Compaq StorageWorks

SAN Switch 16

Installation and Hardware Guide

First Edition (October 1999)
Part Number EK-BCP28-IA. A01 / 161356-001
Compaq Computer Corporation

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Contents

Chapter 2
Installation

Chapter 3
Setup

Chapter 4
Front Panel Switch Management

Front Panel Switch Management

continued

Front Panel Switch Management

continued

Chapter 5

Diagnostics

Chapter 6
Error Messages

Chapter 7
Repair and Replacement

Appendix A
Regulatory Compliance Notices

About This Guide

This guide is designed to be used as step-by-step instructions for installation and as a reference for operation, troubleshooting, and future upgrades.

Text Conventions

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

Keys	Keys on a keyboard appear in boldface.
<Keys>	Keys on the switch front panel appear in hash marks (<>).
USER INPUT	User input appears in a different typeface and in uppercase.
FILENAMES	File names appear in uppercase italics.
Menu Options, Command Names, Dialog Box Names	These elements appear in initial capital letters.
COMMANDS, DIRECTORY NAMES, and DRIVE NAMES	These elements appear in uppercase.
Type	When you are instructed to *type* information, type the information **without** pressing the **Enter** key.
Enter	When you are instructed to *enter* information, type the information and then press the **Enter** key.

Symbols in Text

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

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

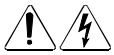
CAUTION: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

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

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

Symbols on Equipment

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



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

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

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

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

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

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

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

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

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

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

Rack Stability

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

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

Getting Help

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

Compaq Technical Support

In North America, call the Compaq Technical Phone Support Center at 1-800-OK-COMPAQ. This service is available 24 hours a day, 7 days a week. For continuous quality improvement, calls may be recorded or monitored.

Outside North America, call the nearest Compaq Technical Support Phone Center. Telephone numbers for worldwide Technical Support Centers are listed on the Compaq website. Access the Compaq website at http://www.compaq.com.

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

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

Compaq Website

The Compaq website has information on this product as well as the latest drivers and Flash ROM images. You can access the Compaq website at http://www.compaq.com.

Compaq Authorized Reseller

For the name of your nearest Compaq authorized reseller:

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

Chapter **1**

Introduction

Compaq StorageWorks SAN Switch 16

The Compaq StorageWorks SAN Switch 16 is a 16-port Fibre Channel switch that provides a flexible switching platform to meet both low-latency and high-throughput demands. It consists of a motherboard with connections for up to 16 Giga Bit Interface Converter (GBIC) modules, one or two power supplies, a fan assembly, a chassis with an RJ-45 Ethernet connection, and a front panel display with a keypad. The switch's management functions let you control and monitor fabric topology, frame throughput, error statistics, fans, cooling, media type, port status, and a variety of other information to aid in system debugging and performance analysis.

Front Panel

The following figure shows the front view of the SAN Switch 16. The following table describes the front panel features.

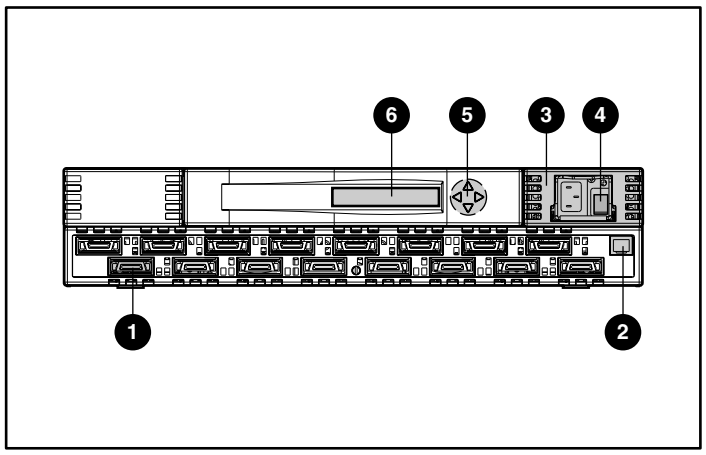


Figure 1-1. Storage switch front panel

Table 1-1
Front Panel Features

Identifier	Description	Function
❶	Fibre Channel ports	Connects the switch to devices
❷	RJ-45 Ethernet connector	Connects the switch to the network for out-of-band (Ethernet) management
❸	Power supply	Connects the switch to the power source
❹	Power ON/OFF switch	Turns the unit on and off
❺	Front panel controls	Control navigation through menus and let you increment and decrement numeric values
❻	Front panel display	Displays switch information

