



Hewlett Packard
Enterprise

HPE StorageWorks

8-Gb SAN Switch

Hardware Reference Guide

Abstract

This document provides information on installing, configuring, and maintaining the 8-Gb SAN family of HPE StorageWorks Fibre Channel switches. This document is intended for system administrators and technicians with knowledge of SANs and HPE StorageWorks Fibre Channel switches.

Part Number: 5200-1457
Published: June 2016
Edition: 6

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Contents

1 HPE StorageWorks 8-Gb SAN Switches	7
Overview.....	7
HPE 8-Gb SAN Switch models.....	7
Power Pack+ models.....	8
8/8 and 8/24 SAN Switch features.....	8
Port side of the 8/8 and 8/24 SAN Switch.....	9
Nonport side of the 8/8 and 8/24 SAN Switch.....	9
Activating additional 8/8 and 8/24 SAN Switch ports.....	9
Enabling E_Ports on the 8/8 SAN Switch.....	9
8/40 SAN Switch features.....	10
Port side of the 8/40 SAN Switch.....	10
Nonport side of the 8/40 SAN Switch.....	10
Activating additional 8/40 SAN Switch ports.....	11
8/80 SAN Switch features.....	11
Port side of the 8/80 SAN Switch.....	11
Nonport side of the 8/80 SAN Switch and the Encryption SAN Switch.....	12
Activating additional 8/80 SAN Switch ports.....	13
Encryption SAN Switch features.....	13
Port side of the Encryption SAN Switch.....	14
FCoE Converged Network Switch features.....	15
Port side of the FCoE Converged Network Switch.....	16
Nonport side of the FCoE Converged Network Switch.....	16
1606 Extension SAN Switch features.....	16
Feature comparison of base and upgraded products.....	17
Available licenses.....	18
Port side of the 1606 Extension SAN Switch.....	19
Nonport side of the 1606 Extension SAN Switch.....	19
Installing and activating Port Upgrade licenses.....	20
SAN Switch ISL Trunking groups.....	20
Supported SFP transceiver options.....	21
8-Gb SAN Switch software options.....	22
8-Gb SAN Switch hardware options.....	23
2 Installing and configuring an 8-Gb SAN Switch	24
Shipping carton contents.....	24
Installation and safety considerations.....	25
Electrical considerations.....	25
Environmental considerations.....	26
Rack mount considerations.....	26
Cabling considerations.....	26
Items required for installation.....	27
Installing the switch as a standalone device.....	27
Installing the switch using the SAN Switch Rack Mount Kit.....	27
Supported devices.....	28
Related documentation.....	28
Before you begin—Important information about the plenum.....	28
Installation and safety guidelines.....	29
Installing the HPE SAN Switch Rack Mount Kit in your Hewlett Packard Enterprise custom rack.....	30
Installing the plenum (if required).....	36
Securing the device to the outer rails.....	37
Cabling and configuring the SAN Switch.....	37

Connecting the SAN Switch to the fabric.....	38
EZSwitch Setup (optional).....	38
Obtaining required items.....	38
Powering on the 8-Gb SAN Switch.....	38
Powering off the 8-Gb SAN Switch.....	39
Making a serial connection.....	39
Setting the switch IP address.....	39
DHCP.....	40
Setting a static IP address.....	40
Connecting an Ethernet cable and opening a Telnet session.....	40
Setting the domain ID.....	40
Setting the switch date and time.....	41
About setting time zones.....	41
Setting the time zone.....	42
Correcting the time zone.....	43
Synchronizing local time using Network Time Protocol.....	43
Verifying the configuration.....	45
Backing up the configuration.....	45
Changing the switch name and chassis name.....	46
3 Managing the 8-Gb SAN Switches.....	47
Configuring the Encryption SAN Switch.....	47
Configuring the FCoE Converged Network Switch.....	48
Configuring the 1606 Extension SAN Switch.....	48
FCIP and Fibre Channel routing services configuration.....	48
Verifying switch operation.....	49
8-Gb SAN Switch LEDs.....	50
8/8 and 8/24 SAN Switch LEDs.....	50
8/40 SAN Switch LEDs.....	51
8/80 SAN Switch LEDs.....	52
Port side LED activity for the 8/80 SAN Switch.....	53
Nonport side LED activity for the 8/80 SAN Switch.....	54
Port side LED activity for the Encryption SAN Switch.....	55
Port side LED activity for the FCoE Converged Network Switch.....	57
Nonport side LED activity for the FCoE Converged Network Switch.....	59
Port side LED activity for the 1606 Extension SAN Switch.....	60
Nonport side LED activity for the 1606 Extension SAN Switch.....	63
Interpreting POST results.....	63
Maintaining the 8-Gb SAN Switches.....	64
Installing an SFP.....	64
Diagnostic Tests.....	65
Installing Field-Replaceable Units.....	65
8/8 SAN Switch and 8/24 SAN Switch FRU units.....	65
8/40 SAN, FCoE Converged Network, and 1606 Extension SAN Switch FRU units.....	65
Verifying fan assembly FRU replacement.....	65
Fan assembly.....	66
Fan assembly LEDs.....	66
Replacing the 8/40 SAN Switch power supply and fan assembly.....	67
8/80 SAN Switch and Encryption SAN Switch FRU units.....	67
Replacing the 8/80 SAN Switch and Encryption SAN Switch fan assembly.....	68
Replacing an 8/80 SAN Switch or Encryption SAN Switch power supply.....	69
Power supply.....	71
SAN Switch management features.....	71
4 Technical specifications.....	73
Weight and physical dimensions.....	73

Memory.....	73
Facility requirements.....	74
Electromagnetic compatibility	75
Power supply specifications.....	75
Data transmission ranges.....	76
FCoE Converged Network Switch data flow latency.....	79
Fibre Channel port specifications.....	79
POST and boot specifications.....	80
POST.....	80
Boot.....	80
Supported HBAs and CNAs.....	80
5 Support and other resources.....	81
Hewlett Packard Enterprise technical support.....	81
Subscription service.....	81
Documentation feedback.....	81
Related information.....	81
HP websites.....	82
Rack stability.....	82
Typographic conventions.....	83
Customer self repair.....	83
A Regulatory compliance and safety.....	84
Regulatory compliance.....	84
Federal Communications Commission notice for Class A equipment.....	84
Modifications.....	84
Cables.....	84
Regulatory compliance identification numbers.....	84
Laser device.....	84
Laser safety warning.....	84
Certification and classification information.....	84
Laser product label.....	85
International notices and statements.....	85
Canadian notice (avis Canadien).....	85
Class A equipment.....	85
European Union regulatory notice.....	85
Japanese notice.....	86
Korean notices.....	86
Safety.....	86
Battery replacement notice.....	86
Taiwan battery recycling notice.....	87
Power cords.....	87
Japanese power cord statement.....	87
Waste Electrical and Electronic Equipment directive.....	87
English notice.....	87
Dutch notice.....	87
Czechoslovakian notice.....	88
Estonian notice.....	88
Finnish notice.....	88
French notice.....	88
German notice.....	89
Greek notice.....	89
Hungarian notice.....	89
Italian notice.....	89
Latvian notice.....	90
Lithuanian notice.....	90

Polish notice.....	90
Portuguese notice.....	90
Slovakian notice.....	91
Slovenian notice.....	91
Spanish notice.....	91
Swedish notice.....	91
B Electrostatic discharge.....	93
How to prevent electrostatic discharge.....	93
Grounding methods.....	93
Glossary.....	94
Index.....	99

1 HPE StorageWorks 8-Gb SAN Switches

This chapter describes HPE 8-Gb SAN Switches.

Overview

Each HPE StorageWorks 8-Gb SAN Switch delivers ASIC technology and architecture for Fibre Channel SANs. The 8-Gb SAN Switches are high-performance switches designed for the needs of enterprise environments that require a high-port footprint for port aggregation. Additionally, the 8-Gb Encryption SAN Switch provides cryptography (encryption/decryption) and data compression capabilities, while the FCoE Converged Network Switch provides low-latency lossless CEE ports, and 8-Gb FC ports in a single switch. The 1606 Extension SAN Switch is a platform for FCIP, enabling the transmission of Fibre Channel data over long distances, in addition to providing 8-Gb FC ports for switching and routing.

The 8-Gb SAN Switches satisfy demanding RAS, performance, and scalability requirements of an enterprise switch while delivering interoperability and ease-of-use advantages. The 8-Gb SAN Switches are the latest offering from the HPE StorageWorks family of entry-to-enterprise products.

HPE 8-Gb SAN Switch models

Models include:

- **HPE StorageWorks 8/8 Base SAN Switch**—Ships with 8 ports activated and no E_Port license. It includes Advanced Web Tools, Advanced Zoning, and EGM as standard software components.
- **HPE StorageWorks 8/8 Full Fabric SAN Switch**—Ships with 8 ports activated and includes a Full Fabric license, Advanced Web Tools, Advanced Zoning, and EGM as standard software components.
- **HPE StorageWorks 8/24 SAN Switch**—Ships with 16 ports activated and includes a Full Fabric license. It includes Advanced Web Tools, Advanced Zoning, and EGM as standard software components.
- **HPE StorageWorks 8/40 SAN Switch**—Ships with 24 ports activated and includes a Full Fabric license. It includes Advanced Web Tools, Advanced Zoning, and EGM as standard software components.
- **HPE StorageWorks 8/40 Power Pack+ SAN Switch**—Ships with 24 ports activated and includes a Full Fabric license. This model includes the Power Pack+ software bundle (Adaptive Networking, Fabric Watch, ISL Trunking, Extended Fabric, and Advanced Performance Monitor). It also includes Advanced Web Tools, Advanced Zoning, and EGM as standard software components.
- **HPE StorageWorks 8/80 SAN Switch**—Ships with 48 ports activated and includes a Full Fabric license. It includes Advanced Web Tools, Advanced Zoning, and EGM as standard software components.
- **HPE StorageWorks 8/80 Power Pack+ SAN Switch**—Ships with 48 ports activated and includes a Full Fabric license. This model includes the Power Pack+ software bundle (Adaptive Networking, Fabric Watch, ISL Trunking, Extended Fabric, and Advanced Performance Monitor). It also includes Advanced Web Tools, Advanced Zoning, and EGM as standard software components.
- **HPE StorageWorks Encryption SAN Switch**—Ships with 32 ports activated and includes a Full Fabric license. It includes Advanced Web Tools, Advanced Zoning, and EGM as standard software components.
- **HPE StorageWorks Encryption Switch Power Pack+ SAN Switch**—Ships with 32 ports activated and includes a Full Fabric license. This model includes the Power Pack+ software bundle (Adaptive Networking, Fabric Watch, ISL Trunking, Extended Fabric, and Advanced

Performance Monitor). It also includes Advanced Web Tools, Advanced Zoning, and EGM as standard software components.

- **HPE StorageWorks 2408 FCoE Converged Network Switch**—Ships with 8 active Fibre Channel ports, 24 active CEE ports, and base software (Full Fabric, Advanced Fabric OS, Advanced Web Tools, and Advanced Zoning).
- **HPE StorageWorks 2408 FCoE Power Pack+ Converged Network Switch**—Ships with 8 active Fibre Channel ports, 24 active CEE ports, base software (Full Fabric, Advanced Fabric OS, Advanced Web Tools, and Advanced Zoning), and Power Pack+ software (ISL Trunking, Advanced Performance Monitor, and Fabric Watch).
- **HPE StorageWorks 1606 Extension SAN Switch**—Ships with 6 Fibre Channel SFP ports and two active GbE ports. It includes a Full Fabric license.
- **HPE StorageWorks 1606 Extension Power Pack+ SAN Switch**—Ships with 16 Fibre Channel SFP ports, 6 active GbE ports, base software (Full Fabric, Advanced Fabric OS, Advanced Web Tools, and Advanced Zoning), and Power Pack+ software (Adaptive Networking, Fabric Watch, ISL Trunking, Extended Fabric, and Advanced Performance Monitor).

Power Pack+ models

All 8-Gb SAN Switch Power Pack+ models ship with the following licensed options:

- Adaptive Networking
- Fabric Watch
- APM
- Extended Fabric
- ISL Trunking
- Server Application Optimization

NOTE: The HPE StorageWorks 2408 FCoE Power Pack+ Converged Network Switch does not include Adaptive Networking or Extended Fabric.

The HPE StorageWorks 1606 Extension SAN Switch ships with the following additional license options:

- Advanced Extension
- Integrated Routing

For more information on these features, see the *Fabric OS Administrator's Guide* for the firmware version you are running.

8/8 and 8/24 SAN Switch features

- Functions as an edge device in fabrics of up to 239 switches.
- Integrates a single motherboard design with 667 MHz PowerPC 440EPx RISC CPU and integrated peripherals which provide high performance.
- Provides the EZSwitch Setup Wizard for easy setup and basic configuration.
- Provides on-demand scaling of 8 to 24 ports.
- Operates as a fully functional switch or an NPIV Access Gateway (with all ports licensed only).
- Integrates ISL Trunking (requires an optional license) and enables up to eight ports between a pair of switches to be combined to form a single, logical ISL switch with a speed of up to 64 Gb/s (128 Gb/s full duplex) for optimal bandwidth utilization and load balancing.

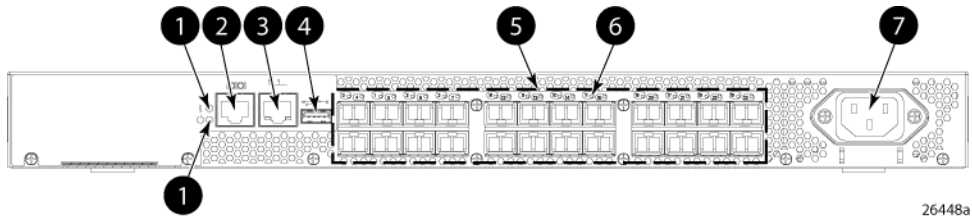
- Provides DPS, which optimizes fabric-wide performance and load balancing by automatically routing data to the most efficient available path in the fabric.
- Provides universal ports that self-configure as E_Ports, F_Ports, M_Ports, or FL_Ports.

Port side of the 8/8 and 8/24 SAN Switch

The port side of the 8/8 and 8/24 SAN Switch includes the system status LED, console port, Ethernet port, USB port, and FC ports with corresponding port status LEDs. Additionally, a pull-out tab identifies the serial number, MAC address, and WWN. Record the switch IP address on the pull-out tab for easy access.

[Figure 1 \(page 9\)](#) shows the port side of the 8/8 and 8/24 SAN Switch.

Figure 1 Port side view—8/8 and 8/24 SAN Switch



- | | |
|------------------------------------------------|------------------------------|
| 1. System status (top) and power (bottom) LEDs | 5. Fibre Channel status LEDs |
| 2. System RS-232 console port (RJ-45) | 6. Fibre Channel ports (24) |
| 3. Ethernet port with two Ethernet status LEDs | 7. AC power inlet |
| 4. USB port | |

Nonport side of the 8/8 and 8/24 SAN Switch

The nonport side is used solely for airflow. The enclosure uses forced-air cooling, with the fans pushing the air from the nonport side of the chassis through the enclosure, and exhausting to the port side.

Activating additional 8/8 and 8/24 SAN Switch ports

By default, the 8/8 SAN Switch model integrates eight licensed ports (ports 0 through 7). Additionally, the 8/24 SAN Switch model integrates 16 licensed ports (ports 0 through 15). To enable additional ports, you must purchase and install the HPE Storage Works 8/8 and 8/24 SAN Switch 8-Gb 8-port Upgrade LTU (part number T5518A):

- For the 8/8 SAN Switch—To enable ports 8 through 15, you must purchase and install one upgrade license. To enable ports 15 through 23, you must purchase and install one upgrade license.
- For the 8/24 SAN Switch—To enable ports 15 through 23, you must purchase and install a second upgrade license.

See [Installing and activating Port Upgrade licenses \(page 20\)](#).

Enabling E_Ports on the 8/8 SAN Switch

The 8/8 SAN Switch model requires that you purchase the HPE StorageWorks Full Fabric Upgrade License (part number T4261A) to enable E_Ports (the 8/24 SAN Switch ships with the Full Fabric license installed).

By default, the 8/8 SAN Switch cannot be connected to another switch until this license is installed. Without the license, the switch can still be connected directly to hosts and storage devices. To install the Full Fabric Upgrade License, use the `licenseadd` command. When installed, the

license appears under the `licenseshow` command as `Full Fabric License` and indicates that `E_Ports` are now enabled automatically.

8/40 SAN Switch features

- Provides the EZSwitch Setup Wizard for easy setup and basic configuration.
- Support for 1, 2, 4, and 8 Gb/s autosensing FC switch and router ports.
- Integrates a single motherboard design with 667 MHz PowerPC 440EPx RISC CPU and integrated peripherals which provide high performance.
- Ships FICON and FICON Cascading ready. FICON CUP is available, but requires an optional license.
- Provides two hot-swappable, redundant integrated power supply and fan FRUs.
- Universal ports that self-configure as `E_Ports`, `F_Ports`, `M_Ports`, or `FL_Ports`. `EX_Ports` are activated on a per-port basis with the optional HPE B-series 48-80 Port SAN Switch Integrated Routing LTU.

This license provides native FCR on a per-port basis, rather than limiting routing ports to those on a dedicated routing blade or switch. Just like traditional FCR, IR uses `EX_Ports` to import and export devices between fabrics, enabling selective device sharing while maintaining remote fabric isolation.

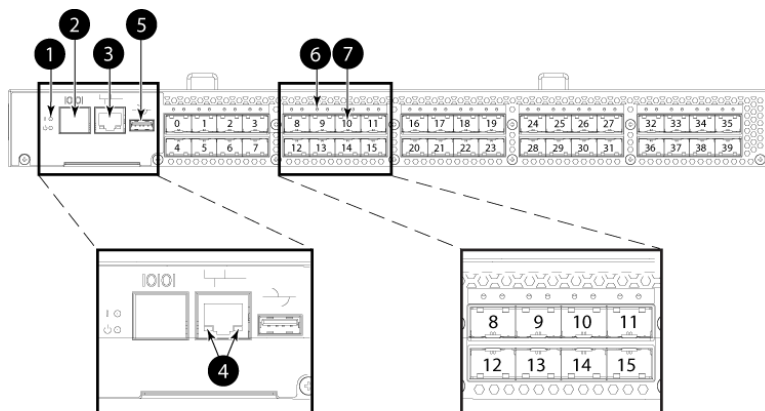
- Integrates a USB port that provides storage for firmware updates, output of the `supportsave` command and storage for configuration uploads and downloads.

Port side of the 8/40 SAN Switch

The port side of the 8/40 SAN Switch includes the system status LED, console port, Ethernet port and LEDs, USB port, and FC ports with corresponding port status LEDs.

Figure 2 (page 10) shows the port side of the 8/40 SAN Switch.

Figure 2 Port side view—8/40 SAN Switch



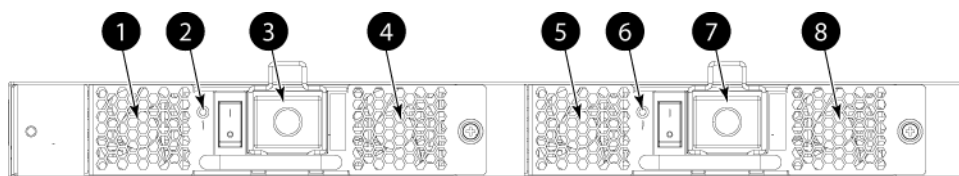
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|------------------------------------------------|----------------------------------|
| 1. System status (top) and power (bottom) LEDs | 5. USB port |
| 2. System RS-232 console port (RJ-45) | 6. Fibre Channel port status LED |
| 3. System Ethernet port | 7. Fibre Channel port |
| 4. Ethernet port LEDs (green/amber) | |

Nonport side of the 8/40 SAN Switch

The nonport side includes the two redundant power supply fan assemblies and the corresponding status LEDs. Figure 3 (page 11) shows the nonport side of the 8/40 SAN Switch.

Figure 3 Nonport side view—8/40 SAN Switch



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- | | |
|------------------------------------------------------------|-------------------------------------------------------------|
| 1. Fan (for power supply/fan FRU2) | 5. Fan (for power supply/fan FRU1) |
| 2. Power supply/fan status LED (for power supply/fan FRU2) | 6. Power supply/fan status LED (for power supply/fan FRU 1) |
| 3. Power supply connector (for power supply/fan FRU2) | 7. Power supply connector (for power supply/fan FRU 1) |
| 4. Fan (for power supply/fan FRU2) | 8. Fan (for power supply/fan FRU1) |

Activating additional 8/40 SAN Switch ports

By default, the 8/40 SAN Switch model integrates 24 licensed ports (ports 0 through 23). To enable additional ports, you must purchase and install the HPE Storage Works 8/40 SAN Switch 8-Gb 8-port Upgrade LTU (part number T5519A):

- To enable ports 24 through 31, you must purchase and install one upgrade license.
- To enable ports 32 through 40, you must purchase and install a second upgrade license.

See [Installing and activating Port Upgrade licenses \(page 20\)](#).

8/80 SAN Switch features

- Provides the EZSwitch Setup Wizard for easy setup and basic configuration.
- Integrates 1, 2, 4, and 8 Gb/s autosensing Fibre Channel switch and router ports.
- Includes a system motherboard that features a Freescale MPC8548 RISC CPU running at 1.3 GHz with integrated peripherals that provides high performance with low power consumption.
- Ships FICON and FICON Cascading ready. FICON CUP is available, but requires an optional license.
- Provides two hot-swappable, redundant power supply FRUs.
- Provides three hot-swappable fan FRUs in an N+1 configuration to provide hardware-redundant cooling.
- Provides universal ports that self-configure as E_Ports, F_Ports, M_Ports, or FL_Ports. EX_Ports are activated on a per-port basis with the optional HPE B-series 48-80 Port SAN Switch Integrated Routing LTU.

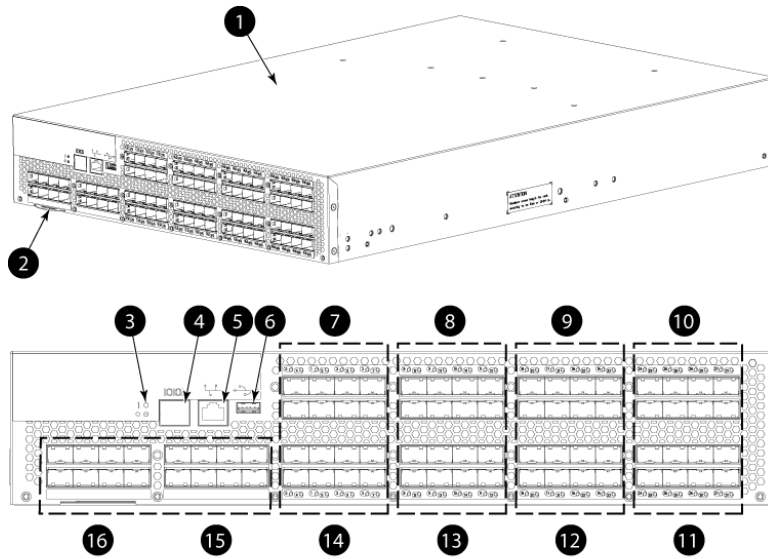
This license provides native FCR on a per-port basis, rather than limiting routing ports to those on a dedicated routing blade or switch. Just like traditional FCR, Integrated Routing uses EX_Ports to import and export devices between fabrics, enabling selective device sharing while maintaining remote fabric isolation.

- Integrates a USB port that provides storage for firmware updates, output of the `supportsave` command, and storage for configuration uploads and downloads.

Port side of the 8/80 SAN Switch

The port side of the 8/80 SAN Switch includes the system status LED, console port, Ethernet port and LEDs, USB port, and FC ports with corresponding port status LEDs. [Figure 4 \(page 12\)](#) shows the port side of the 8/80 SAN Switch.

Figure 4 Port side view—8/80 SAN Switch



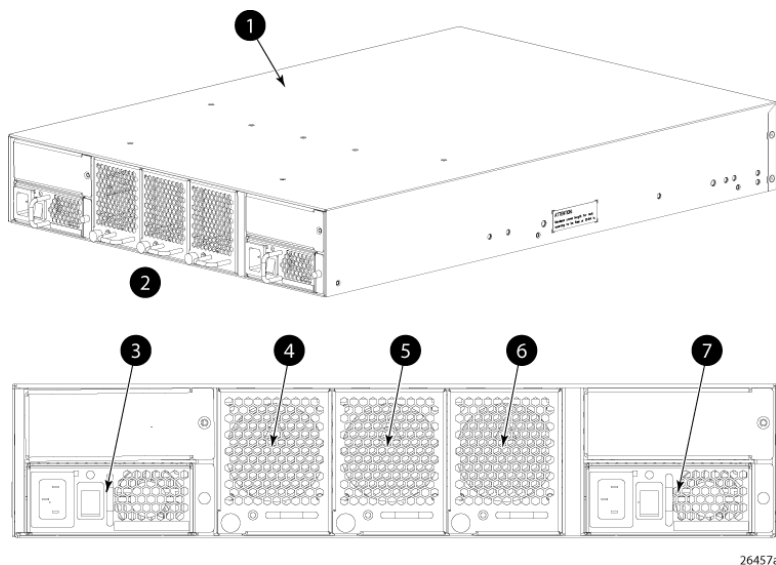
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|----------------------------------------|--------------------|
| 1. 8/80 SAN Switch | 9. FC ports 16–23 |
| 2. Switch ID pull-out tab | 10. FC ports 24–31 |
| 3. Status LED (top) power LED (bottom) | 11. FC ports 32–38 |
| 4. Console port | 12. FC ports 40–47 |
| 5. Ethernet port | 13. FC ports 48–55 |
| 6. USB port | 14. FC ports 56–63 |
| 7. FC ports 0–7 | 15. FC ports 64–71 |
| 8. FC ports 8–15 | 16. FC ports 72–79 |

Nonport side of the 8/80 SAN Switch and the Encryption SAN Switch

Figure 5 (page 13) shows the nonport side of the 8/80 SAN Switch and the Encryption SAN Switch, which contains the power supplies (including the AC power receptacle and AC power switch) and fans.

Figure 5 Nonport side view—8/80 SAN Switch



- | | |
|--------------------|--------------------|
| 1. 8/80 SAN Switch | 5. Fan assembly #2 |
| 2. Nonport side | 6. Fan assembly #1 |
| 3. Power supply #2 | 7. Power supply #1 |
| 4. Fan assembly #3 | |

Activating additional 8/80 SAN Switch ports

By default, the 8/80 SAN Switch model integrates 48 licensed ports (ports 0 through 47). To enable additional ports, you must purchase and install the HPE StorageWorks 8/80 SAN Switch 8-Gb 16-port Upgrade LTU (part number T5520A):

- To enable ports 48 through 63, you must purchase and install one upgrade license.
- To enable ports 64 through 80, you must purchase and install a second upgrade license.

See [Installing and activating Port Upgrade licenses \(page 20\)](#).

