to the requirements contained in Department Of Health and Human Services (DHHS) regulation 21 CFR, Subchapter J. The certification is indicated by a label on the metal SFP housing.

Outside the USA, the SFP is certified as a Class 1 Laser product conforming to requirements contained in IEC 825-1:1993 and EN60825-1:1994, including Amendment 11:1996.

The SFP includes the following certifications:

- UL Recognized Component (USA)
- CSA Certified Component (Canada)
- TUV Certified Component (European Union)
- CB Certificate (Worldwide)

The following figure shows the Class 1 information label that appears on the metal housing of the SFP.

CLASS 1 LASER PRODUCT 21 CFR(J)

B. Product Information

Each communications port consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains internally a semiconductor laser diode in the wavelength of either 850 nanometers (shortwave laser) or 1310 nanometers (longwave laser).

Class 1 Laser products are not considered hazardous.

C. Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and points of access may emit laser radiation above the Class 1 limits established by the IEC and U.S. DHHS.

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 an HP authorized service provider using the HP spare designated for this product. For more information about battery replacement or proper disposal, contact your HP 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 HP, your authorized HP partners, or their agents.

Electrostatic Discharge



B

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 \pm 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 an HP authorized reseller install the part.

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

Technical Specifications



This appendix covers the following topics:

- [Dimensions](#), page 90
- [Power Supply Specifications](#), page 91
- [Environmental Requirements](#), page 92
- [Memory Specifications](#), page 93

Dimensions

Table 6 lists SAN Switch 2/16 dimensions.

Table 6: 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)	28.0 lbs (12.7 kg)

Power Supply Specifications

Table 7 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 7: 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
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

Environmental Requirements

Table 8 lists the environmental ranges that are acceptable when the switch is operating, and the acceptable ranges when the switch is not operating.

Table 8: 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 switch 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 9](#).

Table 9: 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		

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 fibers.

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.

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