Note: Fibre Channel ports are numbered sequentially starting with zero for the far left port. The switch faceplate includes an imprint of each port number.

Compaq StorageWorks SAN Switch 16 Features

The SAN Switch 16 has the following features:

- **Simplicity—**The SAN Switch 16 is easy to set up and configure. After the Power-On Self-Test (POST), just add the switch's Internet protocol (IP) address. The remainder of the setup is automated.
- **Intelligence—**The operating system allows discovery of all connected devices and determines optimum data paths without intervention.
- **Flexibility—**The GBIC modules support single-mode and multi-mode fiber transmission media. The switch's modular construction allows flexibility in creating, upgrading, maintaining, and configuring a fabric.
- **Reliability—**Highly integrated, reliable, multifunction application specific integrated circuits (ASICs) are used throughout the switch.
- **High performance—**The low-latency, high-performance design requires no processor data path interaction. The Fibre Channel bandwidth is 100 MB/s per port (full duplex).

  NOTE: The latency can differ when the device or destination is configured in a loop.

- **Automated congestion management—**Virtual channels enable the switch to perform sophisticated congestion management techniques automatically.
- **Cascading—**Switches can be cascaded for large fabric support. Switches can be interconnected for a large fabric with multiple fabric connections.
- **Compatibility—**The SAN Switch 16 is designed to operate with other Compaq StorageWorks Fibre Channel Switches using a compatibility mode.
- **Universal Ports—**Switch ports are designed to support F_, FL_, and E_Port modes of operation. The software automatically selects the optimum mode of operation.

Table 1-2 describes the switch's technical features.

Table 1-2
Compaq StorageWorks SAN Switch 16 Technical Features

Feature	Description
Login (FC)	Explicit fabric login is supported.
Data field size	The Fibre Channel frame can be up to 2112 bytes in size. The number of bytes must be a multiple of 4.
Buffering	A total of 128 standard-size receive frame buffers are available for each set of 4 Fibre Channel ports.
Adjustable buffer-to-buffer credit	Buffer-to-buffer credit for each F/FL_Port can be up to 31 credits. For the E_Port, buffer-to-buffer credit can be a total of 31 credits distributed among all 8 virtual channels.
In order frame delivery	The switch delivers the frames to a destination F/FL_Port in the same order received by the source F/FL_Port. The in-order frame delivery is maintained within a fabric of multiple interconnected switches.
Automatic address assignment	Switch port address identifiers are selected using an automatic address assignment protocol. All ports within a fabric are assigned address identifiers. Each individual switch maintains its own address pool for ports within the switch.
Hardware frame routing	The switch implements hardware routing of frames between communicating ports and supports self-routing of frames between the communicating ports. The path selection in a multiswitch configuration is based on a self-routing protocol.
User-defined routing	The switch allows the configuration of user defined routes. Failed paths are still used in the event of a failure.
Translative mode	Translates 8-bit private loop addresses to 24-bit Phantom Public Addresses to allow fabric-aware devices to access to private devices.

continued

Table 1-2
Compaq StorageWorks SAN Switch 16 Technical Features *continued*

Feature	Description
Management	The switch can be managed through Telnet, the SNMP agent, or Web Management Tools included in the StorageWorks Command Console software. These items are accessible from the Internet Protocol over the RJ-45 10/100BaseT Ethernet port or any Fibre Channel port. You can use any SNMP-based management product to access the SNMP agent and any supported Web browser to use the Java Web Management Tools.
Name Server	The Name Server feature is based on the Simple Name Server model defined in the Fibre Channel Standard. This function allows external devices to discover other fabric-connected devices. Name Server manages a database that relates external device quantities, including mappings between N/NL_Port 24-bit Fibre Channel physical addresses, World Wide Names, IP addresses, FC-4 device types, and Initial Process Associators. External devices can register and query this information using the Name Server function, which is distributed across switches in a fabric.