Encryption SAN Switch features

The Encryption SAN Switch has the following features:

- 32 front-end 1, 2, 4, or 8 Gb/s autosensing F_Port, FL_Port, E_Port, EX_Port, or M_Ports to connect host servers, SAN disks, SAN tapes, edge switches, or core switches
- Encryption and decryption engines to provide in-line crypto services with up to 96 Gb/s throughput for disk I/O and up to 48 Gb/s throughput for tape I/O (mix of ciphertext and cleartext traffic)
- Integrated with HPE SKM system
- Full 1:1 subscription on all 32 ports at 8 Gb/s
- HA cluster, DEK cluster, and EG to enable transparent failover, host MPIO failover, and centralized management of multiple encryption switches
- Support for automatic expiry or CLI manual based re-keying
- Compliance with encryption standards: AES256-XTS 1619.1 (for disk); AES256-GCM IEEE 1619.2 (for tape)
- Smart Card
- Hardware-based key management and generation

- IR Fabric Service (optional) to enable encryption capabilities across multiple fabrics
- NPIV support
- Two hot-swappable, redundant power supply FRUs
- Three hot-swappable fan FRUs in the N+1 configuration to provide hardware-redundant cooling
- One RJ-45 10/100/1000 Ethernet management port
- Two RJ-45 GE ports for clustering interconnection and re-key, and DEK synchronization within cluster
- One RJ-45 serial console port
- A USB port that facilitates firmware upgrades, serviceability, and system-log functionality
- A switch subsystem and encryption subsystem that features a CPU running at 1.3 GHz with integrated peripherals that provide high performance with low power consumption
- DPS, optimizing fabric-wide performance and load balancing by automatically routing data to the most efficient available path in the fabric
- SFP or SFP+ optical transceivers, providing support for a combination of SWL, LWL, or ELWL optical media among the switch ports

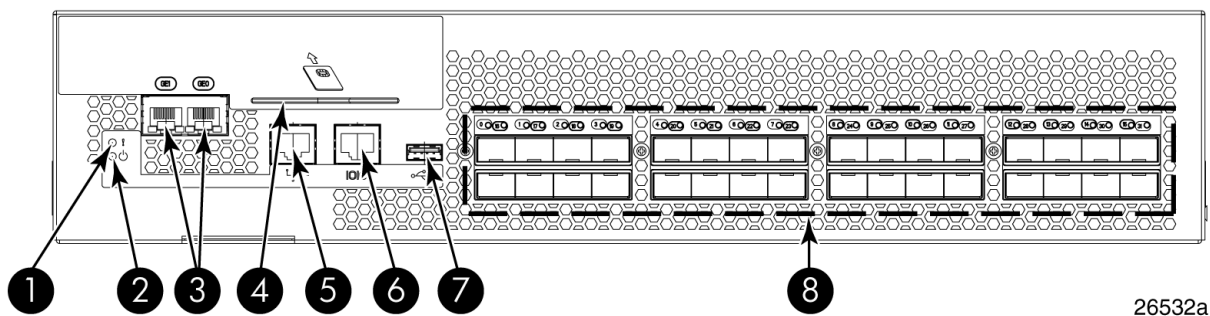
NOTE: The full range of 1, 2, 4, and 8 Gb/s can be achieved only by a combination of 4 Gb/s SFPs (1, 2, and 4 Gb/s) and 8 Gb/s SFP+ (2, 4, and 8 Gb/s).

- Fabric OS support, delivering distributed intelligence throughout the network and enabling a wide range of applications including Web Tools and Zoning. Optional fabric services include: Adaptive Networking with QoS, Extended Fabrics, Enhanced Group Management, Fabric Watch, ISL Trunking, IR, and End-to-End performance monitoring using APM.
- Extensive diagnostics and system-monitoring capabilities to enhance high RAS
- *Pay as you go* port and performance scalability through an Encryption Performance Upgrade License. The base configuration provides 48 Gb/s of encryption bandwidth. The Encryption Performance Upgrade License activates an additional 48 Gb/s bandwidth. Each switch accepts two encryption-performance upgrades for a total of 96 Gb/s of encryption bandwidth. The front-end user ports in the basic, first, and second levels of encryption bandwidth remain as 32 ports at 8 Gb/s Fibre Channel.

Port side of the Encryption SAN Switch

The port side of the Encryption SAN Switch includes the status and power LEDs, smart card reader, the RJ-45 USB, and FC ports. [Figure 6 \(page 15\)](#) shows the port side of the Encryption SAN Switch.

Figure 6 Port side of the Encryption SAN Switch



- | | |
|--------------------------------------------------|-------------------------------|
| 1. Status LED | 5. RJ-45 management port |
| 2. Power LED | 6. RJ-45 serial console port |
| 3. RJ-45 GE ports (for clustering and re-keying) | 7. USB port |
| 4. Smart Card reader | 8. Fibre Channel ports (0–31) |

FCoE Converged Network Switch features

The FCoE Converged Network Switch has the following features:

- Includes a system motherboard with a Freescale MPC8548 RISC CPU running at 1.3 GHz and integrated peripherals, that provides high performance with low power consumption
- Contains an RJ-45 Ethernet management port and EZSwitch Setup, which supports switch IP address discovery and configuration
- Integrates a USB port that provides storage for firmware updates, as well as `supportsave` command output and configuration uploads and downloads
- Provides two hot-swappable, redundant power supply FRUs
- Provides three hot-swappable fan FRUs in an N+1 configuration to provide hardware-redundant cooling
- Includes universal ports that self-configure as E_Ports, F_Ports, M_Ports, or FL_Ports
- Provides extensive diagnostics and system-monitoring capabilities for enhanced RAS
- Provides FCoE-to-FC latency of 1,670 ns

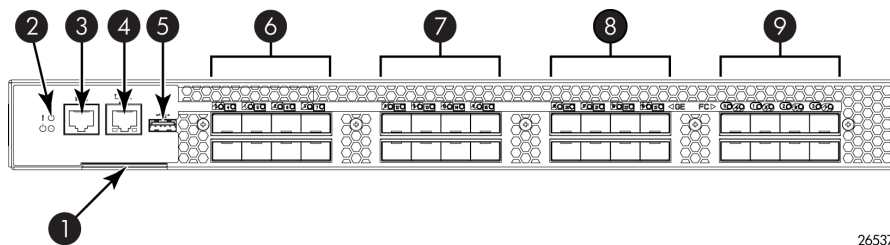
The FCoE Converged Network Switch has the following Ethernet capabilities:

- Contains 24 ports, 10-GbE CEE
- Provides low-latency, lossless, deterministic interconnect required for FCoE
- Provides FCoE support with FPMA discovery. Fabric OS also enables support for Priority-based Flow Control (802.1Qbb)
- Includes DCBX - Capabilities Exchange and Enhanced Transmission Selection (802.1Qaz) to meet the lossless and deterministic FCoE requirement
- Enables hardware-assisted MAC learning and aging
- Support for 32,768 MAC addresses and 4,096 VLANs
- Support for Layer 2 protocols STP/MSTP/RSTP (802.1q) and Link Aggregation (802.1ad)
- Hewlett Packard Enterprise branded 10-Gb SFP+ (SR and LR) and active copper cables
- Provides CEE port to CEE port latency of 570 ns (same ASIC) and 1,050 ns (different ASIC)

Port side of the FCoE Converged Network Switch

Figure 7 (page 16) shows the port side of the FCoE Converged Network Switch.

Figure 7 Port side of the FCoE Converged Network Switch

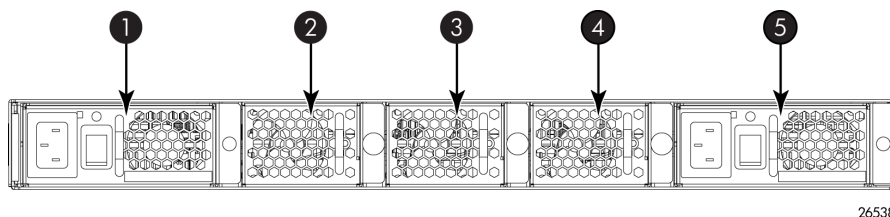


- | | |
|------------------------------------------------|-----------------------|
| 1. Switch ID pull-out tab | 6. 10-GbE ports 0–7 |
| 2. System status (top) and power (bottom) LEDs | 7. 10-GbE ports 8–15 |
| 3. Serial console port | 8. 10-GbE ports 16–23 |
| 4. Management Ethernet port | 9. FC ports 0–7 |
| 5. USB port | |

Nonport side of the FCoE Converged Network Switch

Figure 8 (page 16) shows the nonport side of the FCoE Converged Network Switch.

Figure 8 Nonport side of the FCoE Converged Network Switch



- | | |
|--------------------|--------------------|
| 1. Power supply #2 | 4. Fan assembly #1 |
| 2. Fan assembly #3 | 5. Power supply #1 |
| 3. Fan assembly #2 | |

1606 Extension SAN Switch features

A fully licensed 1606 Extension SAN Switch has the following features:

- FCIP capability
 - Includes up to eight FCIP tunnels.
 - Each FCIP tunnel is represented and managed as a VE_Port.
 - Fibre Channel Routing Services can be used over the FCIP link.
 - Fabrics connected through FCIP merge if the ports are configured as VE_Ports, and do not merge if one end of the connection is configured as a VEX_Port. If VE_Ports are used in a Fibre Channel Routing Services backbone fabric configuration, then the backbone fabric merges but the EX_Ports attached to edge fabrics do not merge. For more information, see the *Fabric OS Administrator's Guide*.
- FCIP Trunking with load balancing and network-based failure recovery

- Adaptive Rate Limiting
 - Configurable minimum and maximum committed bandwidth per FCIP tunnel
 - Minimum rate is guaranteed rate
- FC Frame Compression before FCIP Encapsulation
- FCR
- SOTCP with reorder resistance
- FastWrite over FCIP (not over FC)
- Open Systems Tape Pipelining over FCIP
- FCIP QoS
- TCP Performance Graphing in Web Tools
- FICON and FICON Cascading ready.
- FICON CUP (requires an optional license).
- FICON Accelerator for IBM TotalStorage z/OS Global Mirror (aka, XRC) and FICON Tape (requires an optional license).

The 1606 Extension SAN Switch has the following hardware features:

- Up to 16 Fibre Channel SFP ports supporting Fibre Channel Switching or Fibre Channel Routing Services, with link speeds of 1-, 2-, 4-, or 8-Gb/s
- Up to 6 1-GbE ports supporting the FCIP and Fibre Channel Routing Services features, with transmit link speeds of up to 1-Gb/s on each port
Two ports (ge0 and ge1) can be configured for use with either copper or optical cables
- Rack-mountable 1U chassis
- Two PowerPC 440EPx processors running at 667 MHz
- One GoldenEye2 switch ASIC for 1, 2, 4, or 8 Gb/s FC switching
- One Cavium CN5740 running with 8 MIPS cores at 750 MHz for data path processing
- One Blaster FPGA for FC compression, offloads such as chksum generation/checks
- One 10/100/1000 Base-T Ethernet port for the management interface
- One RJ-45 terminal port
- One USB port for storing firmware updates, `supportSave` command output, and configuration uploads and downloads
- Two redundant, hot-swappable combined power supply/fan assembly FRUs
- Five internal temperature sensors

Feature comparison of base and upgraded products

[Table 1 \(page 17\)](#) compares the features supported on the base and fully upgraded 1606 Extension SAN Switch. It also lists the optionally licensed features.

Table 1 Comparison of 1606 Extension SAN Switch features

Feature	Base product	With upgrade license
Number of Fibre Channel ports	4	16
Number of GbE ports	2	6

Table 1 Comparison of 1606 Extension SAN Switch features (continued)

Feature	Base product	With upgrade license
Fibre Channel Routing between remote fabrics for fault isolation	Yes ¹	Yes ¹
FCIP Tunnel	Yes	Yes
Number of FCIP tunnels	2	8
FCIP Trunking	Yes ²	Yes ²
Adaptive Rate Limiting	Yes ²	Yes ²
FC Frame Compression	Yes	Yes
SOTCP	Yes	Yes
FastWrite over FCIP Tunnel	Yes	Yes
Open Systems Tape Pipelining over FCIP Tunnel	No	Yes

¹ Requires Integrated Routing license

² Requires Advanced Extension license

- Before installation of the upgrade license, any ports other than the basic four FC ports and two GbE ports are shown as `Disabled` when you execute the `switchshow` command.
- On the base 1606 Extension SAN Switch, you can configure the two GbE ports (ge0 and ge1) for use with either copper or optical cables (physically separate ports are provided).
- FC frame compression is not the same as IP compression and is disabled by default. To enable FC frame compression use the `portCfg` command. For more information, see the *Fabric OS Administrator's Guide*.
- FCIP tunnel bandwidth has a minimum rate of 1,544 Kb/s (the T1 rate). Configuration requests with lower rates are rejected.
- FCIP Trunking is available to virtualize two or more IP address pairs (circuits) as part of a single FCIP tunnel. You can configure up to four circuits for a single FCIP tunnel. For more information on configuring circuits, see the *Fabric OS Administrator's Guide*.
- Multiple FCIP tunnels can share the same GbE port. `VE_Ports` and `VEx_Ports` are not associated with a single physical GbE port.

Available licenses

The following features are available with the purchase of a license key for the 1606 Extension SAN Switch:

- Advanced Extension
- IR
- Extended Fabric
- Adaptive Networking
- Server Application Optimization
- ISL Trunking
- Fabric Watch
- Advanced Performance Monitor

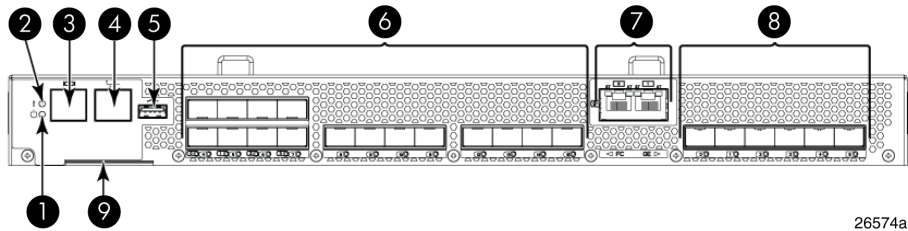
- FICON CUP
- FICON Accelerator

For information on these features, see the *Fabric OS Administrator's Guide*.

Port side of the 1606 Extension SAN Switch

Figure 9 (page 19) shows the components on the port side of the 1606 Extension SAN Switch.

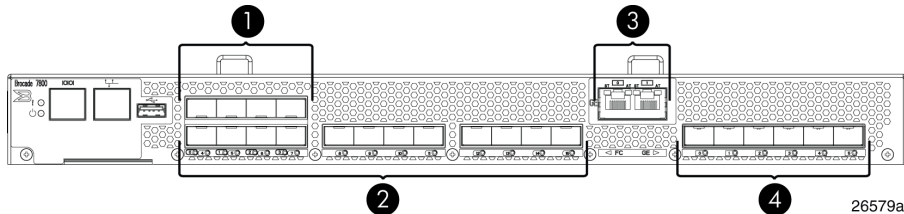
Figure 9 Port side of the HPE 1606 Extension SAN Switch



- | | |
|-----------------------------|-------------------------------|
| 1. System power LED | 6. Fibre Channel ports (16) |
| 2. System status LED | 7. GbE ports: copper RJ45(2) |
| 3. Console port (RJ45) | 8. GbE ports: optical SFP (6) |
| 4. Ethernet management port | 9. Serial number pull-out tab |
| 5. USB port | |

The Fibre Channel ports are numbered from left to right on the faceplate, as shown in Figure 10 (page 19).

Figure 10 Port numbering on the 1606 Extension SAN Switch



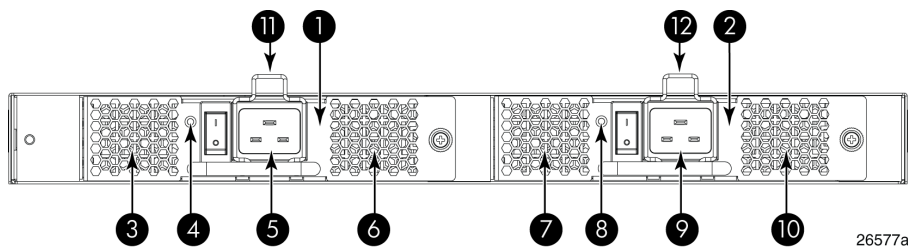
- | | |
|-----------------------------|-------------------------------------|
| 1. Fibre Channel ports 0–3 | 3. GbE ports: ge0-ge1 (copper only) |
| 2. Fibre Channel ports 4–15 | 4. GbE ports: ge0–ge5 (SFP) |

A fully licensed 1606 Extension SAN Switch can have two trunking groups. Group 1 consists of Fibre Channel ports 0–7, and group 2 consists of Fibre Channel ports 8–15.

Nonport side of the 1606 Extension SAN Switch

Figure 11 (page 20) shows the nonport side of the 1606 Extension SAN Switch, which contains the combined power supplies and fans.

Figure 11 Nonport side of the 1606 Extension SAN Switch



- | | |
|-------------------------------------|---------------------|
| 1. Fan and power supply assembly #2 | 7. Fan assembly 1 |
| 2. Fan and power supply assembly #1 | 8. FRU LED |
| 3. Fan assembly #2 | 9. Power supply #1 |
| 4. FRU LED | 10. Fan assembly #1 |
| 5. Power supply #2 | 11. FRU handle |
| 6. Fan assembly #2 | 12. FRU handle |

Installing and activating Port Upgrade licenses

1. Use the `portshow` command to verify the number of ports licensed on your switch. The port status output indicates `Started` and `Licensed` for enabled ports. For more information on this command, see the *Fabric OS Command Reference Manual*.
2. Obtain the WWN from the Switch ID pull-out tab located on the port side of your switch. Alternately, you can use the `switchshow` command to display the WWN.
3. Contact your Hewlett Packard Enterprise representative to purchase the appropriate Port Upgrade license. Hewlett Packard Enterprise requires the switch WWN obtained in [Step 2](#) to assign a license key.
4. Install the license:
 - a. Log in to the switch as `admin`.
 - b. Issue the `licenseadd` command, followed by the license key enclosed in quotation marks. (The license key consists of approximately 16 uppercase and lowercase letters and numerals.)

❗ **IMPORTANT:** Enter the license key exactly as issued. If you enter the key incorrectly, the license will not function properly.

- c. Enter the `licenseshow` command to verify that the license is valid. If a licensed product is not displayed, the license is not valid.

NOTE: It is not necessary to reboot the system.

5. Configure the inactive ports. Enter the `portstart` command to start the ports. This command loads the port code, unlike the `portenable` command, which enables the port laser. For example:

```
portstart 16-31
```
6. Enter the `portenable` command to enable the ports. For example:

```
portenable 16-31
```
7. (Optional) Enter the `portshow` command to verify that the newly activated ports are started.

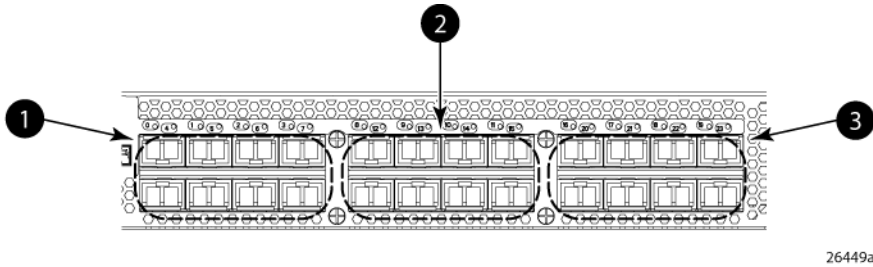
SAN Switch ISL Trunking groups

All 8-Gb SAN Switch models support ISL Trunking as an optional, licensed feature for FC ports. When this feature is enabled, trunked groups of up to eight contiguous ports are created.

For example, the Fibre Channel ports on the SAN Switch are numbered from left to right and color-coded into groups of eight to indicate which ports you can combine into trunked groups. [Figure 12 \(page 21\)](#) shows the 8/8 SAN Switch with three trunked groups of eight ports.

NOTE: If your 8-Gb SAN Switch is licensed for ISL Trunking (for example, Power Pack+ models ship with this license), use the trunking groups available on the switch.

Figure 12 Trunking groups example



1. Trunk group 1: Ports 0–7

3. Trunk group 3: Ports 16–23

2. Trunk group 2: Ports 8–15

For more information about trunking, see the *Fabric OS Administrator's Guide* for the firmware version you are running.

Supported SFP transceiver options

[Table 2 \(page 21\)](#) lists the *only* SFPs supported in your HPE StorageWorks 8-Gb SAN Switches.

Table 2 Supported SFP transceiver options

Switch product	Port type	Option	Part number
2408 FCoE switch	Fibre Channel	8Gb/s short wave SFP+	AJ716A
		8Gb/s long wave SFP+	AJ717A
		4Gb/s short wave SFP	AJ715A
		4Gb/s long wave SFP	AK870A
		4Gb/s extended long wave SFP	AN211A
		8Gb/s extended long wave SFP	AW538A
	10GbE CEE ports	10GbE short range SFP+	AP823A
		10GbE long range SFP+	AP824A
		1m active copper SFP+ cable	AP818A
		3m active copper SFP+ cable	AP819A
5m active copper SFP+ cable		AP820A	
1606 Extension switch	Fibre Channel	8Gb/s short-wave SFP+	AJ716A
		8Gb/s long-wave SFP+	AJ717A
		4Gb/s short-wave SFP	AJ715A

Table 2 Supported SFP transceiver options (continued)

Switch product	Port type	Option	Part number
		4Gb/s long-wave SFP	AK870A
		4Gb/s extended long-wave SFP	AN211A
		8Gb/s extended long-wave SFP	AW538A
	1GbE FCIP ports	4Gb/s short-wave SFP	AJ715A
		4Gb/s long-wave SFP	AK870A
		4Gb/s extended long-wave SFP	AN211A
		1GbE copper SFP	AW537A
	8Gb SAN Switches	Fibre Channel	8Gb/s short-wave SFP+
8Gb/s long-wave SFP+			AJ717A
4Gb/s short-wave SFP			AJ715A
4Gb/s long-wave SFP			AK870A
4Gb/s extended long-wave SFP			AN211A
8Gb/s extended long-wave SFP			AW538A

8-Gb SAN Switch software options

The following optional software kits and licenses are available. More information on these products is include in the product QuickSpecs, which can be accessed from the Hewlett Packard Enterprise website:

http://h18006.www1.hp.com/storage/networking/b_switches/san/index.html

- HPE StorageWorks Full Fabric Upgrade License
- HPE StorageWorks 8/8 and 8/24 SAN Switch 8-Gb 8-port Upgrade LTU
- HPE StorageWorks 8/80 SAN Switch 8-Gb 16-port Upgrade LTU
- HPE StorageWorks 8/40 SAN Switch 8-Gb 8-port Upgrade LTU
- Adaptive Networking
- Fabric Watch
- ISL Trunking
- APM
- Extended Fabric
- HPE B-series 48-80 Port SAN Switch Integrated Routing LTU (purchase for 8/80 SAN Switch *only*)
- Data Center Fabric Manager Professional Plus (4 fabrics, 2560 switch ports)
- Data Center Fabric Manager Enterprise (24 fabrics, 9000 switch ports)
- HPE Encryption SAN Switch Performance Upgrade LTU
- HPE StorageWorks 1606 Switch Upgrade to Full LTU

- HPE StorageWorks Extension SAN Switch Advanced LTU
- HPE StorageWorks 1606 Extension SAN Switch FICON Control Unit Port LTU
- HPE StorageWorks 1606 Extension SAN Switch Integrated Routing LTU (purchase for 1606 Extension SAN Switch only)
- HPE 1606 Switch FICON CUP Accelerator LTU
- HPE StorageWorks Power Pack Upgrade
- SAO
- HPE B-series 24-40 Port SAN Switch Integrated Routing LTU (purchase for 8/40 SAN Switch only)

8-Gb SAN Switch hardware options

Table 3 (page 23) lists the optional hardware kits.

Table 3 Optional hardware kits

Hardware kit	Order number
HPE StorageWorks 2-Gb USB Device	AK864A
OM2 LC-LC type cables	
2 m LC-to-LC multi-mode FC cable	221692-B21
5 m LC-to-LC multi-mode FC cable	221692-B22
15 m LC-to-LC multi-mode FC cable	221692-B23
30 m LC-to-LC multi-mode FC cable	221692-B26
50 m LC-to-LC multi-mode FC cable	221692-B27
OM3 LC-LC type cables	
0.5 m LC-LC multi-mode OM3 FC cable	AJ833A
1 m LC-LC multi-mode OM3 FC cable	AJ834A
2 m LC-LC multi-mode OM3 FC cable	AJ835A
5 m LC-LC multi-mode OM3 FC cable	AJ836A
15 m LC-LC multi-mode OM3 FC cable	AJ837A
30 m LC-LC multi-mode OM3 FC cable	AJ838A
50 m LC-LC multi-mode OM3 FC cable	AJ839A
LC-SC for between a 1-Gb and a 2-Gb device	
2 m LC-SC multi-mode FC cable	221691-B21
5 m LC-SC multi-mode FC cable	221691-B22
15 m LC-SC multi-mode FC cable	221691-B23
30 m LC-SC multi-mode FC cable	221691-B26
50 m LC-SC multi-mode FC cable	221691-B27

NOTE: For the latest information on hardware and software components, see the B-series Switches section of the HPE Storage Networking website: <http://www.hpe.com/go/san>.

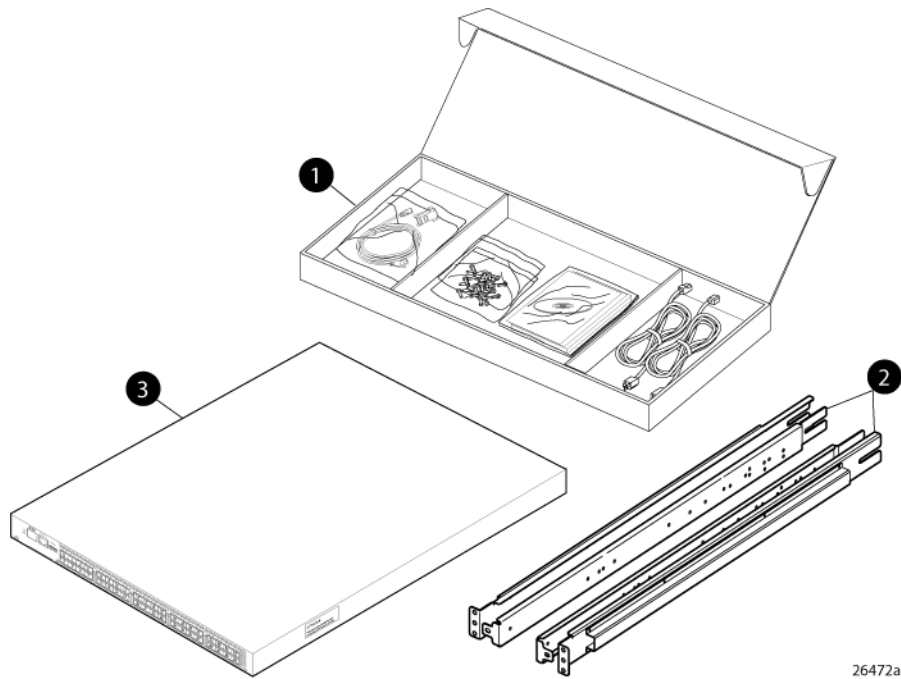
2 Installing and configuring an 8-Gb SAN Switch

This chapter provides information about and instructions to install and configure an 8-Gb SAN Switch.