Performance

A minimum aggregate routing capacity of 4,000,000 frames per second is specified for Class 2, Class 3, and Class F frames. Non-blocking throughput of up to 16 x 100 MB/s (1.6 GB/s) is provided.

A maximum switch latency of less than two microseconds is specified for Class 2, Class 3, and Class F frames when the output port is free.

Manageability

The SAN Switch 16 can be managed in-band by using Fibre Channel protocol, or out-of-band by connecting to the 10/100BaseT Ethernet port. Management interfaces include Telnet, SNMP, or Web Management Tools.

Reliability

The following features ensure the switch's reliability:

- Power-On Self-Test (POST)
- BootROM Memory Testing
- Temperature and fan-speed monitoring
- Low component count
- Optional dual-redundant hot-pluggable power supplies

Serviceability

The following features enhance the switch's serviceability:

- Simple enclosure
- Loopback test modes for service
- User-friendly diagnostics
- No jumpers or switch settings
- Error and significant event logging and reporting
- Modular Field Replaceable Units (FRUs)

NOTE: For more information about FRUs, see Chapter 7, "Repair and Replacement," later in this guide.

Switch Components

Figure 1-2 shows the top view of the SAN Switch 16. Table 1-3 describes the key components.

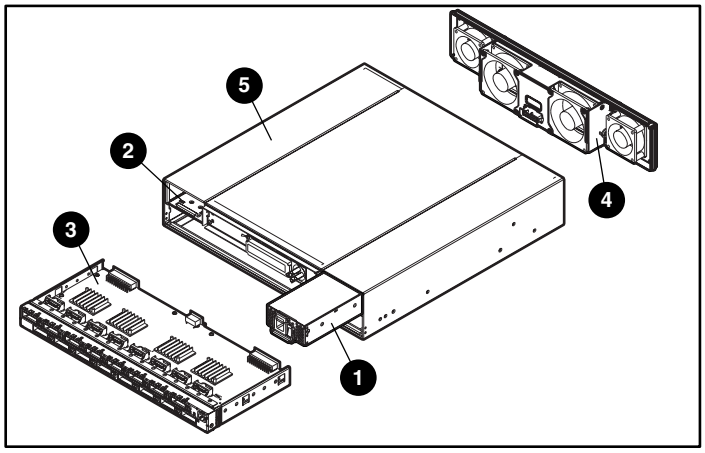


Figure 1-2. Switch components

Table 1-3
Compaq StorageWorks SAN Switch 16 Components

Identifier	Description
❶	Power supply
❷	Dual power supply compartment or optional redundant power supply
❸	Motherboard
❹	Fan assembly
❺	Chassis

Note: The Compaq StorageWorks SAN Switch 16 can support a dual-redundant power supply configuration with hot-pluggable power supplies.

GBIC Modules

The SAN Switch 16 accommodates up to 16 GBIC modules. All interfaces have status lights on the front panel for quick, visual checks of the GBIC modules' status and activity. If your installation requires less than 16 GBIC modules, a metal, spring-loaded door protects the unused port positions.

Shortwave (GBIC-SW) and longwave (GBIC-LW) GBIC modules are supported. The following figure shows a GBIC module.