Shipping carton contents

Figure 13 (page 24) and Table 4 (page 25) identify shipping carton contents for a typical 8-Gb SAN Switch. The shipping configuration for your model can vary.

Figure 13 8/40 SAN Switch shipping carton contents



1. Accessory kit
2. Rails
3. Switch

Table 4 8-Gb SAN Switch shipping carton contents

Description
One accessory kit, containing the following items: <ul style="list-style-type: none">• HPE StorageWorks product documentation:<ul style="list-style-type: none">◦ <i>HPE StorageWorks 8-Gb SAN Switch Quick Start Instructions</i>◦ <i>HPE StorageWorks SAN Switch Rack Mount Kit Installation Instructions</i>◦ <i>Read Me First</i>◦ Safety Guides◦ User License◦ Warranty• A serial cable, approximately 3 m (10 ft.)• Plenum (not shown) ships in your switch accessory kit only if required for installing your switch in an HPE custom rack. For more information, see the <i>HPE StorageWorks SAN Switch Rack Mount Kit Installation Instructions</i>. The plenum is an air duct that attaches to the SAN Switch Rack Mount Kit switch rails.• Four rubber feet for mounting on a flat surface (a lab bench, for example)• EZSwitch Setup CD• One or two grounded power cords, as required for your particular switch• PDU power cords, as required for your particular switch
SAN Switch Rack Mount Kit hardware and rail assemblies: <ul style="list-style-type: none">• Two rear mounting brackets• A right inner rail and a right outer rail• A left inner rail and a left outer rail
One 8-Gb SAN Switch, including power supply and fan assembly units

Installation and safety considerations

You can install the switch in a rack or as a standalone device on a flat surface.

Hewlett Packard Enterprise highly recommends mounting the switch in one of the following Hewlett Packard Enterprise customized racks:

- HPE System/e Rack
- HPE 10000 Series Rack

Electrical considerations

For successful installation and operation of the switch, ensure that the following electrical requirements are met:

- The primary outlet is correctly wired, protected by a circuit breaker, and grounded in accordance with local electrical codes.
- The supply circuit, line fusing, and wire size are adequate, as specified by the electrical rating on the switch nameplate.
- A minimum of 79.8 cubic meters/hour (47 cubic feet/minute) of airflow is available to the air intake vents on the nonport side of the switch.
- The power supply standards provided in [Power supply specifications \(page 75\)](#), are met.

Environmental considerations

Before installing the switch, verify that the following environmental requirements are met:

- Install the switch with the nonport side, which contains the air intake vents, facing the cool-air aisle.
- All equipment in the rack forces air in the same direction, to avoid taking in exhaust air.
- A minimum of 24 cubic ft/min of airflow is available to the air intake vents on the nonport side of the switch.
- The ambient air temperature does not exceed 40°C (104°F) while the switch is operating.

ⓘ **IMPORTANT:** The 40°C value applies to the ambient air temperature at the air intake vents on the nonport side of the switch. The temperature inside the switch can be up to 80°C (176°F) during switch operation. If the internal temperature range exceeds the operating ranges of the components, the LEDs, error messages, and Fabric Watch alerts indicate a problem. Enter the `tempshow` or `fabric watch` command to view the temperature status.

Rack mount considerations

If you are installing the switch in a rack, verify that the following requirements are met:

- The cabinet or rack must be a standard EIA cabinet.
- Plan rack mount space that is 1 U high, and 48.3 cm (19 inches) wide. One U is 4.45 cm (1.75 inches).
- Ground all equipment in the cabinet through a reliable branch circuit connection, and maintain ground at all times. Do not rely on a secondary connection to a branch circuit, such as a power strip.
- Ensure that airflow and temperature requirements are met on an ongoing basis, particularly if the switch is installed in a closed or multirack assembly.
- Verify that the additional weight of the switch does not exceed the cabinet's weight limits.
- Secure the rack to ensure stability in case of unexpected movement, such as an earthquake.

Cabling considerations

NOTE: Cables can be organized and managed in a variety of ways: for example, using cable channels on the sides of the cabinet or patch panels to minimize cable management.

Before installing the switch, plan for cable management based on the following Hewlett Packard Enterprise recommendations:

- Leave enough space to allow for the fact that the minimum bend radius for a 50-micron cable is 5 cm (2 inches) under full tensile load and 3 cm (1.2 inches) with no tensile load.
- Leave at least 1 m (3.28 ft) of slack for each port cable. This provides room to remove and replace the switch, allows for inadvertent movement of the rack, and helps prevent the cables from being bent to less than the minimum bend radius.
- If you are using ISL Trunking, consider grouping cables by trunking groups. The cables used in trunking groups must meet specific requirements, as described in the *Fabric OS Administrator's Guide*.
- For easier maintenance, label the fiber optic cables, and record the devices to which they are connected.

- Keep LEDs visible by routing port cables and other cables away from the LEDs.
-
- △ **CAUTION:** Do not use tie wraps on fiber optic cables because wraps are easily overtightened and can damage the optical fibers.
-
- Use Velcro straps to secure and organize fiber optic cables.

Items required for installation

Obtain the following:

- 8-Gb SAN Switch installed and connected to a power source
- A workstation with an installed terminal emulator, such as HyperTerminal
- Unused IP address and corresponding subnet mask and gateway address
- Serial cable (supplied with switch)
- Ethernet cable
- SFP transceivers and compatible cables, as required

NOTE: For FCoE Converged Network Switches, both HPE-branded FC SFPs and CEE 10-GbE SFPs are required. FC SFP+ transceivers are required for 8-Gb/s performance; copper cables must be HPE-branded.

- Access to an FTP server to back up the switch configuration (optional)

Installing the switch as a standalone device

To install the switch as a standalone unit:

1. Unpack the switch, and verify that all items listed in [Shipping carton contents \(page 24\)](#) are present.
2. Locate the four rubber feet in the accessory box.
3. Apply the adhesive rubber feet to the switch. The rubber feet help prevent the switch from sliding off the supporting surface.
 - a. Clean the indentations at each corner of the bottom of the switch to ensure that they are free of dust or other debris that can lessen the adhesion of the feet.
 - b. With the adhesive side against the chassis, place one rubber foot in each indentation and press into place.
4. Place the switch on a flat, sturdy surface.
5. Apply power to the switch as described in [Powering on the 8-Gb SAN Switch \(page 38\)](#).

-
- △ **CAUTION:** Do not connect the switch to the network until the IP address is set. See [Setting the switch IP address \(page 39\)](#).
-

Installing the switch using the SAN Switch Rack Mount Kit

This section describes the use of the SAN Switch Rack Mount Kit (part number A7511A) to rack mount SAN switches and routers.

Use the SAN Switch Rack Mount Kit for installations in the following HPE StorageWorks custom racks only:

- HPE 9000 Series Rack
- HPE 10000 Series Rack

- HPE 10000 G2 Series Rack
- HPE System/e Rack

NOTE: In this document, “HPE 10000 Series Rack” refers to both the HPE 10000 Series Rack and the HPE 10000 G2 Series Rack.

Supported devices

Use the SAN Switch Rack Mount Kit to install the following switch models:

- SAN Switch 2/8V
- SAN Switch 2/8
- SAN Switch 2/8-EL
- SAN Switch 2/16V
- SAN Switch 2/16
- SAN Switch 2/16N
- SAN Switch 2/32
- SAN Switch 4/32
- SAN Switch 4/32B
- 4/8 SAN Switch
- 4/16 SAN Switch
- 4/64 SAN Switch
- 8/8 SAN Switch
- 8/24 SAN Switch
- 8/40 SAN Switch
- 8/80 SAN Switch
- 1606 Extension SAN Switch
- FCoE Converged Network Switch
- Encryption SAN Switch
- Multiprotocol (MP) Router
- 400 Multiprotocol (MP) Router

Related documentation

For the latest B-series switch product documentation, see the **storage** section on the Hewlett Packard Enterprise website:

<http://www.hp.com/support/manuals>

Before you begin—Important information about the plenum

The plenum is an air duct that attaches to the switch rails, enabling the switch to draw cooler air into the switch from outside the rack, rather than drawing in heated air from within the rack.

A plenum ships with the following 8-Gb SAN Switch models only:

- SAN Switch 2/8V
- SAN Switch 2/8

- SAN Switch 2/16V
- 4/8 SAN Switch
- 4/16 SAN Switch
- 4/32B SAN Switch
- 8/8 SAN Switch
- 8/24 SAN Switch

See [\(page 36\)](#) for instructions on installing the plenum.

Installation and safety guidelines

Verify that the rack and the area around the rack meet the following requirements:

- Plan a rack space that is 1.5 units high (6.7 cm or 2.6 inches), 48.3 cm (19 inches) wide, and at least 68.6 cm (23 inches) deep. For the MP Router, 4/64 SAN Switch, or 8/80 SAN Switch, and Encryption SAN Switch, plan a rack space that is at least 2 units high.
- Ground all equipment in the rack through a reliable branch circuit connection, and maintain ground at all times. Do not rely on a secondary connection to a branch circuit, such as a power strip.
- Ensure that airflow and temperature requirements are met on an ongoing basis.
- Secure the rack to ensure stability in case of unexpected movement.

Installing the HPE SAN Switch Rack Mount Kit in your Hewlett Packard Enterprise custom rack

The SAN Switch Rack Mount Kit enables you to install your Hewlett Packard Enterprise device in the following Hewlett Packard Enterprise custom racks:

- HPE System/e Rack
- HPE 10000 Series rack

For optimal cable management, Hewlett Packard Enterprise recommends that you install the SAN Switch Rack Mount Kit to allow the nonport side of the device to slide out of the cool-air side of the rack. In this installation, the port side of the switch is set back from the edge of the rack, allowing a more gradual bend in the fiber optic cables.

NOTE: The SAN Switch Rack Mount Kit installation requires one technician.

The following items are required to install the switch in a rack:

- Power cables
- A #2 Phillips screwdriver
- A 7/16-inch wrench or socket
- Plenum (if required)

See “[Before you begin—Important information about the plenum](#)” (page 28) to determine whether you need to install a plenum before rack mounting your device.

- SAN Switch Rack Mount Kit hardware, listed in [Table 5 \(page 30\)](#)

[Table 5 \(page 30\)](#) identifies the rails and rail-mounting hardware.

Depending on your configuration, one of the following devices may be required:

- SAN Switch or MP Router
- FCoE Converged Network Switch
- Encryption SAN Switch

Table 5 SAN Switch Rack Mount Kit hardware

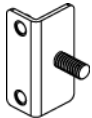





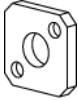


Item	Description
	Two rear mounting brackets
	A right inner rail and a right outer rail
	A left inner rail and a left outer rail
	<p>Fourteen #8-32 x 3/16-inch Phillips panhead screws with thread lock for use with the SAN Switch 2/32 only.</p> <p>Fourteen #8-32 x 5/16-inch Phillips panhead SEMS screws for use with the 4/8, 4/16, 4/32, 4/64 SAN and 4/32B SAN Switches, and the 2/16, 2/8V, 2/16V, MP Router, 400 MP Router, 8/8, 8/24, 8/40, 8/80, and FCoE Converged Network Switch</p>

Table 5 SAN Switch Rack Mount Kit hardware *(continued)*

Item	Description
	NOTE: All devices require 10 screws except for the 4/32B SAN Switch, MP Router, Encryption SAN Switch, and FCoE Converged Network Switch, which require only 6 screws.
	Ten #10-32 x 1/2-inch Phillips panhead screws with captive star lock washers
	Eight #10 alignment washers
	Eight #10 adapter washers
	Two 1/4-20 hex nuts with captive star lock washers
	Two 1/4-inch flat washers

△ CAUTION: For proper airflow, the SFP+ media side of the device port side must face the rear of the rack. This allows air to enter the front of the rack and exit from the rear.

To install the device in a rack:

1. Verify that the required parts and hardware are available. (See [Table 5 \(page 30\)](#).)
2. Choose a mounting location for the device in the rack.
3. Attach the rear mounting brackets to the rear rack uprights.
 - For an HPE 10000 Series Rack, assemble each of the brackets using two #10-32 x 1/2-inch Phillips panhead screws with captive star lock washers and two #10 adapter washers, as shown in [Figure 14 \(page 32\)](#).
 - For an HPE System/e Rack, install the two rear mounting brackets using two #10-32 x 1/2-inch Phillips panhead screws and two #10 alignment washers, as shown in [Figure 15 \(page 32\)](#).

Figure 14 Installing the rear mounting brackets (HPE 10000 Series rack)

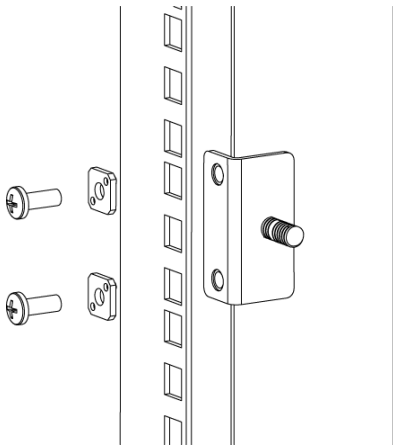
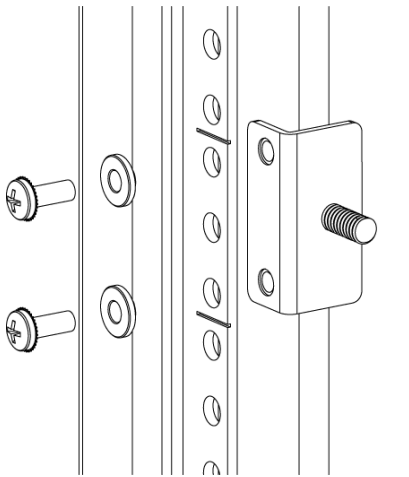


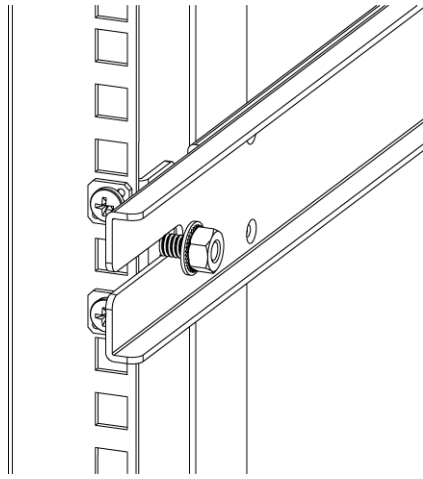
Figure 15 Installing the rear mounting brackets (HPE System/e rack)



NOTE: The SAN Switch Rack Mount Kit contains rails labeled Left and Right to designate the left side and right side of the cabinet as viewed from the front of the cabinet.

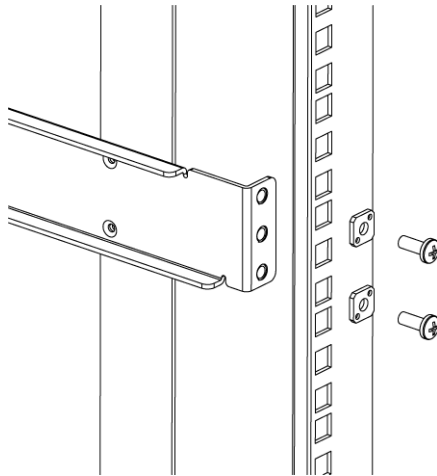
4. Assemble the outer rails:
 - a. Attach the left outer rail and the right outer rail to the rear mounting brackets using two 1/4-20 hex nuts with captive star lock washers attached loosely, as shown in [Figure 16 \(page 33\)](#). Do not tighten the nuts.

Figure 16 Installing the outer rails (HPE 10000 Series rack)



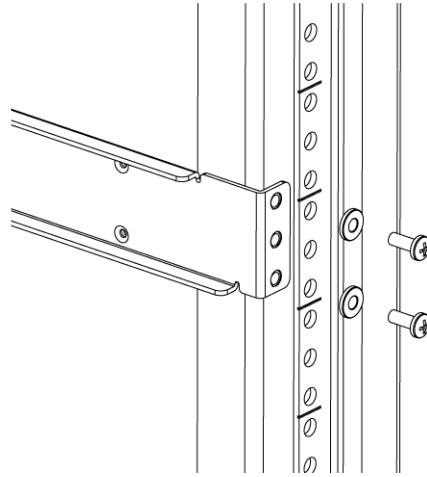
- b. Depending on the rack you are using, complete one of the following tasks:
 - For an HPE 10000 Series Rack, install two #10-32 x 1/2-inch Phillips panhead screws with captive star lock washers and two #10 adapter washers in the upper and lower holes on the right rail. Then, install two #10-32 x 1/2-inch Phillips panhead screws with captive star lock washers and two #10 adapter washers in the upper and lower holes on the left rail. (See [Figure 17 \(page 33\)](#).)

Figure 17 Assembling the outer rails (HPE 10000 Series rack)



- For an HPE System/e Rack, install two #10-32 x 1/2-inch Phillips panhead screws with captive star lock washers and two #10 alignment washers in the upper and lower holes on the right rail. Then, install two #10-32 x 1/2-inch Phillips panhead screws with captive star lock washers and two #10 alignment washers in the upper and lower holes on the left rail. (See [Figure 18 \(page 33\)](#).)

Figure 18 Assembling the outer rails (HPE System/e rack)



5. See [Table 6 \(page 34\)](#) to determine the screw type and the number of screws required for your device.

CAUTION: Use only the screws provided in the SAN Switch Rack Mount Kit. Using other screws can cause damage to internal components.

Table 6 Screws required to assemble the inner rails

Device	#8-32 x 5/16-inch screws	#8-32 x 3/16-inch screws
SAN Switch 2/16 SAN Switch 2/8V SAN Switch 2/16V	Ten (five per rail)	N/A
SAN Switch 2/32	N/A	Twelve (six per rail)
4/8 SAN Switch 4/16 SAN Switch SAN Switch 4/32	Ten (five per rail)	N/A
4/32B SAN Switch	Six (three per rail)	N/A
MP Router	Six (three per rail)	N/A
4/64 SAN Switch 400 MP Router	Ten (five per rail)	N/A
8/8 SAN Switch 8/24 SAN Switch 8/40 SAN Switch 8/80 SAN Switch	Ten (five per rail)	N/A
FCoE Converged Network Switch Encryption SAN Switch 1606 Extension SAN Switch	Six (three per rail)	N/A

6. Identify the screw holes to install the inner rails to your device:
 - To attach the inner rails to the SAN Switch 2/16, SAN Switch 2/8V, or SAN Switch 2/16V, use the screw holes marked **8**.
 - To attach the inner rails to the SAN Switch 2/32, use the screw holes marked **32**.

- To attach the inner rails to the 4/8, 4/16, 8/8, or 8/24 SAN Switch, use the five screw holes marked **8**. The plenum requires one screw hole marked **8** and one screw hole marked **16**, as shown in (page 36).
- To attach the inner rails to the 4/32, 4/32B, 4/64, 8/40, or 8/80 SAN Switch, or the 400 MP Router, use the screw holes marked 16, as shown in Figure 20 (page 35).
- To attach the inner rails to the MP Router, FCoE Converged Network Switch, 1606 Extension SAN Switch, or the Encryption Switch, use the two screw holes marked **R** and one screw hole marked **16**.

⚠ CAUTION: Be sure to use the screw holes labeled **8** when attaching the inner rails to the SAN Switch 2/16V or SAN Switch 2/16N.

7. Secure the two inner rails (one on each side) to the device using the appropriate number of screws (see Table 6 (page 34)).

For example, Figure 19 (page 35) shows an inner rail attached to the MP Router with three screws, using the two screw holes marked **R** and one marked **16**. Attaching both rails requires six screws.

Figure 20 (page 35) shows an inner rail attached to the 4/64 SAN Switch with five screws, using the rail screw holes marked **16**. Attaching both rails requires ten screws.

Figure 19 Securing the inner rails to an MP Router

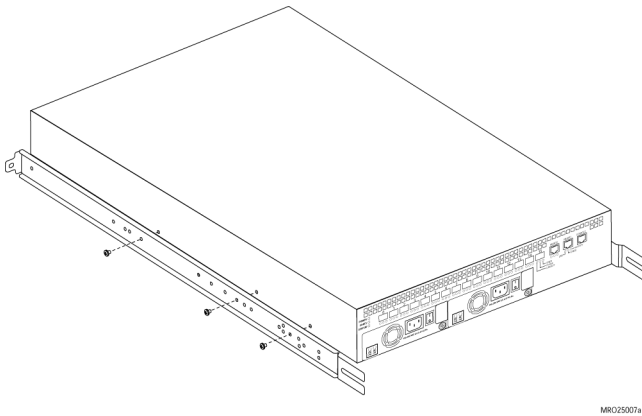
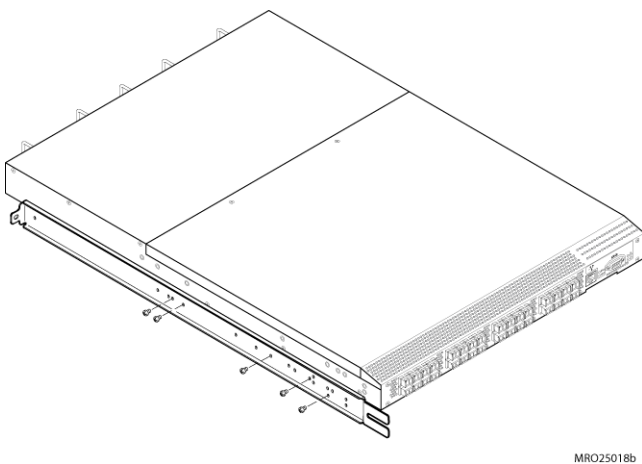


Figure 20 Securing the inner rails to the 4/64 SAN Switch



NOTE: For factory integration *only*, tighten the #8-32 x 5/16-inch Phillips panhead SEMS screws and torque between 6 and 8 inch-pounds.

8. If you are installing one of the following devices, install the plenum included in the switch accessory kit:
 - SAN Switch 2/8V
 - SAN Switch 2/16
 - SAN Switch 2/16V
 - 4/8 SAN Switch
 - 4/16 SAN Switch
 - 4/32B SAN Switch
 - 8/8 SAN Switch
 - 8/24 SAN Switch

See (page 36) for complete installation instructions.

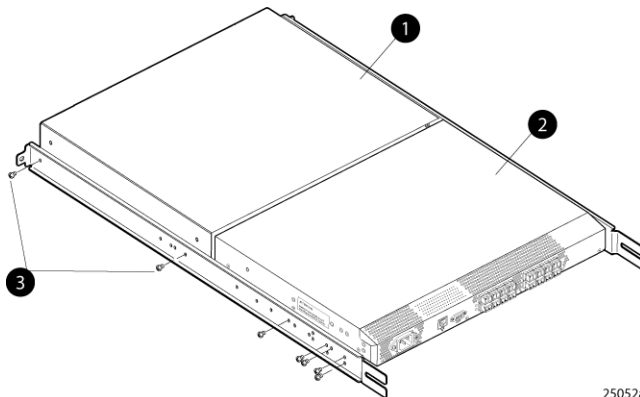
If you are installing a different device, see [Securing the switch to the outer rails \(page 37\)](#) to complete the rack mount procedure.

Installing the plenum (if required)

1. Place the device (with inner rails attached) on a flat surface (see [Figure 21 \(page 36\)](#)).

NOTE: [Figure 21 \(page 36\)](#) illustrates how to attach the plenum to the 4/8 or 4/16 SAN Switch, but this procedure also applies to other switch models that require a plenum.

Figure 21 Attaching the plenum to a 4/8 or 4/16 SAN Switch



1. Plenum (installed)
2. 4/8 or 4/16 SAN Switch
3. Two screws that secure the rails to the plenum

2. Locate the four 8-32 x .312 Phillips panhead SEMS screws in the accessory kit. These are the same screws used to attach the inner rails in [Step 5](#) of the preceding section.
3. For each inner rail (left and right), use one screw hole marked **8** and one screw hole marked **16** to attach the plenum.

CAUTION: Verify that the open end of the plenum faces the rear of the switch. When installed properly, you should see the plenum's air vent holes on one side, and the front panel of the switch on the other.

Securing the device to the outer rails

To secure the device to the outer rails:

1. Insert the switch with the attached inner rails into the outer rails.

NOTE: This step applies to the installation of a device in an HPE 9000 Series Rack or HPE System/e Rack.

2. Insert the device into the rack, and install one #10-32 x 1/2-inch Phillips panhead screw with captive star lock washer. Repeat for the remaining side. (See [Figure 22 \(page 37\)](#) and [Figure 23 \(page 37\)](#).)

Figure 22 Securing the switch (HPE 9000 Series or HPE 10000 Series racks)

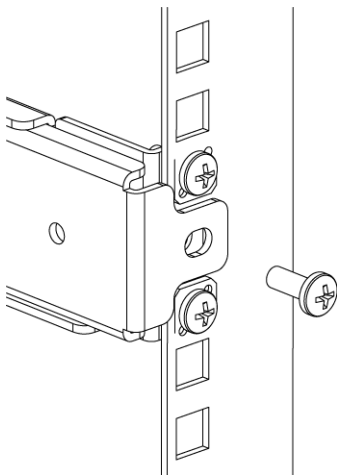
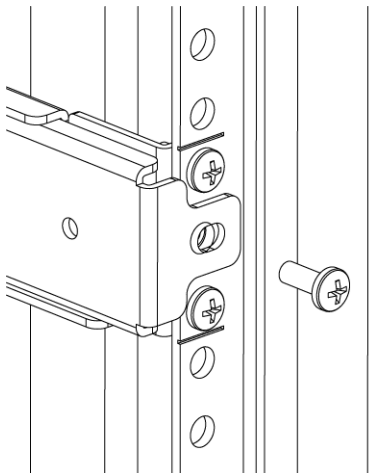


Figure 23 Securing the device in an HPE System/e Rack



3. Tighten the hex nuts installed in ??? of [Page 30](#). (See [Page 33](#).)

This completes the rack mount procedure.

Cabling and configuring the SAN Switch

The SAN Switch must be configured to ensure correct operation with a network and fabric. For instructions on configuring the switch to operate in a fabric containing switches from other vendors, see the *Fabric OS Administrator's Guide*.

For more information about the commands used in this procedure, see the *Fabric OS Command Reference Manual* for the Fabric OS version running on your switch.

Connecting the SAN Switch to the fabric

This section describes the procedure for connecting the SAN Switch to the fabric.

EZSwitch Setup (optional)

After you have set up the 8-Gb SAN Switch in a rack or as a standalone switch, you can power it on and configure it. If you are going to use the 8-Gb SAN Switch in a single-switch setup, you can use EZSwitch Setup to complete the basic configuration.

For more information, see the EZSwitch Setup CD or *HPE StorageWorks 8-Gb SAN Switch Quick Start Instructions*, included with your 8-Gb SAN Switch.

If you do not want to use EZSwitch Setup, use the procedures that follow.

Obtaining required items

To configure the SAN Switch for use in a network, ensure that you have the following:

- 8-Gb SAN Switch installed and connected to a power source
- Workstation with an installed terminal emulator, such as HyperTerminal
- Unused IP address and corresponding subnet mask and gateway address
- Serial cable (supplied with switch)
- Ethernet cable
- SFP transceivers and compatible cables, as required
- Access to an FTP server to back up the switch configuration (optional)

Powering on the 8-Gb SAN Switch

The 8/8 and 8/24 SAN Switches use one power cord. The 8/40 and 8/80 SAN Switches, Encryption SAN Switch, FCoE Converged Network Switch, and 1606 Extension SAN Switch use two power cords.

❗ **IMPORTANT:** The 8/8 and 8/24 SAN Switches do not have an on/off switch. Power is supplied as soon as you connect it to an AC power source.

To power on the switch:

1. Connect the power cords to a power inlet on the switch and to a power source. Verify that the cords use a minimum service loop of 15.2 cm (6 inches) to avoid stress. The switch powers on automatically; there is no ON/OFF switch. To power off, remove the power cord from the power source.

⚠ **CAUTION:** To protect against AC failure on the 8/40 and 8/80 SAN Switches, Encryption SAN Switch, FCoE Converged Network Switch, and 1606 Extension SAN Switch, connect each power cord to an outlet on separate circuits.

2. For the 8/40 and 8/80 SAN Switches, Encryption SAN Switch, FCoE Converged Network Switch, and 1606 Extension SAN Switch, set the two AC switches to the ON position (1). Power is supplied to the switch as soon as the first power supply is connected and turned on.

The power supply LEDs display amber until POST completes, and then change to green. The switch usually requires from 1 to 3 minutes to boot and complete POST.

3. After POST completes, verify that the switch Power and Status LEDs light are green.

Powering off the 8-Gb SAN Switch

1. Execute the `sysshutdown` command.
This command shuts down the key processors and powers off the switch. All LEDs extinguish.
2. Set each AC power switch to **O**.

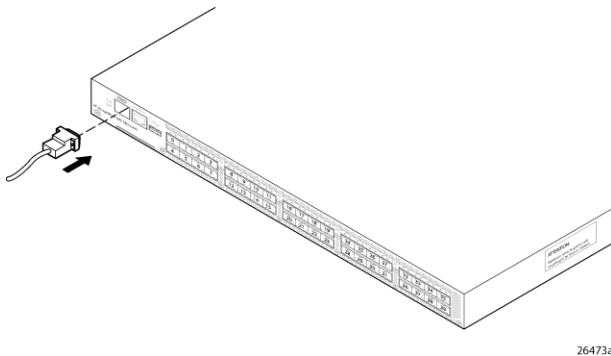
Making a serial connection

All basic configuration tasks require a serial connection.

1. Connect the serial cable to an RS-232 serial port on the workstation, as shown in [Figure 24 \(page 39\)](#). ??? shows the 8/40 SAN Switch; however, the procedure is similar for all SAN Switches.

NOTE: If the serial port on the workstation uses an RJ-45 connector instead of an RS-232 connector, remove the adapter on the end of the serial cable, and insert the exposed RJ-45 connector into the RJ-45 serial port on the workstation.

Figure 24 Connecting the serial cable



2. Close any serial communication programs running on the workstation.
3. Open a terminal emulator application (such as HyperTerminal on a PC or TERM in a UNIX environment) and configure the application as follows:
 - In a Windows 95, 98, 2000, or NT environment:
 - Bits per second—9600
 - Data bits—8
 - Parity—None
 - Stop bits—1
 - Flow control—None
 - In a UNIX environment, enter the following at the prompt:

```
tip/dev/ttyb -9600
```

If `ttyb` is already in use, use `ttya` instead and enter the following string at the prompt:

```
tip /dev/ttya -9600
```

Setting the switch IP address

You can configure the 8-Gb SAN Switch with a static IP address, or you can use a DHCP server to set the IP address. DHCP is enabled by default. The 8-Gb SAN Switch supports both IPv4 and IPv6.

DHCP

When using DHCP, the 8-Gb SAN Switch obtains an IP address, subnet mask, and default gateway address from the DHCP server. The DHCP client can only connect to a DHCP server that is on the same subnet as the switch. If your DHCP server is not on the same subnet as the 8-Gb SAN Switch, use a static IP address.

Setting a static IP address

1. Log in to the switch using the default password, `(password)`.
2. Enter `ipaddrset` to set the Ethernet IP address.

If you are going to use an IPv4 IP address, enter the IP address in dotted decimal notation as prompted:

```
Ethernet IP Address: [192.168.74.102]
```

If you are going to use an IPv6 address, enter the network information in colon-separated notation as prompted:

```
switch:admin> ipaddrset -ipv6 --add 1080::8:800:200C:417A/64  
IP address is being changed...Done.
```

3. Enter the IP addressing information, as prompted.

```
Ethernet Subnetmask: [255.255.255.0]  
Ethernet IP Address: [192.168.74.102]  
Ethernet Subnetmask: [255.255.255.0]
```

4. Enter `off` to disable DHCP when prompted.
DHCP [OFF]: `off`
5. (Optional) Verify that the address is correct by issuing the `ipaddrshow` command at the prompt.
6. Record the IP address on the label located on the port side of the chassis.
Record the IP address on the pull-out tab on the port side of the switch.
7. If the serial port is no longer required, log out of the serial console, remove the serial cable, and replace the safety plug in the serial port.

Connecting an Ethernet cable and opening a Telnet session

To create an Ethernet connection to the switch:

1. Remove the plug from the Ethernet port.
2. Connect an Ethernet cable to the switch Ethernet port and to the workstation or to an Ethernet network containing the workstation.
3. Open a Telnet session on the workstation.

NOTE: The following procedures use the CLI, but these tasks can also be performed using Web Tools or DCFM. For DCFM versions earlier than 10.3.0, Enterprise is required for the Encryption SAN Switch. For DCFM 10.3.0 and later, any DCFM version (Professional, Professional Plus, or Enterprise) is supported with encryption.

Setting the domain ID

To set the switch domain ID:

1. Using Telnet, log in to the switch as `admin`.

2. Modify the domain ID, if required. The default domain ID is 1.
 - If the switch is not powered on until after it is connected to the fabric and the default domain ID is already in use, the domain ID for the new switch is automatically reset to a unique value.
 - If the switch is connected to the fabric after it has been powered on and the default domain ID is already in use, the fabric segments. To find the domain IDs that are currently in use, run the `fabricshow` command on another switch in the fabric, and then do the following:
 1. Disable the switch by entering the `switchdisable` command.
 2. Enter the `configure` command.
The command prompts appear sequentially.
 3. Enter a new value or press **Enter** to accept each default value.
 4. Enter **y** after the `Fabric param` prompt:
Fabric param (yes, y, no, n): [no] y
 5. Enter a unique domain ID, such as the domain ID used by the previous switch, if it is still available:
Domain: (1 ..239) [1] 3
 6. Complete the remaining prompts or press **Ctrl-D** to accept the remaining settings without completing all the prompts.
 7. Re-enable the switch by entering the `switchenable` command.

Setting the switch date and time

The 8-Gb SAN Switch maintains the current date and time inside a battery-backed RTC circuit. Switch operation does not depend on the date and time. An 8-Gb SAN Switch with an incorrect date and time value still functions properly. However, it is important that your switch shows the accurate date and time, because these are used for logging, error detection, and troubleshooting.

1. Log in to the switch using the default password, (`password`).
2. Enter the `date` command:

```
date "mmddHHMMyy"
```

The values represent the following:

- *mm* is the month; valid values are 01 through 12.
- *dd* is the date; valid values are 01 through 31.
- *HH* is the hour; valid values are 00 through 23.
- *MM* is minutes; valid values are 00 through 59.
- *yy* is the year; valid values are 00 through 99. (Values greater than 69 are interpreted as 1970 through 1999, and values less than 70 are interpreted as 2000-2069.)

```
switch:admin> date
Fri Sep 29 17:01:48 UTC 2007
switch:admin> date "0927123007"
Thu Sep 27 12:30:00 UTC 2007
switch:admin>
```

About setting time zones

You can set the time zone for the switch by name. You can also set country, city, or time zone parameters.

If the time zone is not set with the new options, the switch retains the offset time zone settings. The `tstimezone` command includes an option to revert to the prior time zone format. For more information about the `--old` option, see the *Fabric OS Command Reference Manual*.

You can use the `tstimezone` command to:

- Display all of the time zones supported in the firmware.
- View the time zone settings. However, only those with administrative permissions can set the time zones.
- Set the time zone for a switch based on a country and city combination or based on a time zone ID, such as PST.

Consider the following:

- The `tsTimeZone` setting adjusts automatically for daylight savings time.
- Changing the time zone on a switch updates the local time zone setup and is reflected in local time calculations.
- By default, all switches are in the GMT time zone (0,0). If all switches in a fabric are in one time zone, you can keep the time zone setup at the default setting.
- System services that have already started reflect the time zone changes only after the next reboot.
- Time zone settings persist across failover for high availability.

Setting the time zone

- ⓘ **IMPORTANT:** The following procedure describes how to set the time zone for a switch. You must perform the procedure on all switches for which the time zone must be set. However, you only need to set the time zone once on each switch, because the value is written to nonvolatile memory.

1. Log in to the switch using the default password, `(password)`.
2. Enter the `tstimezone` command:

```
switch:admin> tstimezone [--interactive]/ [,timezone_fmt]
```

Use `timezone_fmt` to set the time zone by Country/City or by time zone ID, such as PST. The following example shows how to change the time zone to US/Central:

```
switch:admin> tstimezone
Time Zone : US/Pacific
switch:admin> tstimezone US/Central
switch:admin> tstimezone
Time Zone : US/Central
```

To set the time zone using interactive mode:

1. Enter the `tstimezone` command:

```
switch:admin> tstimezone --interactive
```
2. You are prompted to select a general location.
Please identify a location so that time zone rules can be set correctly.
3. Enter the appropriate number or **Ctrl-D** to quit.
4. At the prompt, select a country location.
5. At the prompt, enter the appropriate number to specify the time zone region or **Ctrl-D** to quit.

Correcting the time zone

If the switch time is off by hours (not minutes), set the time zone as follows:

1. Log in as `admin`.
2. Enter the `tstimezone -interactive` command and follow the prompts or enter the `tstimezone` command as follows:

```
tstimezone [houroffset [, minuteoffset]]
```

For Pacific Standard Time, enter `tstimezone -8,0`

For Central Standard Time, enter `tstimezone -6,0`

For Eastern Standard Time, enter `tstimezone -5,0`

The default time zone for switches is UTC, which is 8 hours ahead of Pacific Standard Time. To determine the `tstimezone` command parameter for other U.S. time zones, see [\(page 43\)](#).

The parameters do not apply if the time zone for the switch has already been changed from the default (UTC). Because the time value is stored in nonvolatile memory, you need only set this once.

For more information about the command parameters, see the `tstimezone` command description in the *Fabric OS Command Reference*.

Table 7 `tstimezone` command parameters

Local time	tstimezone parameter (difference from UTC)
Atlantic Standard	-4,0
Atlantic Daylight	-3,0
Eastern Standard	-5,0
Eastern Daylight	-4,0
Central Standard	-6,0
Central Daylight	-5,0
Mountain Standard	-7,0
Mountain Daylight	-6,0
Pacific Standard	-8,0
Pacific Daylight	-7,0
Alaskan Standard	-9,0
Alaskan Daylight	-8,0
Hawaiian Standard	-10,0

Synchronizing local time using Network Time Protocol

You can synchronize the local time of the principal or primary FCS switch to a maximum of eight external NTP servers. To keep the time in your SAN current, Hewlett Packard Enterprise recommends that the principal or primary FCS switch has its time synchronized with at least one external NTP server. The other switches in the fabric set their time automatically from the principal or primary FCS switch.

All switches in the fabric maintain the current clock server value in nonvolatile memory. By default, this value is the local clock server `<LOCL>` of the principal or primary FCS switch. Changes to the clock server value on the principal or primary FCS switch are propagated to all switches in the fabric.

For more information on using an NTP server, and IPv6 considerations, see the *Fabric OS Administrator's Guide*.

1. Log in to the switch using the default password: `password`.
2. Enter the `tsclockserver` command:

```
switch:admin> tsclockserver "<ntp1;ntp2>"
```

where `ntp1` is the IP address or DNS name of the first NTP server, which the switch must be able to access. The second `ntp2` is the second NTP server and is optional. The operand "`<ntp1;ntp2>`" is optional. By default, this value is `LOCL`, which uses the local clock of the principal or primary switch as the clock server.

The `tsclockserver` command accepts multiple server addresses in either IPv4, IPv6, or DNS name formats. When multiple NTP server addresses are passed, `tsclockserver` sets the first obtainable address as the active NTP server. The rest are stored as backup servers that can take over if the active NTP server fails. The principal or primary FCS switch synchronizes its time with the NTP server every 64 seconds.

```
switch:admin> tsclockserver
```

```
LOCLx
```

```
switch:admin> tsclockserver "132.163.135.131"
```

```
switch:admin> tsclockserver
```

```
132.163.135.131
```

```
switch:admin>
```

The following example shows how to set up more than one NTP server using a DNS name:

```
switch:admin> tsclockserver
```

```
"10.32.170.1;10.32.170.2;ntp.localdomain.net"
```

```
Updating Clock Server configuration...done.
```

```
Updated with the NTP servers
```

Changes to the clock server value on the principal or primary FCS switch are propagated to all switches in the fabric.

Verifying the configuration

To confirm that the switch is configured and ready for use:

1. Check the LEDs to verify that all components are functional. For information about LED patterns, see [\(page 53\)](#).
2. Issue the `switchshow` command from the workstation. This command provides information about the switch and port status.
3. Issue the `fabricshow` command from the workstation. This command provides general information about the fabric.

Backing up the configuration

Hewlett Packard Enterprise recommends regular backups to ensure that a recent configuration is available.

To back up the switch configuration to an FTP server:

1. Issue the `configupload` command.
2. Follow the prompts.

The command uploads the switch configuration to the server, making it available for downloading to a replacement switch, if necessary. For instructions on backing up the configuration, see the *Fabric OS Administrator's Guide*.

Changing the switch name and chassis name

Changing the switch and chassis names is important for accurate tracking of errors in the RASlog. The messages in the log are labeled with the switch or chassis name, so choose a meaningful name for the switch and chassis.

To change the chassis name and then the switch name:

1. Using Telnet, log in to the switch as `admin`.
2. Use the `chassisname` command to change the chassis name.

The following example shows how to change the chassis name to `myhpchassis`.

```
switch:admin> chassisname myhpchassis  
switch:admin> chassisname  
myhpchassis
```

3. Use the `switchname` command to change the switch name.

The following example shows how to change the switch name to `myhpswitch`.

```
switch:admin> switchname myhpswitch  
switch:admin> switchname  
myhpswitch
```

3 Managing the 8-Gb SAN Switches

The 8-Gb SAN Switches are designed for high availability and low failure. They do not require any regular physical maintenance. They include diagnostic tests and field-replaceable units for the HPE StorageWorks 8/40 and 8/80 SAN Switches, the Encryption SAN Switch the FCoE Converged Network Switch, and the 1606 Extension SAN Switch.

Configuring the Encryption SAN Switch

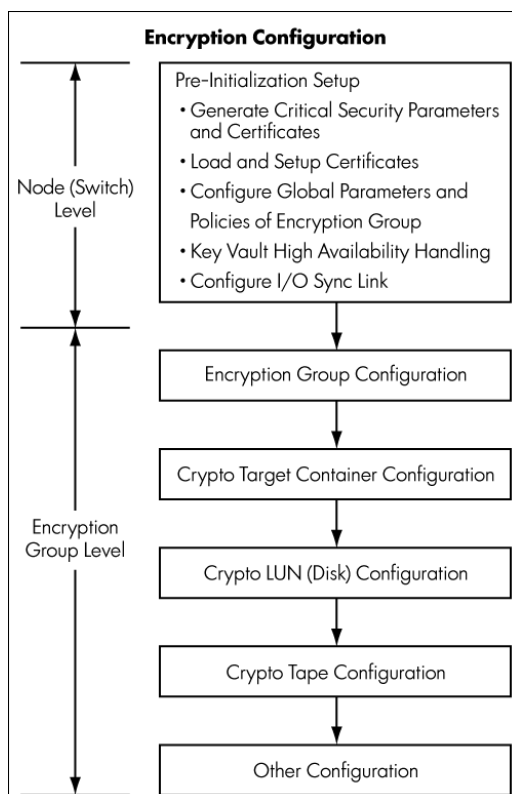
NOTE: For procedures to configure the encryption functions, including HPE Secure Key Manager information, see the *Fabric OS Encryption Administrator's Guide*. For additional SKM setup requirements, see the *HPE Secure Key Manager User Guide*.

If the Encryption SAN Switch is being configured for the first time for encryption services, you must perform the following pre-initialization tasks related to configuring the encryption node (switch):

- Generate the CSPs and certificates
- Load and set up the certificates
- Establish a trusted link (SKM Appliance)
- Configure the global parameters and policies of the encryption group
- Generate and back up the master key in SKM environments
- Handle key-vault high-availability
- Configure cluster interconnect

After completing the pre-initialization tasks, you may need to perform several tasks related to configuring the encryption group. [Figure 25 \(page 47\)](#) summarizes the flow of encryption configuration tasks.

Figure 25 Encryption configuration



Configuring the FCoE Converged Network Switch

For more information on configuring the CEE portion of the FCoE Converged Network Switch, see the *Brocade Converged Enhanced Ethernet Administrator's Guide*.

Configuring the 1606 Extension SAN Switch

The following sections provide information on configuring the 1606 Extension SAN Switch.

FCIP and Fibre Channel routing services configuration

Initially, the FC ports on the 1606 Extension SAN Switch are set to persistently disabled. If you want to enable the FC ports as standard E_Ports or F_Ports, use the `portcfgpersistentenable` command.

If you are using the FC ports as EX_Ports, you must configure the Fibre Channel Routing Services feature before enabling the ports. The GbE ports can be used only after you have configured FCIP and enabled the VE_Ports.

For instructions on configuring the Fibre Channel Router ports and GbE ports on the 1606 Extension SAN Switch, see the *Fabric OS Administrator's Guide*.

Verifying switch operation

To verify correct operation of the 1606 Extension SAN Switch:

1. Check the LEDs to verify that all components are functional (see [\(page 60\)](#)).
2. Execute the `portcfgpersistentenable` command to activate the FC ports for FC operation.
3. Verify correct operation of the switch by entering the `switchshow` command from the workstation.

This command provides information about switch and port status.

```
sw7800:admin> switchshow
switchName: sw7800
switchType: 83.3
switchState: Online
switchMode: Native
switchRole: Principal
switchDomain: 220
switchId: fffcdc
switchWwn: 10:00:00:05:1e:55:a2:00
zoning: ON (DEFAULT_CFG_LSAN)
switchBeacon: OFF
FC Router: ON
FC Router BB Fabric ID: 1
Index Port Address Media Speed State Proto
=====
0 0 dc0000 id N8 No_Light FC
1 1 dc0100 id N8 No_Light FC
2 2 dc0200 id N8 No_Light FC
3 3 dc0300 id N8 No_Light FC
4 4 dc0400 -- N8 No_Module FC
5 5 dc0500 -- N8 No_Module FC
6 6 dc0600 -- N8 No_Module FC
7 7 dc0700 -- N8 No_Module FC
8 8 dc0800 id N8 No_Light FC
9 9 dc0900 -- N8 No_Module FC
10 10 dc0a00 id N8 No_Light FC
11 11 dc0b00 id N8 No_Light FC
12 12 dc0c00 id N8 No_Light FC
13 13 dc0d00 id N8 No_Light FC
14 14 dc0e00 id N8 No_Light FC
15 15 dc0f00 id N8 No_Light FC
16 16 dc1000 -- -- Offline VE
17 17 dc1100 -- -- Offline VE
18 18 dc1200 -- -- Offline VE
19 19 dc1300 -- -- Offline VE
20 20 dc1400 -- -- Offline VE
21 21 dc1500 -- -- Offline VE
22 22 dc1600 -- -- Offline VE
23 23 dc1700 -- -- Offline VE
ge0 id 1G No_Light FCIP
ge1 id 1G No_Light FCIP
ge2 id 1G No_Light FCIP
ge3 id 1G No_Light FCIP
ge4 id 1G No_Light FCIP
ge5 id 1G No_Light FCIP
sw7800:admin>
```

4. Verify correct operation of the switch in the fabric by entering the `fabricshow` command from the workstation.

This command provides general information about the fabric.

8-Gb SAN Switch LEDs

System activity and status can be determined through the activity of the LEDs on the switch. The LED states are as follows:

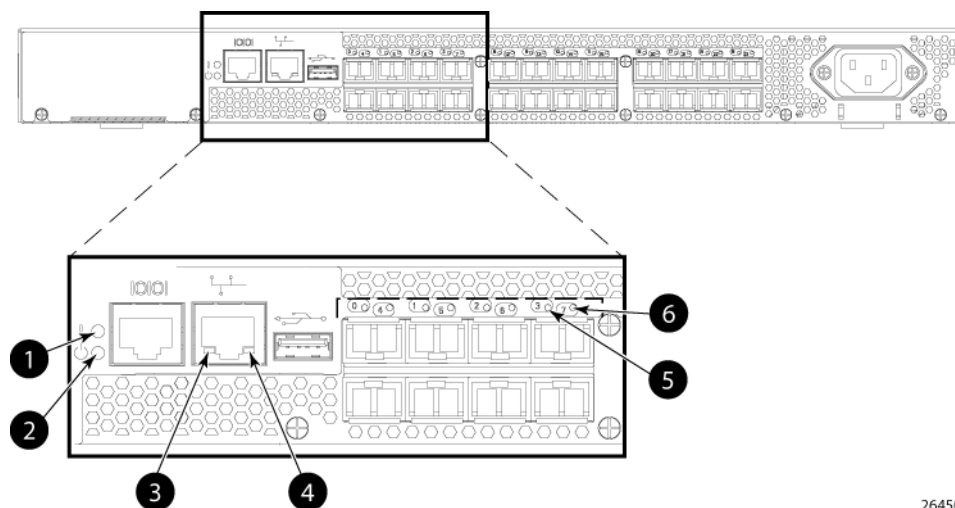
- No light
- Steady light
- Flashing light

The LEDs are either green or amber.

8/8 and 8/24 SAN Switch LEDs

8/8 and 8/24 SAN Switch LEDs are located on the port side only.

Figure 26 Identifying 8/8 and 8/24 SAN Switch LEDs



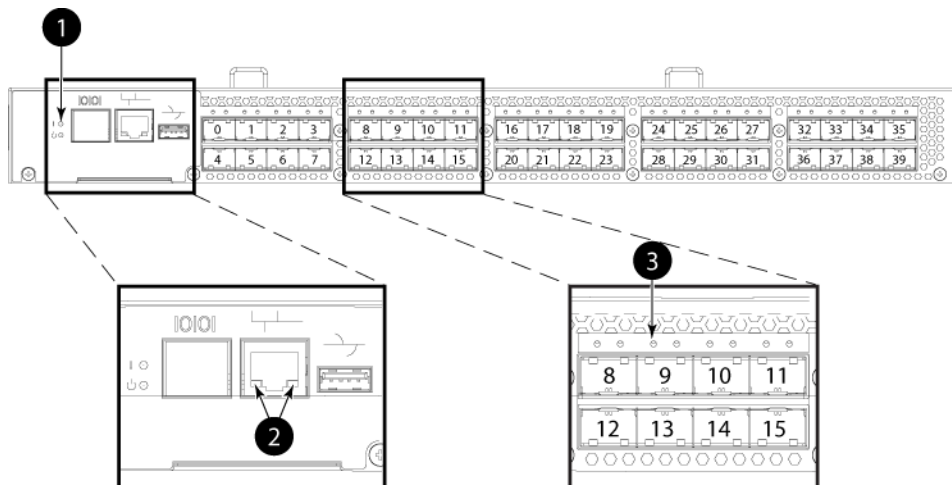
26450a

- | | |
|------------------------------------|-----------------------------|
| 1. System power LED (green) | 4. Link speed LED |
| 2. System status LED (green/amber) | 5. Port status LED (port 3) |
| 3. Link status LED | 6. Port status LED (port 7) |

8/40 SAN Switch LEDs

8/40 SAN Switch LEDs are located on the port side and nonport side. See [Figure 27 \(page 51\)](#) and [Figure 28 \(page 51\)](#).