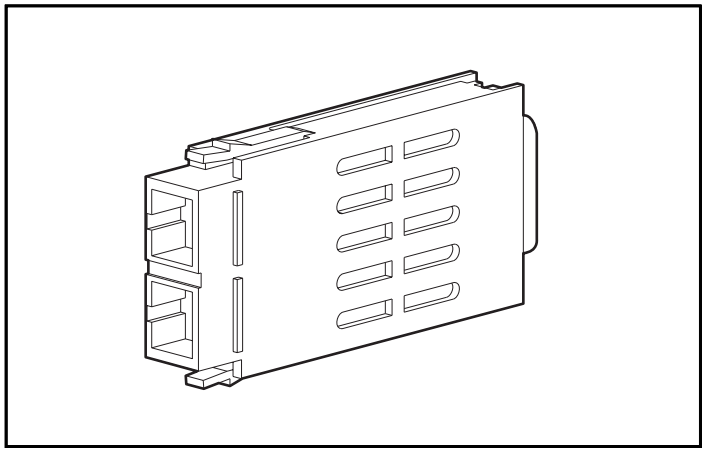


Figure 1-3. Giga Bit Interface Converter (GBIC) module

GBIC-SW Module

The GBIC-SW module with the subscriber connector (SC) connector color-coded black is based on short wavelength lasers supporting 1.0625 GB/s link speeds. The GBIC-SW module supports 50-micron multi-mode fiber optic cables in lengths up to 500 meters. The GBIC-SW module uses a Class 1 laser, which complies with the 21 CFR, subpart (J) standard as of the date of manufacture. The GBIC-SW module is shipped with a protective plug that should remain in place when no fiber optic cable is connected to the port.

GBIC-LW Module

The GBIC-LW module with the SC connector color-coded blue is based on long wavelength 1300 nm lasers supporting 1.0625 GB/s link speeds. The GBIC-LW module supports 9-micron single-mode fiber optic cables in lengths up to 10 kilometers. The GBIC-LW module is shipped with a protective plug that should remain in place when no fiber optic cable is connected to the port.

Switching Function

The SAN Switch 16 switching function is based on a central memory bank and its associated data path control. Each switch port stores received frames in the central memory, while passing a buffer pointer to the forwarding port's transmitter. The switch uses cut-through routing to route frames from the receiving port to the transmitting port, providing the transmitting port is free, without waiting for the end of the frame to be received. This provides a low-latency data path within the switch. If the transmitting port is busy, the frame can be temporarily stored in the switch's memory bank.

Chapter **2**

Installation

Package Contents

Make sure the following items are included in the Compaq StorageWorks SAN Switch 16 package:

- A 16-port Fibre Channel Switch ❶
- One AC power cord ❷
- A software and documentation package ❸

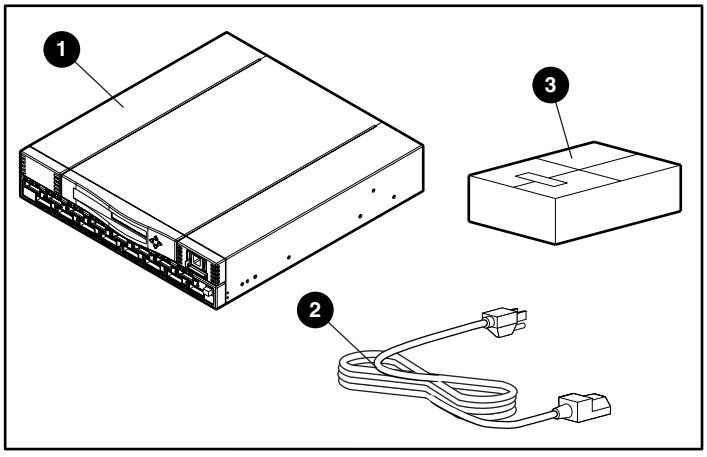


Figure 2-1. Switch kit contents

Selecting an Operating Location

The switch should be located in a secure or limited-access area to ensure that cable connections are not compromised. The operating location you select for the switch must meet the cooling air requirements and power requirements described in the following sections.