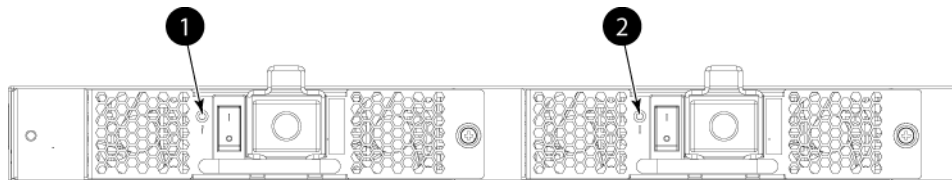
Figure 27 Identifying 8/40 SAN Switch port side LEDs



26455a

1. System status LED (top) and system power (bottom)
2. Ethernet port status LEDs (green/amber)
3. FC port status (port 9)

Figure 28 Identifying 8/40 SAN Switch nonport side LEDs



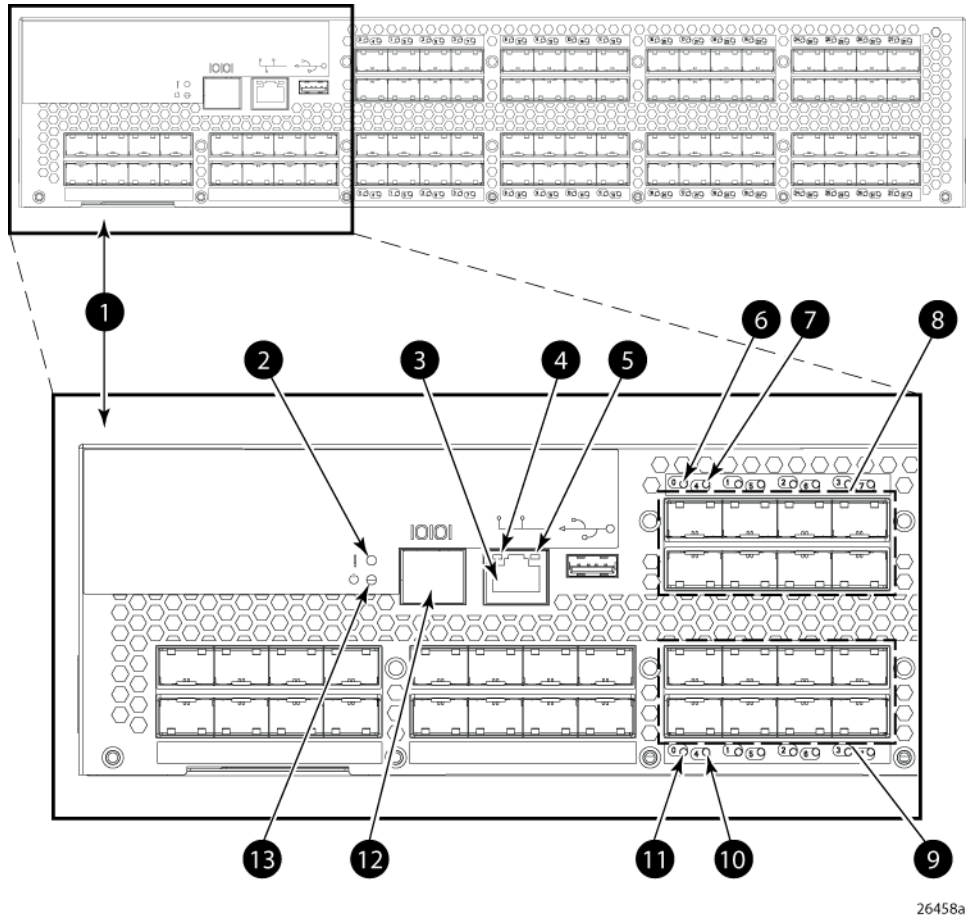
26452a

1. Power supply 1 status LED
2. Power supply 2 status LED

8/80 SAN Switch LEDs

8/80 SAN Switch LEDs are located on the port side and nonport side. See [Figure 29 \(page 52\)](#) and [Figure 30 \(page 53\)](#).

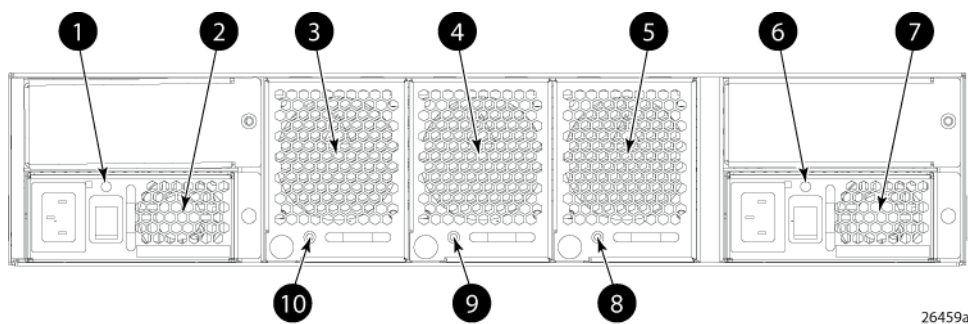
Figure 29 Identifying 8/80 SAN Switch port side LEDs



26458a

- | | |
|--------------------------------|----------------------------------|
| 1. 8/80 SAN Switch | 8. FC ports (0 through 7) |
| 2. System status LED | 9. FC ports (48 through 55) |
| 3. Ethernet port | 10. FC port status LED (port 52) |
| 4. Ethernet speed LED | 11. FC port status LED (port 48) |
| 5. Ethernet link LED | 12. Console port |
| 6. FC port status LED (port 0) | 13. System power LED |
| 7. FC port status LED (port 4) | |

Figure 30 Identifying 8/80 SAN Switch nonport side LEDs



- | | |
|-------------------------------|--------------------------------|
| 1. Power supply #2 status LED | 6. Power supply #1 status LED |
| 2. Power supply #2 | 7. Power supply #1 |
| 3. Fan assembly #3 | 8. Fan assembly #1 status LED |
| 4. Fan assembly #2 | 9. Fan assembly #2 status LED |
| 5. Fan assembly #1 | 10. Fan Assembly #3 status LED |

Port side LED activity for the 8/80 SAN Switch

Table 8 (page 53) describes LEDs and recommended actions.

Table 8 8-Gb SAN Switch port side LED patterns

LED name	LED color	Status of hardware	Recommended action
Power status	No light	System is off or there is an internal power supply failure.	Verify that the system is powered on (power supply switches to 1), the power cables are attached, and your power source is live. If the system power LED is not green, the unit may be faulty. Contact your switch service provider.
	Steady green	System is on and power supplies are functioning properly.	No action required.
System status	No light	System is off or there is no power.	Verify that the system is on and has completed booting.
	Steady green	System is on and functioning properly.	No action required.
	Steady amber (for more than five seconds)	Faulty fan FRU or power supply FRU, boot failed, or the system is faulty. NOTE: This LED displays steady amber during POST. This is normal and does not indicate a fault.	Verify that the fan FRU and power supply FRU are seated correctly. Replace the fan FRU or power supply FRU, if necessary. If the fan or power supply FRU is not the problem, do the following: <ol style="list-style-type: none"> 1. Connect a serial cable to the system. 2. Reboot the system. 3. Check the failure message on the console. 4. Contact your service provider.
	Flashing amber/green	Attention is required. A number of variables can cause this status, including a single power supply failure, a fan failure, or exceeding one or more environmental ranges.	Check the management interface and the error log for details on the cause of the status. Contact your switch service provider.

Table 8 8-Gb SAN Switch port side LED patterns (continued)

LED name	LED color	Status of hardware	Recommended action
Ethernet speed	No light	Port speed is 10 Mb/sec.	No action required.
	Steady green	Port speed is 100 Mb/sec.	No action required.
Ethernet link	No light	There is no link.	Verify that the Ethernet cable is connected correctly.
	Steady amber	There is a link.	No action required.
	Flashing amber/no light	There is link activity (traffic).	No action required.
Port status	No light	No signal or light carrier (media or cable) is detected.	Check transceiver and cable.
	Slow flashing green (flashing in 2-second intervals)	Port is online but segmented because of a loopback cable or incompatible switch connection.	No action required.
	Fast flashing green (flashing in half-second intervals)	Port is online and an internal loopback diagnostic test is running.	No action required.
	Flickering green (steady with random flashes)	Port is online and frames are flowing through the port.	No action required.
	Steady green	Port is online, but has no traffic.	No action required.
	Slow flashing amber (flashing in 2-second intervals)	Port is disabled because of diagnostics or the <code>portdisable</code> command.	Verify that the diagnostic tests are not running. Re-enable the port using the <code>portenable</code> command.
	Fast flashing amber (flashing in half-second intervals)	Port is faulty.	Check the management interface and the error log for details on the cause of status. Contact your switch service provider.
	Steady amber (for more than 5 seconds)	Port is receiving light or signal carrier at 4 Gb/s, but is not yet online.	No action required.

Nonport side LED activity for the 8/80 SAN Switch

Table 9 (page 54) describes LEDs and recommended actions.

Table 9 Nonport side LED patterns during normal operation

LED name	LED color	Status of hardware	Recommended action
Power supply status	No light	Power supply is not receiving power or is off.	Verify that the power supply is on and seated and the power cord is connected to a functioning power source.
	Steady green	Power supply is operating normally.	No action required.
	Steady amber (for more than five seconds)	Power supply fault for one of the following reasons: <ul style="list-style-type: none"> Power supply is switched off. Power cable is disconnected. Power supply has failed. 	Do the following: <ul style="list-style-type: none"> Check the power cable connection. Verify the power supply is on. Replace the power supply FRU.

Table 9 Nonport side LED patterns during normal operation (continued)

LED name	LED color	Status of hardware	Recommended action
		<p>NOTE: When the switch is first powered on the power supply status LED will show amber until POST has completed.</p>	
Fan status	No light	Fan assembly is not receiving power.	<p>Do the following:</p> <ul style="list-style-type: none"> • Verify the fan FRU is seated. • Verify the switch is on.
	Steady green	Fan assembly is operating normally.	No action required.
	Steady amber (for more than five seconds)	<p>Fan fault for one of the following reasons:</p> <ul style="list-style-type: none"> • One or more of the fans in the fan assembly has failed. • The fan FRU was disabled by the user. <p>NOTE: When the switch is first powered on, the fan status LED will show amber until POST has completed.</p>	<p>Do the following:</p> <ul style="list-style-type: none"> • Verify the fan FRU is enabled (use the <code>fanenable</code> command). • Replace the fan FRU.

Port side LED activity for the Encryption SAN Switch

Table 10 (page 55) describes LEDs and recommended actions.

Table 10 Encryption SAN Switch and FRU LEDs

LED name	LED color	Status of hardware	Recommended action
System status (Attention)	No light	System is on and functioning properly	No action required.
	Steady amber for more than 5 seconds	<p>Indicates one of the following:</p> <ul style="list-style-type: none"> • Fan FRU or power supply FRU is faulty. • Boot has failed. • System is faulty. <p>NOTE: This LED displays steady amber during POST, which is normal and does not indicate a fault.</p>	<p>Do the following:</p> <ul style="list-style-type: none"> • Verify that the fan FRU and power supply FRU are seated correctly. • Replace the fan FRU or power supply FRU. <ol style="list-style-type: none"> 1. Connect a serial cable to the system. 2. Reboot the system. 3. Check the failure indicated on the system console. 4. Contact your service provider.
Power status	No light	System is off or there is an internal power supply failure.	<p>Verify that the system is powered on (power supply switches to 1), the power cables are attached, and the power source is live.</p> <p>If the system power LED is not green, the unit may be faulty. Contact your service provider.</p>
	Steady green	System is on and power supplies are functioning properly.	No action required.

Table 10 Encryption SAN Switch and FRU LEDs (continued)

LED name	LED color	Status of hardware	Recommended action
Ethernet link	No light	There is no link.	Verify that the Ethernet cable is connected properly.
	Steady green	There is a link.	No action required.
Ethernet activity	Flashing green	There is link activity (traffic).	No action required.
	No light	No link activity	No action required.
Port status	No light	Indicates one of the following: <ul style="list-style-type: none"> No signal or light carrier (media or cable) is detected. The switch is initializing. A connected device is configured in an offline state. 	Do the following: <ul style="list-style-type: none"> Verify the power LED is on; check the SFP and cable. Verify the switch is initializing. Verify the status of the connected device.
	Steady green	Port is online (connected to external device), but there is no traffic.	No action required.
	Slow flashing green (on 1 second, then off 1 second)	Port is online, but segmented because of a loopback cable or incompatible switch connection.	Verify that the correct device is attached to the switch.
	Fast flashing green (on 1/4 second, then off 1/4 second)	Port is online and an internal loopback diagnostic test is running.	No action required.
	Flickering green	Port is online and frames are flowing through the port.	No action required.
	Steady amber	Port is receiving light or signal carrier, but is not online yet.	No action required.
	Very slow flashing amber (on 2 seconds, then off 2 seconds)	Port is disabled because of diagnostics or the <code>portdisable</code> command.	Verify that the diagnostic tests are not running. Re-enable the port using the <code>portenable</code> command.
	Fast flashing amber (on 1/2 second, then off 1/2 second)	SFP or port is faulty.	Replace the SFP. Reset the port.
Power supply status	No light	Indicates one of the following: <ul style="list-style-type: none"> Power supply FRU is switched off. Power supply FRU is not seated correctly. Power cord is disconnected. Power cord is not actively powered. The power supply FRU has failed. 	Do the following: <ul style="list-style-type: none"> Verify that the power supply FRU is powered on. Verify that the power supply FRU is seated correctly. Check the power cable connection. Replace the power supply FRU.
	Steady green	Power supply is operating normally.	No action required.
	Steady amber (for more than 5 seconds)	Indicates one of the following: <ul style="list-style-type: none"> Power supply FRU is switched off. Power supply FRU is not seated correctly. 	Do one of the following: <ul style="list-style-type: none"> Verify that the power supply FRU is powered on. Verify that the power supply FRU is seated correctly.

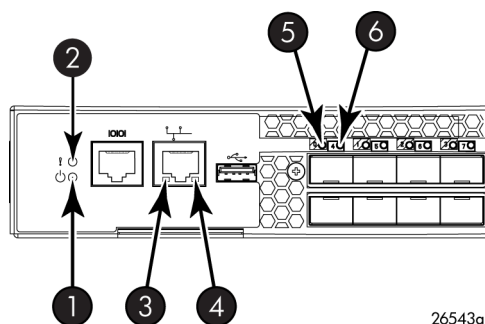
Table 10 Encryption SAN Switch and FRU LEDs (continued)

LED name	LED color	Status of hardware	Recommended action
		<ul style="list-style-type: none"> The power cable is disconnected. The power supply FRU has failed. <p>NOTE: When the switch is first powered on, the power supply status LED shows amber until POST has completed.</p>	<ul style="list-style-type: none"> Check the power cable connection. Replace the power supply FRU.
Fan status	No light	Indicates one of the following: <ul style="list-style-type: none"> Fan FRU is not seated correctly. Fan FRU is not receiving power. 	Do one of the following: <ul style="list-style-type: none"> Verify that the fan FRU is seated correctly. Verify that the switch is powered on.
	Steady green	Fan assembly is operating normally.	No action required.
	Steady amber (for more than 5 seconds)	Indicates one of the following: <ul style="list-style-type: none"> Fan FRU is not seated correctly. One or more of the fans in the fan FRU has failed. The fan FRU was disabled by the user. <p>NOTE: When the switch is first powered on, the fan status LED shows amber until POST has completed.</p>	Do one of the following: <ul style="list-style-type: none"> Verify that the fan FRU is seated correctly. Verify that the fan FRU is enabled (use the <code>fanenable</code> command). Replace the fan FRU.

Port side LED activity for the FCoE Converged Network Switch

Figure 31 (page 57) shows the port side of the FCoE Converged Network Switch. There are two port status LEDs above each of the top row of ports. The left LED is for the top port, and the right LED is for the bottom port. See (page 16) for the locations of the GbE and FC ports.

Figure 31 Port side LEDs on the FCoE Converged Network Switch



- | | |
|-----------------------|---------------------------------|
| 1. System power LED | 4. Ethernet link LED |
| 2. System status LED | 5. CEE port status LED (port 0) |
| 3. Ethernet speed LED | 6. CEE port status LED (port 4) |

Table 11 (page 58) describes the port side LEDs and the recommended actions.

Table 11 FCoE Converged Network Switch port side LED patterns

LED name	LED color	Status of hardware	Recommended action
Power status	No light	System is off or there is an internal power supply failure.	Verify the following: <ul style="list-style-type: none"> • System is powered on (power supply switches to 1). • The power cables are attached. • The power source is live. If the system power LED is not green, the unit may be faulty. Contact your switch service provider.
	Steady green	System is on and power supplies are functioning properly.	No action required.
System status	No light	System is off or there is no power.	Verify that the system is on and has completed booting.
	Steady green	System is on and functioning properly.	No action required.
	Steady amber (for more than five seconds)	System is in an unknown state, boot failed, or the system is faulty. Note: This LED displays steady amber during POST. This is normal and does not indicate a fault.	Perform the following steps: <ol style="list-style-type: none"> 1. Connect a serial cable to the system. 2. Reboot the system. 3. Check the failure indicated on the system console. 4. Contact your switch service provider.
	Flashing amber	Attention is required. Several variables can cause this status, including a power supply failure, fan failure, or if one or more environmental ranges have been exceeded.	Check the management interface and the error log for details on the cause of the status. Contact your switch service provider.
Ethernet speed (Management port)	No light	Port speed is 10 Mb/s.	No action required.
	Steady green	Port speed is 100/1000 Mb/s.	No action required.
Ethernet activity/Link (Management port)	No light	There is no link.	Verify that the Ethernet cable is connected properly.
	Steady green	There is a link.	No action required.
	Blinking green	There is link activity (traffic).	No action required.
Optical media port status (two-color LED for each FC and CEE port)	Off	No light or signal carrier on media interface	Verify that the transceiver is installed correctly and the cable is connected correctly.
	Steady amber	Receiving light or carrier, but not online	No action required.
	Slow blinking amber (2 seconds)	Receiving light or carrier, but not online	Verify that the diagnostic tests are not running. Re-enable the port using the <code>portenable</code> command.
	Fast blinking amber (1/2 second)	Port failure	Check the management interface and the error log for details on the cause of the failure. Contact Hewlett Packard Enterprise technical support, if necessary.

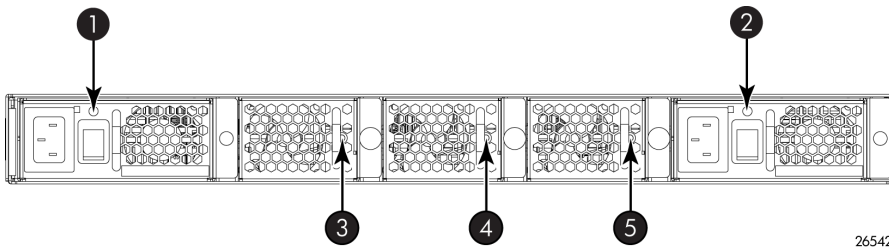
Table 11 FCoE Converged Network Switch port side LED patterns (continued)

LED name	LED color	Status of hardware	Recommended action
	Steady green	Online	No action required.
	Slow blinking green (2 seconds)	Online but segmented (loopback cable or incompatible switch)	No action required.
	Fast blinking green (1/2 second)	Internal loopback (diagnostic)	No action required.
	Flickering green	Online; frames flowing through port	No action required.

Nonport side LED activity for the FCoE Converged Network Switch

Figure 32 (page 59) shows the LEDs on the nonport side of the switch. See (page 16) for power supply and fan assembly locations.

Figure 32 Nonport side LEDs on the FCoE Converged Network Switch



- | | |
|-------------------------------|-------------------------------|
| 1. Power supply #2 status LED | 4. Fan assembly #2 status LED |
| 2. Power supply #1 status LED | 5. Fan assembly #1 status LED |
| 3. Fan assembly #3 status LED | |

Table 12 (page 60) describes the LEDs on the nonport side of the switch.

Table 12 FCoE Converged Network Switch nonport side LED patterns

LED name	LED color	Status of hardware	Recommended action
Power supply status	No light	Power supply is not receiving power or is off.	Verify the power supply is on and seated and the power cord is connected to a functioning power source.
	Steady green	Power supply is operating normally.	No action required.
	Steady amber (for more than 5 seconds)	Power supply is faulty. NOTE: When the switch is first powered on, the power supply status LED displays steady amber until POST completes.	Do the following: <ul style="list-style-type: none"> • Check the power cable connection. • Verify that the power supply is powered on. • Replace the power supply FRU.
Fan status	No light	Fan assembly is not receiving power.	Do the following: <ul style="list-style-type: none"> • Verify the fan FRU is seated correctly. • Verify the switch is powered on.
	Steady green	Fan assembly is operating normally.	No action required.
	Steady amber (for more than 5 seconds)	Fan fault for one of the following reasons: <ul style="list-style-type: none"> • One or more of the fans in the fan assembly has failed. • The fan FRU has been disabled. NOTE: When the switch is first powered on, the fan status LED displays steady amber until POST completes.	Do the following: <ul style="list-style-type: none"> • Verify the fan FRU is enabled (use the <code>fanenable</code> command). • Replace the fan FRU.

Port side LED activity for the 1606 Extension SAN Switch

System activity and status can be determined through the activity of the LEDs on the 1606 Extension SAN Switch. Figure 33 (page 61) shows the LEDs on the port side of the 1606 Extension SAN Switch.

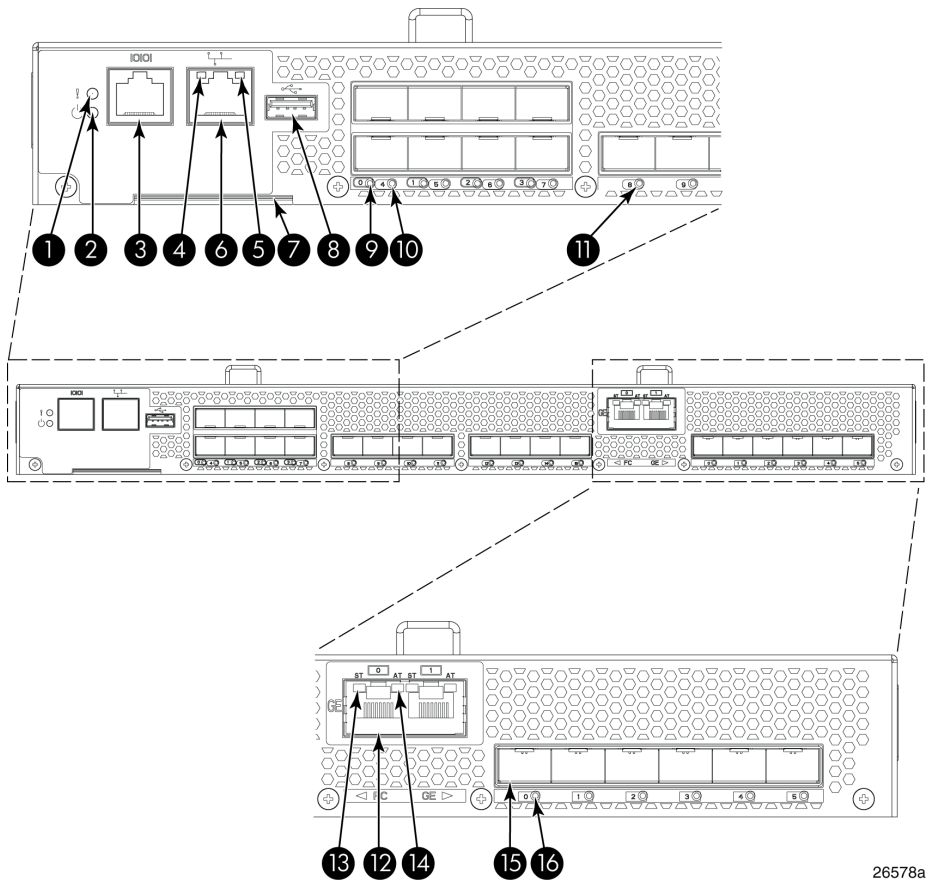
The LED states are as follows:

- No light
- Steady light
- Flashing light

The LEDs are either green or amber.

NOTE: The LEDs may be solid amber or may flash during boot, POST, or other diagnostic tests. This is normal; it does not indicate a problem unless the LEDs do not indicate a healthy state after all boot processes and diagnostic tests are complete.

Figure 33 Port side LEDs on the 1606 Extension SAN Switch



- | | |
|----------------------------|-------------------------------------|
| 1. System status LED | 9. Port 0 status LED |
| 2. System power LED | 10. Port 4 status LED |
| 3. Console port | 11. Port 8 status LED |
| 4. Ethernet link LED | 12. GbE copper port |
| 5. Ethernet status LED | 13. GbE port 0 Fault (FLT) LED |
| 6. Ethernet port | 14. GbE port 0 status/activity LED |
| 7. IP Address pull-out tab | 15. GbE optical port |
| 8. USB port | 16. GbE dual-color optical port LED |

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Table 13 (page 61) describes the port side LEDs and the recommended actions.

Table 13 1606 Extension SAN Switch port side LED patterns

LED name	LED color	Status of hardware	Recommended action
Power status	No light	System is off or there is an internal power supply failure.	Verify the following: <ul style="list-style-type: none"> System is powered on (power supply switches are set to 1). The power cables are attached. The power source is live. If the system power LED is not green, the unit may be faulty. Contact your switch service provider.
	Steady green	System is on and power supplies are functioning properly.	No action required.

Table 13 1606 Extension SAN Switch port side LED patterns (continued)

System status	No light	System is off or there is no power.	Verify that the system is on and has completed booting.
	Steady green	System is on and functioning properly.	No action required.
	Steady amber (for more than five seconds)	System is in an unknown state, boot failed, or system is faulty. NOTE: This LED displays steady amber during POST. This is normal and does not indicate a fault.	Perform the following steps: 1. Connect a serial cable to the system. 2. Reboot the system. 3. Check the failure indicated on the system console. 4. Contact your switch service provider.
	Flashing amber/green	Attention is required. There are several possible causes, including a power supply failure, fan failure, or one or more environmental ranges being exceeded.	Check the management interface and the error log for details on the cause of the status. Contact your switch service provider.
Ethernet link	No light	There is no link.	Verify that the Ethernet cable is connected properly.
	Steady green	There is a link.	No action required.
Ethernet status/activity	No light	There is no link activity.	No action required.
	Flashing green	There is link activity (traffic).	No action required.
FC port status	No light	Indicates one of the following: <ul style="list-style-type: none"> No signal or light carrier (media or cable) is detected. Device may be initializing. Connected device is configured in an offline state. 	Verify that the power LED is on. Verify the SFP and cable. Verify that the device is not initializing. Verify the status of the connected device.
	Steady green	Port is online (connected to external device) but has no traffic.	No action required.
	Slow-flashing green (on 1 second; then off 1 second)	Port is online but segmented because of a loopback cable or an incompatible switch connection.	Verify that the correct device is attached to the switch.
	Fast-flashing green (on 1/4 second; then off 1/4 second)	Port is online and an internal loopback diagnostic test is running.	No action required.
	Flickering green	Port is online and frames are flowing through the port.	No action required.
	Steady amber	Port is receiving light or signal carrier, but is not yet online.	No action required.
	Slow-flashing amber (on 2 seconds; then off 2 seconds)	Port is disabled because of diagnostics or the <code>portdisable</code> command.	Reset the port. The <code>portcfgpersistentdisable</code> command is persistent across reboots.
	Fast-flashing amber (on 1/2 second, then off 1/2 second)	SFP or port is faulty.	Reset the port. Replace the SFP. with an HPE SFP.

Table 13 1606 Extension SAN Switch port side LED patterns (continued)

GbE Optical Port Status	No light	Port is offline.	Verify that the power LED is on and check the SFP and cable.
	Steady green	Port is online but has no traffic.	No action required.
	Flickering green	Port is online and frames are flowing through the port.	No action required.
	Steady amber	Port is faulty.	Change the SFP or reset the switch from the workstation.
GbE Copper Port Status 2 LEDs per port - one green, one amber	No lights (both LEDs are off)	Port is offline.	Verify that the power LED is on, and check the SFP and cable.
	Steady green, amber off	Port is online but has no traffic.	No action required.
	Flickering green, amber off	Port is online and frames are flowing through the port.	No action required.
	Green off, steady amber	Port is faulty.	Reset the switch from the workstation. If the problem persists, use the other copper port or the optical ports, or return the switch for repair.

Nonport side LED activity for the 1606 Extension SAN Switch

The LEDs on the nonport side of the 1606 Extension SAN Switch are shown in [Figure 11 \(page 20\)](#). [Table 14 \(page 63\)](#) describes the nonport side LEDs and the recommended actions.

Table 14 1606 Extension SAN Switch nonport side LED patterns

LED name	LED color	Status of hardware	Recommended action
Power supply status/fan status	No light	Power supply is not seated correctly.	Verify that the power supply is seated correctly.
	Steady green	System is on and power supplies are functioning properly.	No action required.
	Flashing green	A fault has occurred in the FRU.	Do the following: <ul style="list-style-type: none"> • Check the power cable connection. • Verify that the power supply is powered on. • Use the <code>psshow</code> and <code>fanshow</code> commands to determine the source of the fault. • Replace the power supply FRU.

Interpreting POST results

POST is a system check that is performed each time the switch is powered on, rebooted, or reset, and during which the LEDs flash different colors.

To determine if POST completed successfully and whether any errors were detected:

1. Verify that the LEDs on the switch indicate that all components are healthy. (LED patterns are described in [\(page 53\)](#) and [\(page 54\)](#).) If one or more LEDs do not display a healthy state, do the following:
 - a. Verify that the LEDs are not set to beacon (this can be determined through the `switchshow` command or Web Tools). For information about how to turn beaconing on and off, see the *Fabric OS Administrator's Guide* or the *Web Tools Administrator's Guide*.
 - b. Follow the recommended action for the observed LED behavior, as listed in [Table 8 \(page 53\)](#) and [Table 9 \(page 54\)](#).
2. Verify that the switch prompt appears on the terminal of a computer workstation that is connected to the switch.

If the prompt does not appear when POST completes, press **Enter**. If the prompt still does not appear, open another Telnet session or access the switch through another management tool. If this is not successful, the switch did not successfully complete POST. Contact the switch supplier.
3. Using either Web Tools or the CLI, verify that the diagnostic status for all ports in the switch is OK.
 - If you are using Web Tools, select **Port Admin** or **Status** to display information about the ports.
 - If you are using the CLI, use the `diagshow` command.
4. Review the system log for errors.
 - If you are using Web Tools, errors are listed under **Switch Events**.
 - If you are using the CLI, errors detected during POST are written to the system log, which is viewed using the `errshow` command. For more information about this command, see the *Fabric OS Message Reference*.

Maintaining the 8-Gb SAN Switches

The 8-Gb SAN Switches are designed for high availability and low failure. They do not require any regular physical maintenance. They include diagnostic tests and FRUs for the 8/40, 8/80, Encryption SAN Switch, FCoE Converged Network Switch, and 1606 Extension SAN Switch, as described in the following sections.

Installing an SFP

The 8-Gb SAN Switches support only HPE-branded SFPs. For ordering information, see [Supported SFP transceiver options \(page 21\)](#).

If you use an unqualified SFP, the `switchshow` command output will show the port in an `Mod_Inv` state. Additionally, the firmware logs the issue in the system error log.

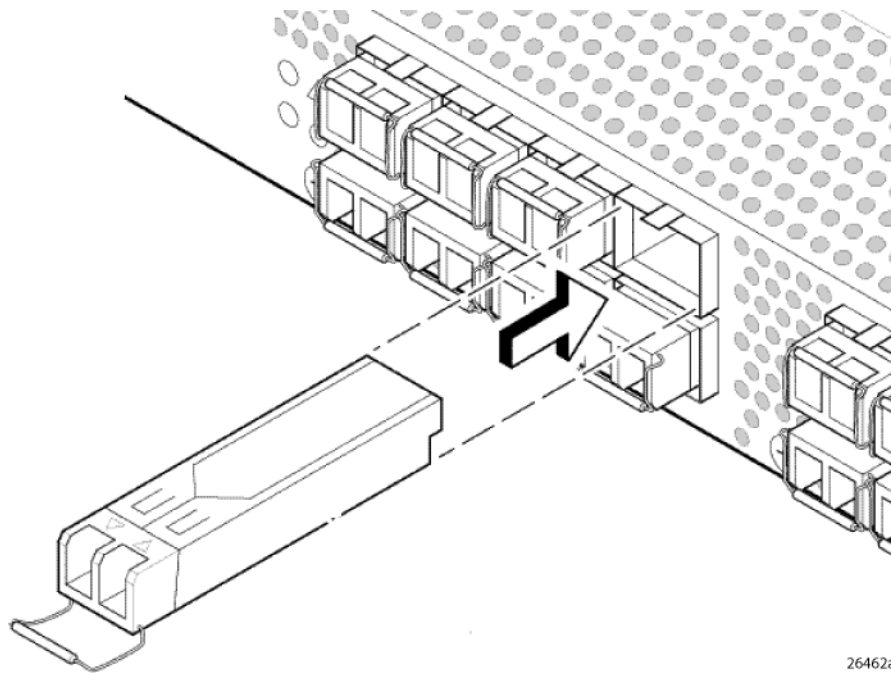
To install an SFP:

1. Verify that the bale (wire handle) is in the unlocked position (see [Figure 34 \(page 65\)](#)).
2. Place the SFP in the correctly oriented position on the port.

NOTE: Each SFP has a gold-plated PCB-edge connector on the bottom. The correct position to insert an SFP into the upper row of ports is with the gold edge down. The correct position to insert an SFP into the lower row of ports is with the gold edge up.

3. Slide the SFP into the port until you feel it click into place; then close the bale.

Figure 34 Installing an SFP in the upper row of port slot



Diagnostic Tests

In addition to POST, Fabric OS includes diagnostic tests to help you troubleshoot the hardware and firmware. This includes tests of internal connections and circuitry, fixed media, and the transceivers and cables in use. The tests are implemented by command, either through a Telnet session or through a console set up to the serial connection to the switch. Some tests require the ports to be connected by external cables to enable diagnostics to verify the serializer/deserializer interface, transceiver, and cable. Some tests require loopback plugs.

Diagnostic tests for FC ports run at link speeds of 1, 2, 4 and 8 Gb/s.

-
- ⓘ **IMPORTANT:** Diagnostic tests might temporarily lock the transmit and receive speed of the links during diagnostic testing. For information about specific diagnostic tests, see the *Brocade Fabric OS Troubleshooting and Diagnostics Guide*.
-

Installing Field-Replaceable Units

This section lists FRUs and provides FRU installation procedures.

8/8 SAN Switch and 8/24 SAN Switch FRU units

No components in the 8/8 SAN Switch and 8/24 SAN Switch are field replaceable. If the switch becomes inoperable, replace the entire switch.

8/40 SAN, FCoE Converged Network, and 1606 Extension SAN Switch FRU units

Replace the power supply and fan assembly unit.

Verifying fan assembly FRU replacement

To determine if a fan assembly requires replacing, do any of the following:

- Observe the system status LED. If the system status LED is flashing amber and green, it could indicate that the fan has failed. The green power supply/fan LED flashes in the event

of failure. Check the management interface and the error log for details on the cause of status.

- In Web Tools, check the **Fan Status** icon background color. It will be either yellow or red if the fan has failed. When the fan is functioning correctly, the background color is green.
- Enter the `fanshow` command at the command prompt to display fan status:

```
switch:admin> fanshow  
Fan 1 is OK, speed is 7105 RPM  
Fan 2 is OK, speed is 7258 RPM
```

Fan assembly

Two fan assemblies are hot-swappable, if replaced one at a time. They are identical and fit into any fan slot.

Fabric OS identifies the fan assemblies as follows (viewing the switch from the nonport side):

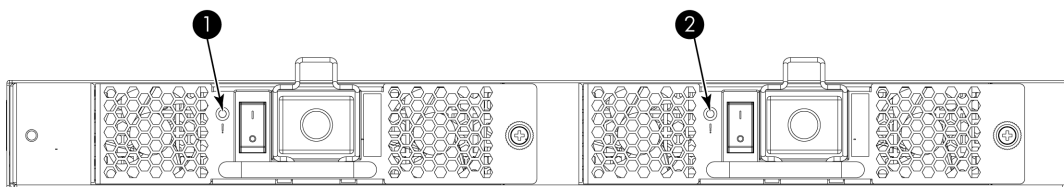
- Fan assembly 2 is on the left.
- Fan assembly 1 is on the right.

To determine whether a fan assembly should be replaced, do any of the following:

- Check the system status LED ([Figure 35 \(page 66\)](#)). If the fan status LED is not on, verify that the fan is seated correctly. If the light does not turn green, the fan assembly may need to be replaced.
- In Web Tools, check the Fan Status icon background color. It will be either yellow or red if the fan has failed. When the fan is functioning correctly, the background color is green.
- Enter the `fanshow` command at the command prompt to display fan status as shown below:

```
switch:admin> fanshow  
Fan 1 is OK, speed is 9507 RPM  
Fan 2 is OK, speed is 9246 RPM  
Fan 3 is OK, speed is 9337 RPM
```

Figure 35 Nonport side LEDs



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1. Status LED for power supply/fan unit 2

2. Status LED for power supply/fan unit 1

Fan assembly LEDs

[Table 15 \(page 67\)](#) describes the fan status LED colors, behaviors, and actions required, if any.

Table 15 Fan status LED behavior, description, and required actions

LED color and behavior	Description	Action required
No light	Fan assembly is not receiving power.	Verify that the fan FRU is seated correctly.
Steady green	Fan assembly is operating normally.	No action required.
Steady amber (for more than five seconds)	Fan fault for one of the following reasons: <ul style="list-style-type: none"> One or more of the fans in the fan assembly has failed. The fan FRU was disabled by the user. 	Verify that the fan FRU is enabled. If the fan FRU is enabled and the FRU is faulty it should be replaced.

Replacing the 8/40 SAN Switch power supply and fan assembly

- △ CAUTION:** Disassembling any part of the power supply and fan assembly voids the warranty and regulatory certifications. There are no user-serviceable parts inside the power supply and fan assembly. Because the cooling system relies on pressurized air, do not leave any of the fan assembly slots empty longer than two minutes while the switch is operating. If a fan assembly fails, leave it in the switch until it can be replaced. Maintain all fan assemblies in operational condition to provide redundancy.

Replacing the power supply and fan assembly unit takes approximately two minutes. You will need:

- New power supply and fan assembly FRU (one unit)
- Phillips-head screwdriver #1

To replace the power supply and fan assembly unit:

1. Use a Phillips-head screwdriver to unscrew the captive screw on the power supply fan assembly you are replacing.
2. Remove the power supply fan assembly you are replacing from the chassis by pulling the handle out and away from the chassis.
3. Install the new power supply fan assembly unit in the chassis:
 - a. Orient the new fan assembly with the captive screw on the right.
 - b. Gently push the power supply fan assembly into the chassis until it is firmly seated.

- △ CAUTION:** Do not force the installation. If the power supply fan assembly does not slide in easily, ensure that it is correctly oriented before continuing.

- c. Secure the fan assembly to the chassis by screwing in the captive screw.
4. Verify that the fan status LED is lit steady green to indicate normal operation.
 5. (Optional) Display the fan status using the `fanshow` command from the CLI.

8/80 SAN Switch and Encryption SAN Switch FRU units

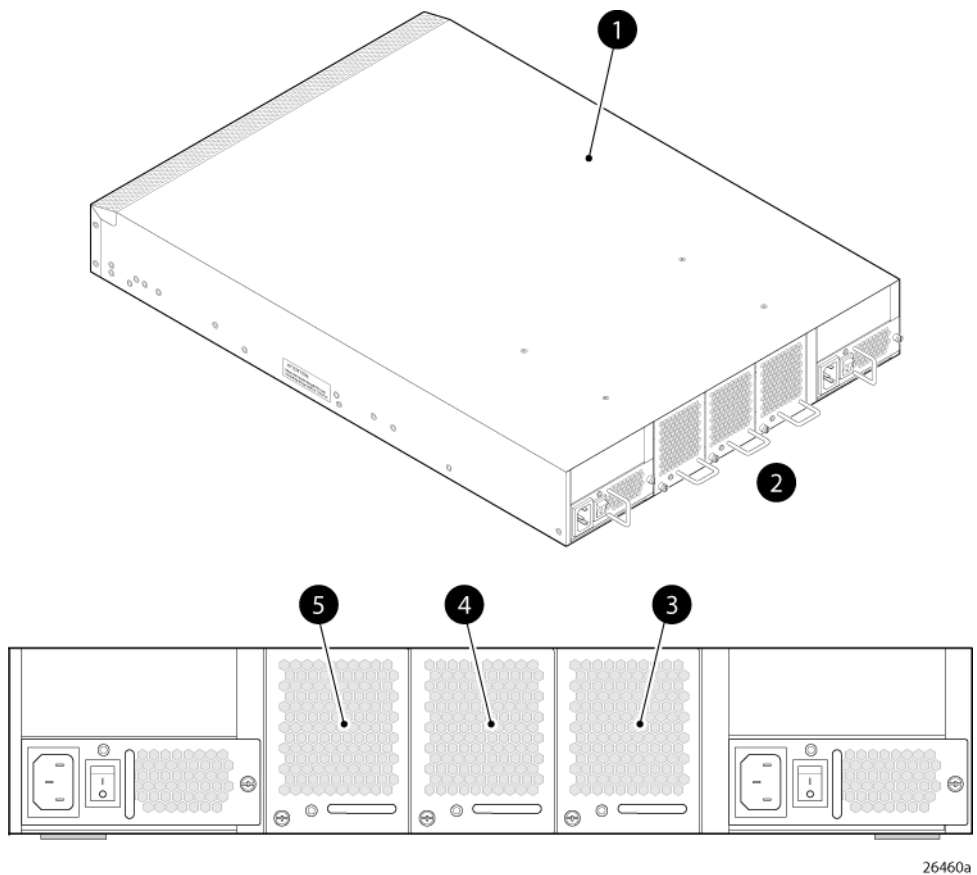
Replace the following FRUs as required:

- Fan assembly
- Power supply

The 8/80 SAN Switch and Encryption SAN Switch integrate three fan assemblies (see [Figure 36 \(page 68\)](#)).

Fabric OS identifies the fans from left to right as Fan assembly #3, Fan assembly #2, and Fan assembly #1.

Figure 36 8/80 and Encryption SAN Switch fan assemblies on the nonport side



- | | |
|--------------------|--------------------|
| 1. 8/80 SAN Switch | 4. Fan assembly #2 |
| 2. Nonport side | 5. Fan assembly #3 |
| 3. Fan assembly #1 | |

CAUTION: Disassembling any part of the fan assembly voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the fan assembly. Because the cooling system relies on pressurized air, do not leave any of the fan assembly slots empty longer than two minutes while the switch is operating. If a fan assembly fails, leave it in the switch until it can be replaced. Maintain all three fan assemblies in operational condition to provide redundancy.

Replacing the 8/80 SAN Switch and Encryption SAN Switch fan assembly

Replacing a fan assembly takes approximately two minutes. You will need:

- 8/80 SAN Switch or Encryption SAN Switch
- New fan FRU assembly
- Phillips-head screwdriver #1

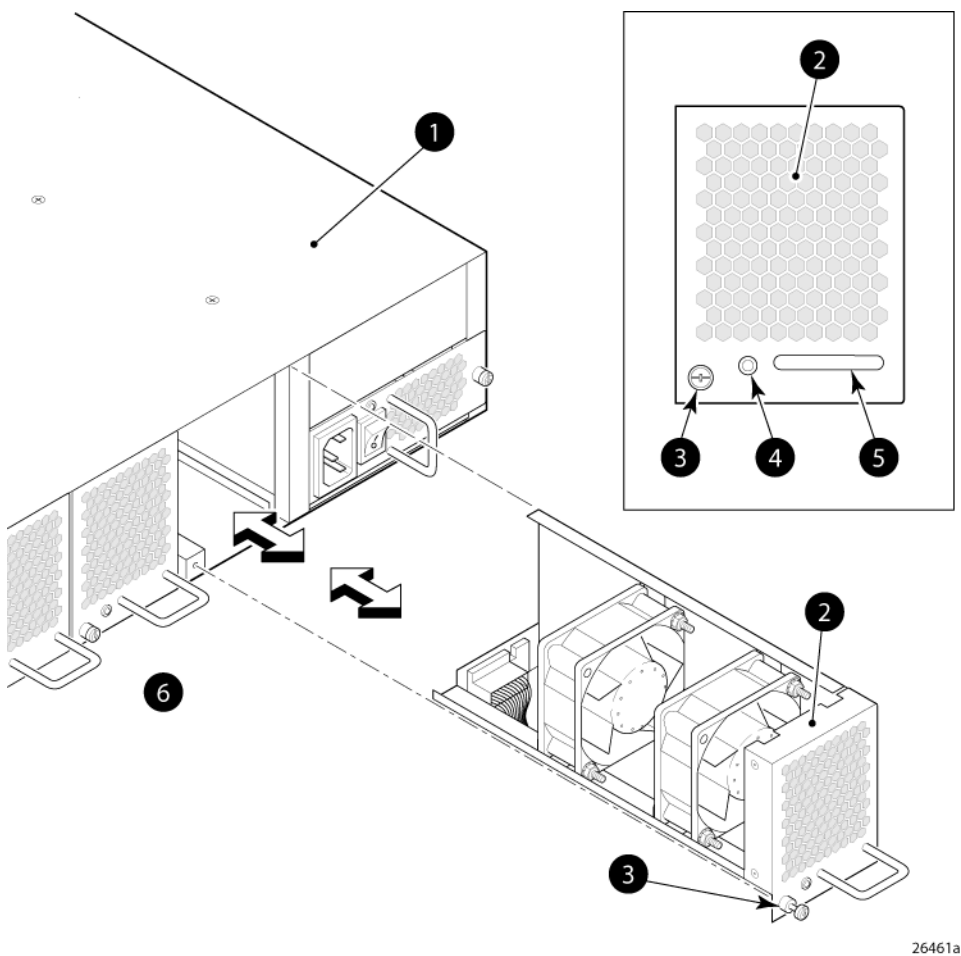
CAUTION: The 8/80 and Encryption SAN Switches use two power cords. Disconnect both power cords before servicing.

To replace a fan assembly:

1. Use a Phillips-head screwdriver to unscrew the captive screw on the fan assembly you are replacing.
2. Remove the fan assembly from the chassis by pulling the handle out and away from the chassis.

3. Install the new fan assembly in the chassis:
 - a. Orient the new fan assembly as shown in [Figure 37 \(page 69\)](#), with the captive screw on the right.
 - b. Gently push the fan assembly into the chassis until it is firmly seated.
-
- ⚠ CAUTION:** Do not force the installation. If the fan assembly does not slide in easily, ensure that it is correctly oriented before continuing.
-
- c. Secure the fan assembly to the chassis with the captive screw.
 4. Verify that the fan status LED is lit steady green to indicate normal operation (see [Table 15 \(page 67\)](#)).
 5. (Optional) Display the fan status using the `fanshow` command from the CLI (see [Figure 37 \(page 69\)](#) for the locations of Fan assembly #1, Fan assembly #2, and Fan assembly #3).

Figure 37 Inserting the fan assembly in the 8/80 SAN Switch



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- | | |
|----------------------|-----------------|
| 1. 8/80 SAN Switch | 4. Status LED |
| 2. Fan assembly unit | 5. Handle |
| 3. Captive screw | 6. Nonport side |

Replacing an 8/80 SAN Switch or Encryption SAN Switch power supply

- ⚠ CAUTION:** If a power supply fails, leave the power supply in the switch until it can be replaced. Maintain both power supplies in operational condition to provide redundancy.

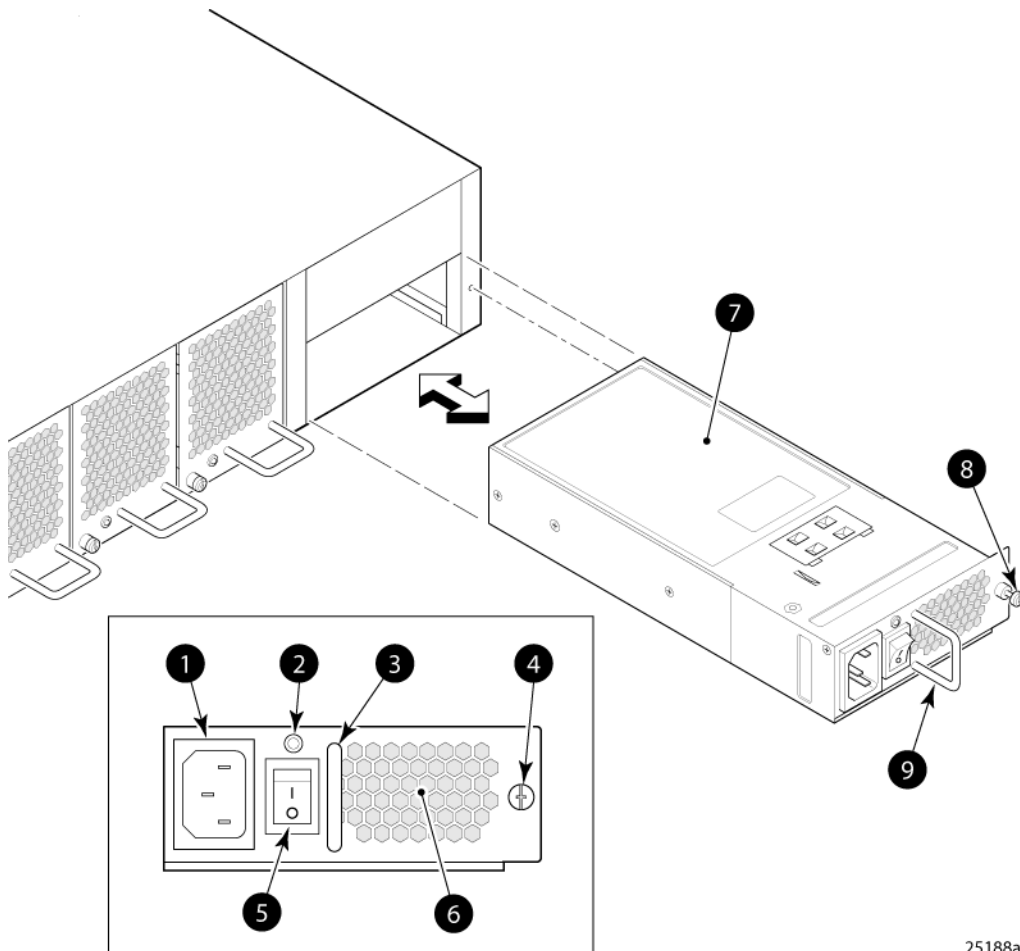
Replacing a power supply takes approximately two minutes. You will need:

- 8/80 SAN Switch or Encryption SAN Switch
- New power supply
- Phillips-head screwdriver #1

To replace a power supply:

1. If the switch remains powered on, verify that the functioning power supply (the one not being replaced) has been powered on for at least four seconds and displays a green LED.
2. If the power supply you are replacing is not already powered off, press the AC power switch to power it off.
3. Unplug the power cord from the power supply you are replacing.

Figure 38 Installing a power supply in the 8/80 or Encryption SAN Switch



25188a

- | | |
|------------------------|--------------------|
| 1. AC power receptacle | 4. Captive screw |
| 2. Status LED | 5. AC power switch |
| 3. Handle | 6. Power supply |

4. Using a Phillips screwdriver, unscrew the captive screw on the power supply you are replacing.
5. Remove the power supply from the chassis by pulling its handle out and away from the chassis.
6. Orient the new power supply as shown in [Figure 38 \(page 70\)](#), with the AC power receptacle on the left.

7. Gently push the power supply into the chassis until it is firmly seated.

⚠ CAUTION: Do not force the installation. If the power supply does not slide in easily, make sure that it is correctly oriented before continuing.

8. Secure the power supply to the chassis by tightening the captive screw.
9. Plug the power cord into the power supply and then press the AC power switch to turn it on.
10. Verify that the LED on the new power supply displays a steady green light while the switch is operating. If the LED is not green, make sure that the power supply is firmly seated.
11. (Optional) Issue the `psshow` command at the CLI prompt to display power supply status.
Fabric OS identifies the power supplies in an 8/80 or Encryption SAN Switch from left to right from the nonport side as PS2 and PS1, as shown in [\(page 70\)](#).

Power supply

The two power supplies are hot-swappable if replaced one at a time. They are identical and fit into either slot.

Fabric OS identifies the power supplies as follows (viewing the switch from the port side):

- Power supply 1 is on the left.
- Power supply 2 is on the right.

To determine whether a power supply should be replaced, do either of the following:

- Check the power supply status LED ([\(page 66\)](#)). If the power supply status LED is not on, verify that the power supply is on and seated correctly and that the power cord is connected to a functioning power source. If the light does not turn green, the power supply may need to be replaced.
- In Web Tools, click the power status icon.
- Enter the `psshow` command at the command prompt to display power supply status:

```
switch:admin> psshow  
Power Supply #1 is OK.  
Power Supply #2 is OK.
```

SAN Switch management features

SAN Switches use built-in management tools to help you monitor fabric topology, check port status, and debug the switch. [Table 16 \(page 72\)](#) lists the management tools available.

When running IP over FC, these management tools must be supported by both HBA and HBA drivers. For a list of supported HBAs, see the *HPE StorageWorks SAN Design Reference Guide*: <http://www.hpe.com/go/sandesignguide>.

Table 16 Management tools

Management tool	Out-of-band support	In-band support
CLI —Up to two admin sessions and four user sessions simultaneously	Ethernet or serial connection	IP over FC
Web Tools —For information, see the <i>Web Tools Administrator's Guide</i> for the Fabric OS version running on your switch.	Ethernet or serial connection	IP over FC
Standard SNMP applications —For information, see the <i>Fabric OS MIB Reference Manual</i> for the Fabric OS version running on your switch.	Ethernet or serial connection	IP over FC
Fabric Manager (optional) —For information, see the <i>Fabric Manager User's Guide</i> . NOTE: The Fabric Manager does not manage the Encryption SAN Switch or FCoE Network Converged Switch.	Ethernet or serial connection	IP over FC
Management Server —For information, see the <i>Fabric OS Administrator's Guide</i> and the <i>Fabric OS Command Reference Manual</i> for the Fabric OS version running on your switch.	Ethernet or serial connection	Native in-band interface (over HBA only)
Data Center Fabric Manager (optional) —For information, see the <i>Brocade Data Center Fabric Manager Enterprise User guide</i> or the <i>Brocade Data Center Fabric Manager Professional User guide</i> .	Ethernet or serial connection	IP over FC

4 Technical specifications

Weight and physical dimensions

Table 17 (page 73) lists the physical dimensions for the SAN Switches.