Cooling Requirements

Cooling air is drawn into the switch chassis by four fans mounted near the rear of the chassis. Exhausted air is expelled through vents in the front of the chassis. The combined air flow through the switch is 75 cubic feet per minute (cfm), with nominal bulk flow of 15 cfm.

CAUTION: Do not block the front or rear air vents. The switch uses ambient air for cooling.

Power Requirements

The AC power cord is connected to the switch connector on the right side of the switch front panel. If you have dual-redundant power supplies, the second AC cord is connected to the switch connector on the left side of the switch front panel. The AC power sources must each meet these requirements:

- A properly wired, earth-grounded AC outlet
- Voltage capability of 85-265 VAC
- Input voltage frequency of 47-63 Hz
- Power capability of 155 watts, maximum

The switch has an autoranging power supply that automatically accepts voltages within its range. There is no provision for surge protection built into the switch power supply, so the AC source should include provisions to ensure clean AC power.

Selecting a Switch Mounting Method

The switch can be placed on a flat surface, such as a tabletop, or mounted in an optional, standard 19-inch equipment rack.

Surface Mounting

To operate the switch on a surface, you do not need to perform additional steps. Continue the installation procedure with "Installing GBIC Modules," later in this chapter.

Rack Mounting

You can install the switch in a RETMA 42U rack, in a Compaq rack, or in a metric SW600 rack. Refer to the documentation that came in your rack-mounting option kit for more information.

Installing GBIC Modules

The SAN Switch 16 can accommodate up to 16 GBIC modules. GBIC modules are hot-pluggable. To install a GBIC module:

CAUTION: The GBIC modules contain static-sensitive components. Use electrostatic discharge (ESD) precautions while handling GBIC modules.

1. Insert a GBIC module into a Fibre Channel port. The module is keyed and can only be inserted one way.

CAUTION: Do not force the GBIC module into a port if you feel resistance.

2. Fully insert the GBIC module until it is properly seated in the Fibre Channel port. If you are using an IBM GBIC module, lock the module in place with the locking bar. For other GBIC modules, the latch prongs automatically lock to prevent accidental removal of the GBIC module.
3. Insert a protective plug over the GBIC module's fiber-optic connectors.
4. Repeat the procedure for each GBIC module to be installed.

Connecting Cables to the Switch

Table 2-1 lists the cable specifications. All cables connect at the front of the switch.

Table 2-1
Cabling Specifications

Cable Type	Cable Specifications	Maximum Length	GBIC Module
Shortwave Fiber Optic	■ Duplex SC plug connectors ■ Multi-mode fiber ■ 50 μm core diameter ■ 125 μm cladding diameter duplex cable	1,641 ft (500 m)	780-860 μm without open fiber control (non-OFC)
Longwave Fiber Optic	■ Duplex SC plug connectors ■ Single-mode fiber ■ 9 μm core diameter ■ 125 μm cladding diameter duplex cable	84,480 ft (10 km)	1270-1350 μm without open fiber control (non-OFC)

Connecting the Storage Subsystem and Host

The storage subsystem and host devices connect to the GBIC modules in the switch's Fibre Channel ports. Cable connectors are keyed and must be inserted properly into the GBIC module connectors. Remove the protective cover from the GBIC connector and make sure that the surfaces of all cable and GBIC module connectors are clean and free of dust and debris. Figure 2-2 shows the cable connections.