Table 17 8-Gb SAN Switch physical dimensions

Property	8/8 and 8/24 SAN Switches	8/40 SAN Switch	8/80 SAN Switch	Encryption SAN Switch	FCoE Converged Network Switch	1606 Extension SAN Switch
Height	4.29 cm (1.69 inches)	1U = 4.3 cm (1.7 inches)	2U = 8.6 cm (3.4 inches)	2U = 8.6 cm (3.34 inches)	1U = 4.3 cm (1.7 inches)	4.45 cm (1.75 inches)
Width	42.88 cm (16.887 inches)	42.9 cm (16.88 inches)	42.8 cm (16.8 inches)	42.9 cm (16.88 inches)	42.8 cm (16.8 inches)	43.18 cm (17 inches)
Depth	30.6 cm (12.07 inches)	61 cm (24 inches)	61 cm (24 inches)	63.5 cm (25 inches)	63.4 cm (25 inches)	64.14 cm (25.25 inches)
Weight	4.35 kg (9.3 lb)	9.34 kg (20.6 lb) (with two power supply/fan assemblies, no SFPs)	15.6 kg (34.4 lb) (with two power supplies, three fan assemblies, no SFPs)	22.4 kg (49.4 lb) (with two power supplies, three fan assemblies, no SFPs)	12.97 kg (28.6 lb) (with two power supply/fan assemblies, no SFPs)	10.9 kg (24 lb) (with two power supply/fan assemblies, no SFPs)

Memory

Table 18 (page 74) lists 8/8, 8/24, and 8/40 SAN Switch memory specifications.

Table 18 8/8, 8/24 and 8/40 SAN Switch memory

Memory type	Install memory
Main Memory (SDRAM)	512 MB
Boot Flash	8/40 SAN Switch only: 4 MB
Compact Flash	1 GB

Table 19 (page 74) lists the 8/80 SAN Switch, Encryption SAN Switch, and FCoE Converged Network Switch memory specifications.

Table 19 8/80 SAN Switch, Encryption SAN Switch, and FCoE Converged Network Switch memory

Memory type	Install memory
Main Memory (DDR2 SDRAM)	1 GB
Boot Flash	4 MB
Compact Flash	1 GB

Table 20 (page 74) lists the 1606 Extension SAN Switch memory specifications.

Table 20 1606 Extension SAN Switch memory

Memory type	Install memory
Main Memory (DDR2 SORDIMM SDRAM)	2 GB
Boot Flash	4 MB
Compact Flash	1 GB

Facility requirements

To ensure correct operation, the facility where the switch is in use must meet the requirements shown in Table 21 (page 74).

Table 21 Facility requirements

Type	Requirements
Electrical	<p>8/8, 8/24, 8/80, Encryption, and 1606 Extension SAN Switches—Primary AC input: 100–240 VAC, 2.0 A, 47–63 Hz; switch autosenses input voltage.</p> <p>8/40 SAN Switch—Primary AC input: 90–264 VAC; switch autosenses input voltage.</p> <p>FCoE Converged Network Switch—Primary AC input: 85–264 VAC; input line frequency 47–63 Hz.</p> <p>Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the switch nameplate.</p> <p>Circuit protected by a circuit breaker and grounded in accordance with local electrical codes.</p> <p>Electrical interference less than the levels in the standards listed in Table 22 (page 75).</p>
Thermal	<p>8/8 and 8/24 SAN Switches—A minimum of 24 cu ft/min of airflow is available to the air intake vents on the nonport side of the switch.</p> <p>8/40, 8/80, Encryption, and 1606 Extension SAN Switches—Air flows from the nonport side to the port side. A minimum airflow of 79.8 cu m/hr (47 cu ft/min) is available in the immediate vicinity of the switch.</p> <p>Ambient air temperature does not exceed 40°C (104°F) while the switch is operating.</p>

Table 21 Facility requirements (continued)

Type	Requirements
	FCoE Converged Network Switch —Air flows from the nonport side to the port side. Maximum airflow of 71.36 cu m/h (42 cu ft/min), nominal airflow of 59.47 cu m/h (35 cu ft/min).
Cabinet (when rack mounted)	8/8, 8/24, and 8/40 SAN Switches, FCoE Converged Network Switch, and 1606 Extension SAN Switch —One rack unit in a 48.3 cm (19 inch) cabinet. 8/80 and Encryption SAN Switches —Cabinet space of 2U in an EIA 19-inch cabinet. All equipment in the cabinet is grounded through a reliable branch circuit connection. Additional weight of the switch does not exceed the cabinet's weight limit. Cabinet is secured to ensure stability in case of unexpected movement, such as an earthquake.

Electromagnetic compatibility

[Table 22 \(page 75\)](#) lists EMC.

Table 22 EMC

Country	Safety	EMC
United States	Bi_Nat UL/CSA 60950-1 1st Ed or latest	ANSI C63.4
Canada	Bi_Nat UL/CSA 60950-1 1st Ed or latest	ICES-003 Class A
Japan		CISPR22 and JEIDA (Harmonics)
European Community	EN60950-1 or latest	EN55022 and EN55024
Australia/New Zealand		EN55022 or CISPR22 or AS/NZS CISPR22
Argentina	IEC60950-1 or latest	
Russian Federation	IEC60950-1 or latest	51318.22-99 and 51318.24.99
Korea		KN22 and KN24
China (PS only)	GB4943-2001 and GB9254-1998 or latest	GB17625.1-2003 or latest
Taiwan (PS only)	CNS 14336(94) or latest	CNS 13438(95) or latest

Power supply specifications

The power supplies are universal and capable of functioning worldwide without using voltage jumpers or switches. They meet IEC 61000-4-5 surge voltage requirements and are autoranging in terms of accommodating input voltages and line frequencies. Each power supply integrates its own built-in fan for cooling, pushing the air forward toward the port side of the switch.

[Table 23 \(page 75\)](#) lists the power supply specifications.

Table 23 Power supply specifications

Specification	Description
Inlet	C13
Maximum output from each power supply	8/8 and 8/24 SAN Switches: 75 W, with fans operating 8/40 SAN Switch: 125 W, with fans operating 8/80 SAN Switch: 300 W, with fans operating Encryption SAN Switch and FCoE Converged Network Switch: 350 W DC (one power supply); in-rush current: less than 60 A peak 1606 Extension SAN Switch (one power supply): 150 watts

Table 23 Power supply specifications (continued)

Specification	Description
System power consumption	8/8 and 8/24 SAN Switches: 48 W nominal, 57 W maximum 8/40 SAN Switch: 84 W nominal, 91 W maximum 8/80 SAN Switch: 260 W nominal, 300 W maximum Encryption SAN Switch: 100–240 VAC, universal FCoE Converged Network Switch: 182.4 W nominal, 306 W maximum 1606 Extension SAN Switch: 95 W nominal, 116 W maximum
Input voltage	8/8, 8/24 , and 8/40 SAN Switches, FCoE Converged Network Switch, and 1606 Extension SAN Switch: 85–264 VAC, universal 8/80 SAN Switch: 90–264 VAC, universal Encryption SAN Switch: 100–240 VAC, universal
Input line frequency	47–63 Hz
BTU rating	8/8 and 8/24 SAN Switches: 277 BTU/hr 8/40 SAN Switch: 406 BTU/hr 8/80 SAN Switch: 1, 313 BTU/hr Encryption SAN Switch: 1, 183 BTU/hr FCoE Converged Network Switch: 1, 044.11 BTU/hr 1606 Extension SAN Switch: 590 BTU/hr
In-rush current	8/8 and 8/24 SAN Switches: 21.5 A at 240 VAC cold start 8/40 SAN Switch: 15–35 A maximum 8/80 SAN Switch: 15 A maximum for period of 10–150 mS Encryption SAN Switch: Less than 60 A peak FCoE Converged Network Switch and 1606 Extension SAN Switch: Maximum of 60 A for period of 10–150 ms
Input line protection	1606 Extension SAN Switch: Both AC lines are fused

Data transmission ranges

See [Table 24 \(page 76\)](#) through [Table 29 \(page 79\)](#) for 8-Gb SAN Switch data transmission ranges for the different cable types and port speeds.

Table 24 Laser data transmission ranges for the 8/8 and 8/24 SAN Switches

Port speed	Cable size (microns)	Short wavelength	Long wavelength
1 Gb/s	50	500 m (1,640 ft)	N/A
	62.5	300 m (984 ft)	N/A
	9	N/A	Up to 10 km (6.2 miles) optional long wave SFPs required
2 Gb/s	50	300 m (984 ft)	N/A
	62.5	150 m (492 ft)	N/A
	9	N/A	N/A
4 Gb/s	50	150 m (492 ft)	N/A
	62.9	70 m (230 ft)	N/A
	9	N/A	N/A

Table 24 Laser data transmission ranges for the 8/8 and 8/24 SAN Switches (continued)

Port speed	Cable size (microns)	Short wavelength	Long wavelength
8 Gb/s	50	150 m	N/A
	62.5	21 m	N/A
	9	N/A	10 km

Table 25 Laser data transmission ranges for the 8/40 SAN Switch

Port speed	Cable size (microns)	Short wavelength	Long wavelength	Extended long wavelength
1 Gb/s	50	500 m (1,640 ft)	10 km (6.2 miles)	N/A
	62.5	300 m (984 ft)	10 km (6.2 miles)	N/A
	9	N/A	10 km (6.2 miles)	40 km (24.8 miles)
2 Gb/s	50	300 m (984 ft)	10 km (6.2 miles)	N/A
	62.5	150 m (492 ft)	10 km (6.2 miles)	N/A
	9	N/A	10 km (6.2 miles) without an HPE Extended Fabrics license 50 to 100 km with an HPE Extended Fabrics license	40 km (24.8 miles)
4 Gb/s	50	150 m (492 ft)	N/A	N/A
	62.5	70 m (230 ft)	N/A	N/A
	9	N/A	N/A	N/A
8 Gb/s	50	150 m	N/A	N/A
	62.5	21 m	N/A	N/A
	9	N/A	10 km	N/A

NOTE: For the 8/40 SAN Switch, up to 500 km at 1 Gb/s is supported when using a long distance transport system such as DWDM.

Table 26 Laser data transmission ranges for the 8/80 SAN Switch

Port speed	Cable size (microns)	Short wavelength	Long wavelength	Extended long wavelength
1 Gb/s	50	500 m (1,640 ft)	10 km (6.2 miles)	N/A
	62.5	300 m (984 ft)	10 km (6.2 miles)	N/A
	9	N/A	10 km (6.2 miles)	80 km (50 miles)
2 Gb/s	50	300 m (984 ft)	N/A	N/A
	62.5	150 m (492 ft)	10 km (6.2 miles)	N/A
	9	N/A	10 km (6.2 miles) without an HPE Extended Fabrics license	80 km (50 miles)

Table 26 Laser data transmission ranges for the 8/80 SAN Switch *(continued)*

Port speed	Cable size (microns)	Short wavelength	Long wavelength	Extended long wavelength
			50 to 100 km with an HPE Extended Fabrics license	
4 Gb/s	50	150 m (492 ft)	N/A	N/A
	62.5	70 m (230 ft)	N/A	N/A
	9	N/A	10 km	N/A
8 Gb/s	50	150 m (492 ft)	N/A	N/A
	62.5	21 m	N/A	N/A
	9	N/A	10 km (6.2 miles)	N/A

NOTE: For the 8/80 SAN Switch, up to 500 km at 1 Gb/s is supported when using a long-distance transport system such as DWDM.

Table 27 Laser data transmission ranges for the Encryption SAN Switch and FCoE Converged Network Switch

Port speed	Cable size (microns)	Short wavelength	Long wavelength (Encryption SAN Switch)	Long wavelength (FCoE Converged Network Switch)
1 Gb/s	50	500 m (1,640 ft) (OM2) 860 m (2,821 ft) (OM3)	N/A	N/A
	62.5	300 m (984 ft)	N/A	N/A
	9	N/A	N/A	10 km (6.2 miles)
2 Gb/s	50	300 m (984 ft) (OM2) 500 m (1,640 ft) (OM3)	N/A	N/A
	62.5	150 m (492 ft)	N/A	N/A
	9	N/A	30 km (18.6 miles)	10 km (6.2 miles)
4 Gb/s	50	150 m (492 ft) (OM2) 380 m (1,246 ft) (OM3)	N/A	N/A
	62.5	70 m (230 ft)	N/A	N/A
	9	N/A	30 km (18.6 miles)	10 km (6.2 miles)
8 Gb/s	50	50 m (164 ft) (OM2) 150 m (492 ft) (OM3)	N/A	N/A
	62.5	21 m (69 ft)	N/A	N/A
	9	N/A	N/A	10 km (6.2 miles)

NOTE: For the Encryption SAN Switch and FCoE Converged Network Switch, up to 500 km at 1 Gb/s is supported when using a long-distance transport system such as DWDM.

Table 28 Laser data transmission ranges for the 1606 Extension SAN Switch Fibre Channel ports

Port speed	Cable size (microns)	Short wavelength	Long wavelength	Extended long wavelength
1 Gb/s	50	500 m (1,640 ft) (OM2) 860 m (2,821 ft) (OM3)	N/A	N/A
	62.5	300 m (984 ft)	N/A	N/A
	9	N/A	10 km (6.2 miles)	80 km (50 miles)
2 Gb/s	50	300 m (984 ft) (OM2) 500 m (1,640 ft) (OM3)	N/A	N/A
	62.5	150 m (492 ft)	N/A	N/A
	9	N/A	10 km (6.2 miles)	80 km (50 miles)
4 Gb/s	50	150 m (492 ft) (OM2) 380 m (1,246 ft) (OM3)	N/A	N/A
	62.5	70 m (230 ft)	N/A	N/A
	9	N/A	10 km (6.2 miles)	N/A
8 Gb/s	50	50 m (164 ft) (OM2) 150 m (492 ft) (OM3)	N/A	N/A
	62.5	21 m (69 ft)	N/A	N/A
	9	N/A	10 km (6.2 miles)	N/A

Table 29 GbE data transmission ranges for the 1606 Extension SAN Switch

Port speed	Cable size (microns)	Short wavelength	Long wavelength
1 Gb/s	50	500 m (1,640 ft) (OM2) 860 m (2,821 ft) (OM3)	N/A
	62.5	300 m (984 ft)	N/A
	9	N/A	4 km (2.48 miles)

FCoE Converged Network Switch data flow latency

Table 30 (page 79) describes the data flow latency for the FCoE Converged Network Switch.

Table 30 Data flow latency for the FCoE Converged Network Switch

Data flow latency type	Size in nanoseconds
FC port to FC port	+/- 700 ns
CEE port to CEE port (same ASIC)	570 ns
CEE port to CEE port (different ASIC)	1,050 ns
FCoE to FC	1,670 ns

Fibre Channel port specifications

The Fibre Channel ports in the 8-Gb SAN Switch are compatible with SWL, LWL, and ELWL SFP transceivers. The strength of the signal is determined by the type of transceiver in use.

The ports meet all required safety standards.

The ports are capable of operating at 1, 2, 4, or 8 Gb/s and are able to autonegotiate to the maximum link speed.

POST and boot specifications

The switch performs POST by default each time it is powered on or rebooted or the system is reset. Boot time with POST is usually about 1 to 3 minutes.

POST can be skipped after subsequent reboots by entering the `fastboot` command. For more information about this command, see the *Fabric OS Command Reference Manual*.

POST

The success/fail results of the diagnostic tests that run during POST can be monitored through LED activity, the error log, or the CLI.

POST performs the following tasks:

- Conducts preliminary POST diagnostics
- Initializes the operating system
- Initializes the hardware
- Runs diagnostic tests on several functions, including circuitry, port functionality, memory, statistics counters, and serialization

Boot

Boot performs the following tasks after POST is complete:

- Performs universal port configuration
- Initializes links
- Analyzes the fabric
If any ports are connected to other switches, the switch participates in a fabric configuration.
- Obtains a domain ID and assigns port addresses
- Constructs unicast routing tables
- Enables normal port operation

Supported HBAs and CNAs

NOTE: CNAs apply to the FCoE Converged Network Switch only.

For a list of HBAs that have been tested and are known to work with the SAN switches, see the latest version of the *HPE StorageWorks SAN Design Reference Guide*, at <http://www.hpe.com/go/sandesignguide>.

5 Support and other resources

Hewlett Packard Enterprise technical support

For worldwide technical support information, see the Hewlett Packard Enterprise support website:

<http://www.hp.com/support>

Before contacting Hewlett Packard Enterprise, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

Subscription service

Hewlett Packard Enterprise recommends that you register your product at the Subscriber's Choice for Business website:

<http://www.hp.com/go/wwalerts>

After registering, you will receive email notification of product enhancements, new driver versions, firmware updates, and other product resources.

Documentation feedback

Hewlett Packard Enterprise welcomes your feedback.

To make comments and suggestions about product documentation, please send a message to storagedocsFeedback@hp.com. All submissions become the property of HP.

Related information

The following documents provide related information. See the appropriate document version for your operating environment.

- *HP StorageWorks Fabric OS 6.3.x Release Notes*
- *Brocade Fabric OS Administrator's Guide 6.3.0*
- *Brocade Fabric OS Encryption Administrator's Guide*
- *Brocade Converged Enhanced Ethernet Administrator's Guide*

You can find these documents on the Manuals page of the HP Business Support Center website:

<http://www.hp.com/support/manuals>

In the Storage section, click **Storage Networking**, and then click **HP StorageWorks DC SAN Director Switches** to access the Manuals web page.

The *Brocade SAN Glossary* provides definitions for SAN-related terminology used throughout this document. To access the glossary, see http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01429405/c01429405.pdf?jumpid=reg_R1002_USEN.

HP websites

For additional information, see the following HP websites:

- <http://www.hp.com>
- <http://www.hp.com/go/storage>
- http://www.hp.com/service_locator
- <http://www.hp.com/support/manuals>
- <http://www.hp.com/support/downloads>

Rack stability

Rack stability protects personnel and equipment.



WARNING! To reduce the risk of personal injury or damage to equipment:


- Extend leveling jacks to the floor.
 - Ensure that the full weight of the rack rests on the leveling jacks.
 - Install stabilizing feet on the rack.
 - In multiple-rack installations, fasten racks together securely.
 - Extend only one rack component at a time. Racks can become unstable if more than one component is extended.
-

Typographic conventions

Table 31 Document conventions


Convention	Element
Blue text: Table 31 (page 83)	Cross-reference links and email addresses
Blue, underlined text: http://www.hp.com	Website addresses
Bold text	<ul style="list-style-type: none">• Keys that are pressed• Text entered into a GUI element, such as a box• GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes
<i>Italic</i> text	Text emphasis
Monospace text	<ul style="list-style-type: none">• File and directory names• System output• Code• Commands, their arguments, and argument values
<i>Monospace, italic</i> text	<ul style="list-style-type: none">• Code variables• Command variables
Monospace, bold text	Emphasized monospace text

 **WARNING!** Indicates that failure to follow directions could result in bodily harm or death.

 **CAUTION:** Indicates that failure to follow directions could result in damage to equipment or data.

 **IMPORTANT:** Provides clarifying information or specific instructions.

NOTE: Provides additional information.

 **TIP:** Provides helpful hints and shortcuts.

Customer self repair

HPE CSR programs allow you to repair your StorageWorks product. If a CSR part needs replacing, Hewlett Packard Enterprise ships the part directly to you so that you can install it at your convenience. Some parts do not qualify for CSR. Your Hewlett Packard Enterprise-authorized service provider will determine whether a repair can be accomplished by CSR.

For more information about CSR, contact your local service provider, or see the CSR website:

<http://www.hp.com/go/selfrepair>

A Regulatory compliance and safety

Regulatory compliance

Federal Communications Commission notice for Class A equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the 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.

Modifications

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

Cables

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

Regulatory compliance identification numbers

For the purpose of regulatory compliance certifications and identification, your product has been assigned a unique RMN. The RMN can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always refer to this RMN. The RMN should not be confused with the marketing name or model number of the product.

Laser device

All Hewlett Packard Enterprise systems equipped with a laser device comply with safety standards, including IEC 825. With specific regard to the laser, the equipment complies with laser product performance standards set by government agencies as a Class 1 laser product. The product does not emit hazardous light.

Laser safety warning



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

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

Certification and classification information

This product contains a laser internal to the FO transceiver for connection to the Fibre Channel communications port.

In the USA, the FO transceiver is certified as a Class 1 laser product conforming to the requirements contained in the Department of Health and Human Services regulation 21 CFR, Subchapter J. A label on the plastic FO transceiver housing indicates the certification.

Outside the USA, the FO transceiver is certified as a Class 1 laser product conforming to the requirements contained in IEC 825–1:1993 and EN 60825–1:1994, including Amendment 11:1996 and Amendment 2:2001.

Laser product label

The optional label in [Figure 39 \(page 85\)](#) or equivalent may be located on the surface of the Hewlett Packard Enterprise supplied laser device.

Figure 39 Class 1 laser product label



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

International notices and statements

Canadian notice (avis Canadien)

Class A equipment

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

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

European Union regulatory notice

European Union Regulatory Notice

This product complies with the following EU Directives:

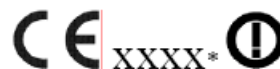
- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) which are listed on the EU Declaration of Conformity issued by Hewlett-Packard for this product or product family.

This compliance is indicated by the following conformity marking placed on the product:



This marking is valid for non-Telecom products and EU harmonized Telecom products (e.g. Bluetooth).



This marking is valid for EU non-harmonized Telecom products.
*Notified body number (used only if applicable - refer to the product label)

Hewlett-Packard GmbH, HQ-TRE, Herrenberger Strasse 140, 71034 Boeblingen, Germany

Japanese notice

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

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

VCCIマークが付いていない場合には、次の点にご注意下さい。

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

Korean notices

A급 기기 (업무용 방송통신기기)	이 기기는 업무용(A급)으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외의 지역에서 사용하는 것을 목적으로 합니다.
-----------------------	-------------------------------------------------------------------------------------------

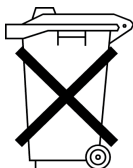
Safety

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 Hewlett Packard Enterprise authorized service provider using the Hewlett Packard Enterprise spare part designated for this product. For more information about battery replacement or proper disposal, contact an Hewlett Packard Enterprise authorized service provider.

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

- Do not attempt to recharge the battery.
- Do not expose to temperatures higher than 60°C.
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
- Replace only with the Hewlett Packard Enterprise spare part designated for this product.



Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. To forward them to recycling or proper disposal, please use the public collection system or return them to Hewlett Packard Enterprise, an authorized Hewlett Packard Enterprise Partner, or their agents.

For more information about battery replacement or proper disposal, contact an Hewlett Packard Enterprise authorized reseller or service provider.

Taiwan battery recycling notice



The Taiwan EPA requires dry battery manufacturing or importing firms in accordance with Article 15 of the Waste Disposal Act to indicate the recovery marks on the batteries used in sales, giveaway, or promotion. Contact a qualified Taiwanese recycler for proper battery disposal.

Power cords

The power cord set must meet the requirements for use in the country where the product was purchased. If the product is to be used in another country, purchase a power cord that is approved for use in that country.

The power cord must be rated for the product and for the voltage and current marked on the product electrical ratings label. The voltage and current rating of the cord should be greater than the voltage and current rating marked on the product. In addition, the diameter of the wire must be a minimum of 1.00 mm² or 18 AWG, and the length of the cord must be between 1.8 m, (6 ft) and 3.6 m (12 ft). If you have questions about the type of power cord to use, contact an Hewlett Packard Enterprise authorized service provider.

NOTE: Route power cords so that they will not be walked on and cannot be pinched by items placed upon or against them. Pay particular attention to the plug, electrical outlet, and the point where the cords exit from the product.

Japanese power cord statement

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

Waste Electrical and Electronic Equipment directive

English notice

Disposal of waste equipment by users in private households in the European Union



■ This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service, or the shop where you purchased the product.

Dutch notice

Verwijdering van afgedankte apparatuur door privé-gebruikers in de Europese Unie



■ Dit symbool op het product of de verpakking geeft aan dat dit product niet mag worden gedeponerd bij het normale huishoudelijke afval. U bent zelf verantwoordelijk voor het inleveren

van uw afgedankte apparatuur bij een inzamelingspunt voor het recyclen van oude elektrische en elektronische apparatuur. Door uw oude apparatuur apart aan te bieden en te recyclen, kunnen natuurlijke bronnen worden behouden en kan het materiaal worden hergebruikt op een manier waarmee de volksgezondheid en het milieu worden beschermd. Neem contact op met uw gemeente, het afvalinzamelingsbedrijf of de winkel waar u het product hebt gekocht voor meer informatie over inzamelingspunten waar u oude apparatuur kunt aanbieden voor recycling.

Czechoslovakian notice

Likvidace zařízení soukromými domácími uživateli v Evropské unii



■ Tento symbol na produktu nebo balení označuje výrobek, který nesmí být vyhozen spolu s ostatním domácím odpadem. Povinností uživatele je předat takto označený odpad na předem určené sběrné místo pro recyklaci elektrických a elektronických zařízení. Okamžité třídění a recyklace odpadu pomůže uchovat přírodní prostředí a zajistí takový způsob recyklace, který ochrání zdraví a životní prostředí člověka. Další informace o možnostech odevzdání odpadu k recyklaci získáte na příslušném obecním nebo městském úřadě, od firmy zabývající se sběrem a svozem odpadu nebo v obchodě, kde jste produkt zakoupili.

Estonian notice

Seadmete jäätmete kõrvaldamine eramajapidamistes Euroopa Liidus



■ See tootel või selle pakendil olev sümbol näitab, et kõnealust toodet ei tohi koos teiste majapidamisjäätmetega kõrvaldada. Teie kohus on oma seadmete jäätmed kõrvaldada, viies need elektri- ja elektroonikaseadmete jäätmete ringlussevõtmiseks selleks ettenähtud kogumispunkti. Seadmete jäätmete eraldi kogumine ja ringlussevõtmine kõrvaldamise ajal aitab kaitsta loodusvarasid ning tagada, et ringlussevõtmine toimub viisil, mis kaitseb inimeste tervist ning keskkonda. Lisateabe saamiseks selle kohta, kuhu oma seadmete jäätmed ringlussevõtmiseks viia, võtke palun ühendust oma kohaliku linnakantselei, majapidamisjäätmete kõrvaldamise teenistuse või kauplusega, kust Te toote ostsite.

Finnish notice

Laitteiden hävittäminen kotitalouksissa Euroopan unionin alueella



■ Jos tuotteessa tai sen pakkauksessa on tämä merkki, tuotetta ei saa hävittää kotitalousjätteiden mukana. Tällöin hävitettävä laite on toimitettava sähkölaitteiden ja elektronisten laitteiden kierrätyspisteeseen. Hävitettävien laitteiden erillinen käsittely ja kierrätys auttavat säästämään luonnonvaroja ja varmistamaan, että laite kierrätetään tavalla, joka estää terveyshaitat ja suojelee luontoa. Lisätietoja paikoista, joihin hävitettävät laitteet voi toimittaa kierrätettäväksi, saa ottamalla yhteyttä jätehuoltoon tai liikkeeseen, josta tuote on ostettu.

French notice

Élimination des appareils mis au rebut par les ménages dans l'Union européenne



■ Le symbole apposé sur ce produit ou sur son emballage indique que ce produit ne doit pas être jeté avec les déchets ménagers ordinaires. Il est de votre responsabilité de mettre au rebut vos appareils en les déposant dans les centres de collecte publique désignés pour le recyclage des équipements électriques et électroniques. La collecte et le recyclage de vos appareils mis au rebut indépendamment du reste des déchets contribue à la préservation des ressources naturelles et garantit que ces appareils seront recyclés dans le respect de la santé humaine et de l'environnement. Pour obtenir plus d'informations sur les centres de collecte et de recyclage

des appareils mis au rebut, veuillez contacter les autorités locales de votre région, les services de collecte des ordures ménagères ou le magasin dans lequel vous avez acheté ce produit.

German notice

Entsorgung von Altgeräten aus privaten Haushalten in der EU



Das Symbol auf dem Produkt oder seiner Verpackung weist darauf hin, dass das Produkt nicht über den normalen Hausmüll entsorgt werden darf. Benutzer sind verpflichtet, die Altgeräte an einer Rücknahmestelle für Elektro- und Elektronik-Altgeräte abzugeben. Die getrennte Sammlung und ordnungsgemäße Entsorgung Ihrer Altgeräte trägt zur Erhaltung der natürlichen Ressourcen bei und garantiert eine Wiederverwertung, die die Gesundheit des Menschen und die Umwelt schützt. Informationen dazu, wo Sie Rücknahmestellen für Ihre Altgeräte finden, erhalten Sie bei Ihrer Stadtverwaltung, den örtlichen Müllentsorgungsbetrieben oder im Geschäft, in dem Sie das Gerät erworben haben.

Greek notice

Απόρριψη άχρηστου εξοπλισμού από χρήστες σε ιδιωτικά νοικοκυριά στην Ευρωπαϊκή Ένωση



Το σύμβολο αυτό στο προϊόν ή τη συσκευασία του υποδεικνύει ότι το συγκεκριμένο προϊόν δεν πρέπει να διατίθεται μαζί με τα άλλα οικιακά σας απορρίμματα. Αντίθετα, είναι δική σας ευθύνη να απορρίψετε τον άχρηστο εξοπλισμό σας παραδίδοντάς τον σε καθορισμένο σημείο συλλογής για την ανακύκλωση άχρηστου ηλεκτρικού και ηλεκτρονικού εξοπλισμού. Η ξεχωριστή συλλογή και ανακύκλωση του άχρηστου εξοπλισμού σας κατά την απόρριψη θα συμβάλει στη διατήρηση των φυσικών πόρων και θα διασφαλίσει ότι η ανακύκλωση γίνεται με τρόπο που προστατεύει την ανθρώπινη υγεία και το περιβάλλον. Για περισσότερες πληροφορίες σχετικά με το πού μπορείτε να παραδώσετε τον άχρηστο εξοπλισμό σας για ανακύκλωση, επικοινωνήστε με το αρμόδιο τοπικό γραφείο, την τοπική υπηρεσία διάθεσης οικιακών απορριμμάτων ή το κατάστημα όπου αγοράσατε το προϊόν.

Hungarian notice

Készülékek magánháztartásban történő selejtezése az Európai Unió területén



A készüléken, illetve a készülék csomagolásán látható azonos szimbólum annak jelzésére szolgál, hogy a készülék a selejtezés során az egyéb háztartási hulladéktól eltérő módon kezelendő. A vásárló a hulladékká vált készüléket köteles a kijelölt gyűjtőhelyre szállítani az elektromos és elektronikai készülékek újrahasznosítása céljából. A hulladékká vált készülékek selejtezési begyűjtése és újrahasznosítása hozzájárul a természeti erőforrások megőrzéséhez, valamint biztosítja a selejtezett termékek környezetre és emberi egészségre nézve biztonságos feldolgozását. A begyűjtés pontos helyéről bővebb tájékoztatást a lakhelye szerint illetékes önkormányzattól, az illetékes személtakarító vállalatától, illetve a terméket elárúsító helyen kaphat.

Italian notice

Smaltimento delle apparecchiature da parte di privati nel territorio dell'Unione Europea



Questo simbolo presente sul prodotto o sulla sua confezione indica che il prodotto non può essere smaltito insieme ai rifiuti domestici. È responsabilità dell'utente smaltire le apparecchiature consegnandole presso un punto di raccolta designato al riciclo e allo smaltimento di apparecchiature elettriche ed elettroniche. La raccolta differenziata e il corretto riciclo delle apparecchiature da smaltire permette di proteggere la salute degli individui e l'ecosistema. Per

ulteriori informazioni relative ai punti di raccolta delle apparecchiature, contattare l'ente locale per lo smaltimento dei rifiuti, oppure il negozio presso il quale è stato acquistato il prodotto.

Latvian notice

Nolietotu iekārtu iznīcināšanas noteikumi lietotājiem Eiropas Savienības privātajās mājāsaimniecībās



Šis simbols uz izstrādājuma vai uz tā iesaiņojuma norāda, ka šo izstrādājumu nedrīkst izmest kopā ar citiem sadzīves atkritumiem. Jūs atbildat par to, lai nolietotās iekārtas tiktu nodotas speciāli iekārtotos punktos, kas paredzēti izmantoto elektrisko un elektronisko iekārtu savākšanai otrreizējai pārstrādei. Atsevišķa nolietoto iekārtu savākšana un otrreizējā pārstrāde palīdzēs saglabāt dabas resursus un garantēs, ka šīs iekārtas tiks otrreizēji pārstrādātas tādā veidā, lai pasargātu vidi un cilvēku veselību. Lai uzzinātu, kur nolietotās iekārtas var izmest otrreizējai pārstrādei, jāvērsas savas dzīves vietas pašvaldībā, sadzīves atkritumu savākšanas dienestā vai veikalā, kurā izstrādājums tika nopirkts.

Lithuanian notice

Vartotojų iš privačių namų ūkių įrangos atliekų šalinimas Europos Sąjungoje



Šis simbolis ant gaminio arba jo pakuotės rodo, kad šio gaminio šalinti kartu su kitomis namų ūkio atliekomis negalima. Šalintinas įrangos atliekas privalote pristatyti į specialią surinkimo vietą elektros ir elektroninės įrangos atliekoms perdirbti. Atskirai surenkamos ir perdirbamos šalintinos įrangos atliekos padės saugoti gamtinius išteklius ir užtikrinti, kad jos bus perdirbtos tokiu būdu, kuris nekenkia žmonių sveikatai ir aplinkai. Jeigu norite sužinoti daugiau apie tai, kur galima pristatyti perdirbtinas įrangos atliekas, kreipkitės į savo seniūniją, namų ūkio atliekų šalinimo tarnybą arba parduotuvę, kurioje įsigijote gaminį.

Polish notice

Pozbywanie się zużytego sprzętu przez użytkowników w prywatnych gospodarstwach domowych w Unii Europejskiej



Ten symbol na produkcie lub jego opakowaniu oznacza, że produkt nie wolno wyrzucać do zwykłych pojemników na śmieci. Obowiązkiem użytkownika jest przekazanie zużytego sprzętu do wyznaczonego punktu zbiórki w celu recyklingu odpadów powstałych ze sprzętu elektrycznego i elektronicznego. Osobna zbiórka oraz recykling zużytego sprzętu pomogą w ochronie zasobów naturalnych i zapewnią ponowne wprowadzenie go do obiegu w sposób chroniący zdrowie człowieka i środowisko. Aby uzyskać więcej informacji o tym, gdzie można przekazać zużyty sprzęt do recyklingu, należy się skontaktować z urzędem miasta, zakładem gospodarki odpadami lub sklepem, w którym zakupiono produkt.

Portuguese notice

Descarte de Lixo Elétrico N/A Comunidade Européia



Este símbolo encontrado no produto ou N/A embalagem indica que o produto não deve ser descartado no lixo doméstico comum. É responsabilidade do cliente descartar o material usado (lixo elétrico), encaminhando-o para um ponto de coleta para reciclagem. A coleta e a reciclagem seletivas desse tipo de lixo ajudarão a conservar as reservas naturais; sendo assim, a reciclagem será feita de uma forma segura, protegendo o ambiente e a saúde das pessoas. Para obter mais informações sobre locais que reciclam esse tipo de material, entre em contato com o escritório

da HP em sua cidade, com o serviço de coleta de lixo ou com a loja em que o produto foi adquirido.

Slovakian notice

Likvidácia vyradených zariadení v domácnostiach v Európskej únii



■ Symbol na výrobku alebo jeho balení označuje, že daný výrobok sa nesmie likvidovať s domovým odpadom. Povinnosťou spotrebiteľa je odovzdať vyradené zariadenie v zbernom mieste, ktoré je určené na recykláciu vyradených elektrických a elektronických zariadení. Separovaný zber a recyklácia vyradených zariadení prispieva k ochrane prírodných zdrojov a zabezpečuje, že recyklácia sa vykonáva spôsobom chrániacim ľudské zdravie a životné prostredie. Informácie o zberných miestach na recykláciu vyradených zariadení vám poskytne miestne zastupiteľstvo, spoločnosť zabezpečujúca odvoz domového odpadu alebo obchod, v ktorom ste si výrobok zakúpili.

Slovenian notice

Odstranjevanje odslužene opreme uporabnikov v zasebnih gospodinjstvih v Evropski uniji



■ Ta znak na izdelku ali njegovi embalaži pomeni, da izdelka ne smete odvreči med gospodinjske odpadke. Nasprotno, odsluženo opremo morate predati na zbirališče, pooblaščen za recikliranje odslužene električne in elektronske opreme. Ločeno zbiranje in recikliranje odslužene opreme prispeva k ohranjanju naravnih virov in zagotavlja recikliranje te opreme na zdravju in okolju neškodljiv način. Za podrobnejše informacije o tem, kam lahko odpeljete odsluženo opremo na recikliranje, se obrnite na pristojni organ, komunalno službo ali trgovino, kjer ste izdelek kupili.

Spanish notice

Eliminación de residuos de equipos eléctricos y electrónicos por parte de usuarios particulares en la Unión Europea



■ Este símbolo en el producto o en su envase indica que no debe eliminarse junto con los desperdicios generales de la casa. Es responsabilidad del usuario eliminar los residuos de este tipo depositándolos en un "punto limpio" para el reciclado de residuos eléctricos y electrónicos. La recogida y el reciclado selectivos de los residuos de aparatos eléctricos en el momento de su eliminación contribuirá a conservar los recursos naturales y a garantizar el reciclado de estos residuos de forma que se proteja el medio ambiente y la salud. Para obtener más información sobre los puntos de recogida de residuos eléctricos y electrónicos para reciclado, póngase en contacto con su ayuntamiento, con el servicio de eliminación de residuos domésticos o con el establecimiento en el que adquirió el producto.

Swedish notice

Bortskaffande av avfallsprodukter från användare i privathushåll inom Europeiska Unionen



■ Om den här symbolen visas på produkten eller förpackningen betyder det att produkten inte får slängas på samma ställe som hushållssopor. I stället är det ditt ansvar att bortskaffa avfallet genom att överlämna det till ett uppsamlingsställe avsett för återvinning av avfall från elektriska och elektroniska produkter. Separat insamling och återvinning av avfallet hjälper till att spara på våra naturresurser och gör att avfallet återvinns på ett sätt som skyddar människors hälsa och miljön. Kontakta ditt lokala kommunkontor, din närmsta återvinningsstation för hushållsavfall eller

affären där du köpte produkten för att få mer information om var du kan lämna ditt avfall för återvinning.

B Electrostatic discharge

This appendix provides the following information:

- [How to prevent electrostatic discharge \(page 93\)](#)
- [Grounding methods \(page 93\)](#)

How to prevent electrostatic discharge

To prevent damage to the system, you must follow certain precautions 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 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 static-dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an Hewlett Packard Enterprise authorized reseller install the part.

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

Glossary

This glossary defines acronyms and terms used in this guide and is not a comprehensive glossary of computer terms.

A

AES	Advanced Encryption Standard. An encryption security technology.
AG	Access Gateway. A software-enable feature that allows B-series Blade switches to function as port aggregators.
APM	Advanced Performance Monitor
ASIC	Application-Specific Integrated Circuit.

B

B-series	Fibre Channel switches and FICON directors manufactured for Hewlett Packard Enterprise by Brocade Communications Systems, Inc.
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C

C-series	Fibre Channel switches and FICON directors manufactured for Hewlett Packard Enterprise by Cisco Systems, Inc.
CEE	Converged Enhanced Ethernet.
CLI	Command line interface.
CN	Converged Network.
CNA	Converged Network Adapter.
CSP	Critical Security Parameter.
CUP	Control unit port. An optional feature used to manage and monitor FICON directors.

D

DA	Directory agent. An iSCSI software component.
DAS	Direct-attached storage.
DCBX	Data Center Bridging eXchange.
DCFM	Data Center Fabric Manager. B-series switch software used to centralize fabric management through a host-based application.
DEK	Data Encryption Key.
DES	Data Encryption Standard. A block cipher designed for use in symmetric cryptography, which encrypts data in 64-bit blocks and uses a key length of 56 bits.
DHCP	Dynamic Host Configuration Protocol
DPS	Dynamic Path Selection.
DWDM	Dense wavelength division multiplexing. The technique of placing several optical signals on a single optical cable simultaneously.

E

EE	Encryption Engine. A feature of the B-series Encryption Switch.
EG	Encryption Group.
EGM	Enhanced Group Manager.
EIA	Electronic Industries Association.
ELWL	<ol style="list-style-type: none">1. Extended long-wave laser.2. Extended long wavelength

EMC	Electromagnetic compatibility.
EMI	Electromagnetic Interference.
enterprise	Any large organization where information technology is essential for continuing operations.
Enterprise Modular Array	A storage system based on an HSG60 or HSG80 controller. These systems include MA6000, MA8000, RA8000, EMA12000, EMA16000, and ESA12000 storage systems.
ESCON	Enterprise Systems Connection.
ESD	Electrostatic discharge.
ESS	Enterprise Storage System.
EVA	HPE StorageWorks Enterprise Virtual Array. A high-performance, high-capacity, and high-availability storage solution for the high-end enterprise class marketplace. Each EVA storage system consists of a pair of HSV virtualizing storage controllers and the disk drives they manage.
F	
fabric	A network of one or more Fibre Channel switches that transmit data between any two N_Ports on any of the switches.
failover	An automatic method for transferring operations from a failed system to a secondary, identical system.
FC	Fibre Channel. A comprehensive set of standards for concurrent communication among servers, storage systems, and peripheral devices.
FCC	<p>1. Fibre Channel Congestion Control. A feature that allows C-series switches to intelligently regulate traffic across ISLs and ensure that each initiator-target pair of devices has the required bandwidth for data transfer.</p> <p>2. Federal Communications Commission. An independent United States government agency. The FCC was established by the Communications Act of 1934 and is charged with regulating interstate and international communications by radio, television, wire, satellite and cable.</p>
FCIP	Fibre Channel over Internet Protocol.
FCoE	Fibre Channel over Ethernet. A technology that allows a convergence of Ethernet and Fibre Channel fabrics.
FCR	Fibre Channel routing.
FCS	Fibre Channel switch.
Fibre Channel	A serial data transport infrastructure and protocol used to implement SANs. See also http://www.fibrechannel.org/ and http://www.t11.org/ .
FICON	Fibre connectivity. Hardware that connects the mainframe to the CU.
FO	Fiber optic.
FPGA	Field-programmable gate array.
FPMA	Fabric Provided Mac Addressing.
FRU	Field-replaceable unit.
G	
Gb/s	Gigabits per second.
GbE	Gigabit Ethernet. An Ethernet standard for transmitting data at 1 Gb/s.
H	
HA	High availability. The relative ability of a system to operate continuously, regardless of the type of failure.
HBA	Host bus adapter. A hardware device that connects the host server to the fabric.
heterogeneous	A mixed environment that incorporates different operating systems, protocols, architectures, and equipment from different vendors or product families.

high availability See HA..
host bus adapter See HBA..

I

IEC International Electrotechnical Commission
in-band communication Communication through the same communications channel as the operational data.
INCITS International Committee for Information Technology Standards.
interswitch link See ISL..
IPS C-series Internet Protocol Storage Services Module.
IR Integrated routing.
iSCSI Internet Small Computer System Interface. A standard protocol that uses SCSI commands to transfer data over IP networks.
ISL Interswitch link. A connection between two directors or switches.

L

LC Lucent connector. An industry-standard connector for fiber optic cable connections.
LR Long reach.
LSAN Logical SAN. An interconnected network of independent fabrics for B-series switches.
LTU License to use.
LUN Logical unit number. An identification scheme for storage disks.
LWL

1. Long-wave laser.
2. Long wavelength.

M

M-series Fibre Channel switches manufactured for Hewlett Packard Enterprise by McDATA Corporation.
MAN Metropolitan area network. A communications network that covers a geographic area such as a town, city, or suburb.
MIB Management Information Base (B-series).
MIPS Million instructions per second.
MP Router Multi-protocol Router.
MPIO Multipath I/O (Microsoft software).

N

NAT Network address translation.
NPIV N_Port ID Virtualization. An industry-standard protocol.
NTP Network time protocol.

O

OCP Operator control panel. A panel on the EVA controller that you use to manage the EVA.
OS Operating system.
out-of-band communication Communication through a different communications channel than that used by operational data.

P

PDU Power distribution unit.

platform	A combination of supported hardware components and operating system on a server from a specific vendor.
POST	Power-on self-test.
pWWN	Port worldwide name. Synonymous with WWPN.
Q	
QoS	Quality of service. A traffic management feature.
R	
RAS	Reliability, availability, and serviceability.
RCS	Reliable commit service. A Fabric OS feature.
RISC	Reduced Instruction Set Computer.
RTC	Real-time clock.
S	
SAN	Storage area network. An intelligent infrastructure that connects heterogeneous servers with shared, heterogeneous storage systems.
SAO	Server application optimization
SC	Subscriber connector.
SFP	Small form-factor pluggable transceiver.
SID	Source ID.
SKM	Secure Key Management.
SMA	HPE StorageWorks Storage Management Appliance.
SMB	Small and medium business. Any organization that uses onsite computer systems.
SME	Storage Media Encryption (C-series). A standards-based encryption solution for heterogeneous and virtual tape libraries.
SMI	Storage Management Initiative (MIB).
SNIA	Storage Networking Industry Association.
SOTCP	Storage Optimized Transmission Control Protocol.
SP	Service pack. A collection of software updates.
SPOCK	Single Point of Connectivity Knowledge. An Hewlett Packard Enterprise website as the primary portal to obtain detailed information about supported HPE StorageWorks product configurations (http://www.hp.com/storage/spock). An HP Passport account is required for access.
SR	Short Reach.
SSP	Selective Storage Presentation. A feature used to restrict access to a Fibre Channel LUN.
ST	Straight-tip connector.
SVSP	SAN Virtualization Services Platform.
SWL	1. Short-wave laser. 2. Short wavelength.
T	
TCP	Transmission Control Protocol.
topology	The physical structure of interconnected components that form a network.
TR	Transparent router. A routed fabric feature that provides inter-fabric routing, allowing controlled and limited access between devices on an 8/20q Fibre Channel Switch (local) fabric and devices on a remote fabric of other vendor switches.

U

USB	Universal Serial Bus.
UTC	Universal Time Conversion. The default time zone for switches, 8 hours ahead of Pacific Standard Time.

V

VE_Port	Virtual Fibre Channel E_Port.
VPN	Virtual private network.
VSAN	Virtual storage area network. A logical SAN partition that can be configured and managed independently.

W

WDM	Wavelength division multiplexing. The technique of placing multiple optical signals on a single optical cable simultaneously.
WWN	Worldwide name. A unique identifier assigned to a Fibre Channel device.
WWPN	Worldwide port name. Synonymous with pWWN.

X

XCS	Xcelerated Controller Software. The software that runs in the HSV controller-based Enterprise Virtual Array XL model storage systems.
XP Continuous Access	An HPE StorageWorks product consisting of two or more XP disk arrays performing disk-to-disk replication, and a management user interface that facilitates configuring, monitoring, and maintaining replication of the storage systems.

Z

zone	A collection of devices or user ports that communicate with each other through a fabric. Any two devices or user ports that are not members of at least one common zone <i>cannot</i> communicate through the fabric.
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Index

Symbols

- 1606 Extension SAN switch
 - configuring, 48
 - features, 16
 - FRUs, 65
 - LED activity, 60
 - verifying operation, 49
- 8-Gb SAN switches
 - hardware options, 23
 - installing and configuring, 24
 - ISL trunking groups, 20
 - LEDs, 50
 - maintaining, 64
 - management features, 71
 - managing, 47
 - powering off, 39
 - powering on, 38
 - software options, 22
- 8/24 SAN switch, 8
 - activating additional ports, 9
 - features, 8
 - FRUs, 65
 - LEDs, 50
 - nonport side, 9
 - port side, 9
- 8/40 SAN switch
 - activating additional ports, 11
 - features, 10
 - FRUs, 65
 - LEDs, 51
 - nonport side of, 10
 - port side of, 10
 - replacing fan assembly, 67
 - replacing power supply, 67
- 8/8 SAN switch, 8
 - activating additional ports, 9
 - enabling E_Ports on, 9
 - features, 8
 - FRUs, 65
 - LEDs, 50
 - nonport side, 9
 - port side, 9
- 8/80 SAN switch
 - activating additional ports, 13
 - features, 11
 - FRUs, 67
 - LEDs, 52
 - nonport side LED activity for, 54
 - nonport side of, 12
 - port side LED activity for, 53
 - port side of, 11
 - replacing fan assembly, 68

B

- battery replacement notice, 86
- boot, 80

C

- cabling and configuring, 37
- cabling considerations, 26
- changing switch name, 46
- commands
 - configupload, 45
 - fabricshow, 45
 - ipaddrshow, 40
 - licenseadd, 20
 - licenseshow, 20
 - portenable, 20
 - portshow, 20
 - portstart, 20
 - psshow, 71
 - switchshow, 45
- configupload command, 45
- configuration
 - backing up, 45
 - verifying, 45
- configuring
 - 1606 Extension SAN switch, 48
 - cabling and configuring, 37
 - connecting an Ethernet cable, 40
 - correcting time zone, 43
 - ezswitch setup, 38
 - FCoE Converged Network Switch, 48
 - making a serial connection, 39
 - opening a Telnet session, 40
 - SAN encryption switch, 47
 - setting switch data and time, 41
 - setting the domain ID, 40
 - setting the IP address, 39
 - setting the static IP address, 40
 - setting time zone, 42
 - synchronizing local time, 43
 - verifying the configuration, 45
- connecting to fabric, 38
- conventions
 - document, 83
 - text symbols, 83
- correcting time zones, 43
- CSR, 83
- customer self repair, 83

D

- data transmission ranges, 76
- diagnostic tests, 65
- document
 - conventions, 83
 - related documentation, 81
- documentation
 - HP website, 81
 - providing feedback, 81
- domain ID
 - setting, 40

- E
 - electrical considerations, 25
 - electromagnetic compatibility, 75
 - Encryption SAN switch
 - nonport side of, 12
 - port side LED activity for, 55
 - environmental considerations, 26
 - Ethernet
 - connecting cable, 40
- F
 - fabric
 - connecting SAN switch to, 38
 - fabricshow command, 45
 - facility requirements, 74
 - fan assembly
 - hot swapping, 66
 - LEDs, 66
 - replacing 8/80 SAN switch, 68
 - replacing SAN encryption switch, 68
 - verifying replacement of, 65
 - FCC notice, 84
 - FCoE Converged Network switch
 - configuring, 48
 - features, 15
 - FRUs, 65
 - nonport side LED activity, 59
 - port side LED activity, 57
 - FRUs
 - 1606 Extension SAN switch, 65
 - 8/40 SAN switch, 65
 - 8/80 SAN switch, 67
 - FCoE Converged Network switch, 65
 - installing, 65
 - SAN encryption switch, 67
- G
 - grounding methods, 93
- H
 - HBAs, supported, 80
 - help
 - obtaining, 81
 - Hewlett Packard Enterprise
 - technical support, 81
 - HPE StorageWorks SAN switches
 - 1606 Extension SAN Switch, 8
 - 8/24, 7
 - 8/40, 7
 - 8/40 power pack+, 7
 - 8/8 base, 7
 - 8/8 full fabric, 7
 - 8/80, 7
 - 8/80 power pack+, 7
 - encryption, 7
 - encryption power pack+, 8
 - FCoE Converged Network, 8
 - power pack+ models, 8
- I
 - Installation
 - plenum, 36
 - installation
 - as standalone device, 27
 - items required for, 27
 - rack mount kit, 30
 - safety guidelines, 29
 - securing device to outer rails, 37
 - using the rack mount kit, 27
 - installation considerations, 25
 - installing
 - FRUs, 65
 - IP address, setting, 39
 - ipaddrshow command, 40
 - ISL trunking groups, 20
- L
 - LEDs
 - 1606 Extension SAN switch, 60
 - 8/24 SAN switch, 50
 - 8/40 SAN Switch, 51
 - 8/8 SAN switch, 50
 - 8/80 SAN switch, 52
 - Encryption SAN switch, 55
 - fan assembly, 66
 - FCoE Converged Network switch , 57
 - licenseadd command, 20
 - licenseshow command, 20
 - local time
 - synchronizing, 43
- M
 - management features, 71
 - memory specifications, 73
 - monitoring topology, 71
- N
 - notices
 - battery replacement, 86
 - Japanese power cord, 87
 - Taiwan battery recycling, 87
- O
 - optional hardware kits, 23
- P
 - physical specifications, 73
 - plenum
 - installation of, 36
 - plenum information, 28
 - port upgrade licenses
 - installing and activating, 20
 - portenable command, 20
 - portshow command, 20
 - portstart command, 20
 - POST, 80
 - interpreting results, 63
 - specifications, 80

- power supply
 - specifications, 75
- psshow command, 71

R

- rack mount considerations, 26
- rack stability
 - warning, 82
- related documentation, 81
- required items, obtaining, 38

S

- safety considerations, 25
- SAN encryption switch
 - configuring, 47
 - facility requirements, 74
 - features, 13
 - FRUs, 67
 - memory, 73
 - port side of, 14
 - replacing fan assembly, 68
- secure key management, 13
- serial connection, making, 39
- setting time zones, 42
- SFP
 - installing, 64
- SFP transceiver options
 - supported, 21
- shipping carton contents, 24
- SKM, 13
- specifications
 - facility requirements, 74
 - Fibre Channel port, 79
 - memory, 73
 - physical, 73
 - POST and boot, 80
 - power supply, 75
- Subscriber's Choice, Hewlett Packard Enterprise, 81
- supported HBAs, 80
- supported sfp options, 21
- switch name, changing, 46
- switchshow command, 45
- symbols in text, 83

T

- Taiwan battery recycling notice, 87
- technical specifications, 73
- technical support
 - Hewlett Packard Enterprise, 81
 - service locator website, 82
- Telnet session
 - opening, 40
- text symbols, 83
- time zones
 - correcting, 43
 - setting, 42

W

- warning

- rack stability, 82
- websites
 - customer self repair, 83
 - Hewlett Packard Enterprise Subscriber's Choice for Business, 81
 - HP , 82
 - product manuals, 81
- weight specifications, 73