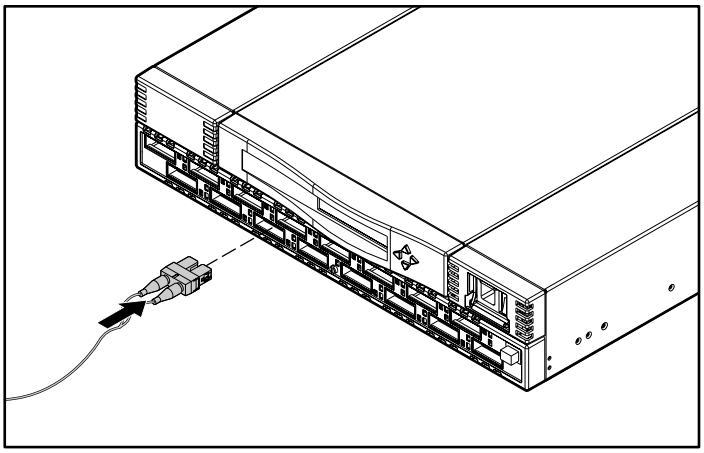


Figure 2-2. Connecting a cable to a GBIC module in a Fibre Channel port

Connecting the Power Cable

Connect the AC power cable to the AC connector on the front, right side of the switch. If you have dual-redundant power supplies, connect the second power cable to the AC connectors on the front, left side of the switch.

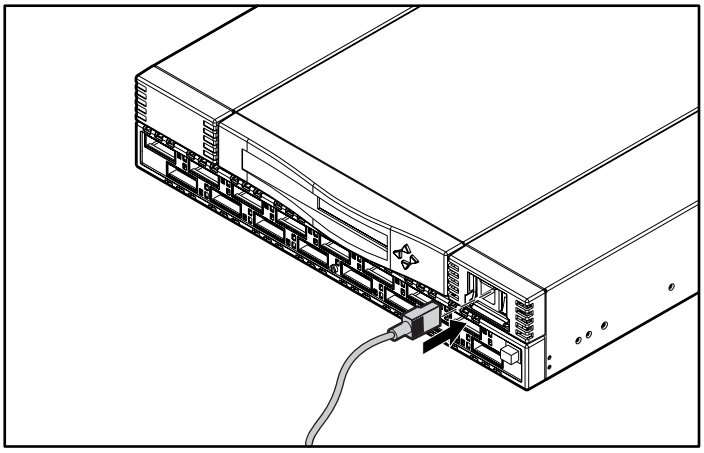


Figure 2-3. Connecting the power cable

Connecting the Ethernet Cable

Connect the switch to an Ethernet 10/100BaseT network by plugging in the Ethernet cable at the RJ-45 connector. This connection allows access to the switch's internal SNMP agent and remote Telnet and Web access.

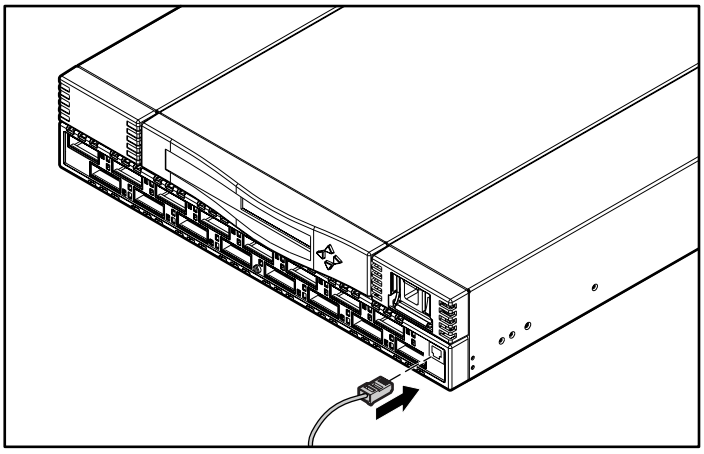


Figure 2-4. Connecting the Ethernet cable

Chapter 3

Setup

To set up the switch and prepare for switch management:

1. Power on the switch.
2. Verify the Power-On Self-Test (POST).
3. Set the IP address of the switch.
4. Initiate a Telnet session.

Powering up the Switch

Turn on the AC power switch located on each power supply. The switch automatically runs the Power-On Self-Test (POST) and the LED indicators become active.

Front Panel LED Indicators

The color and flash speed of the front panel LED indicators signify the status of each Fibre Channel port. Table 3-1 summarizes the possible LED states.

Table 3-1
Front Panel LED Indicators

LED Indicators	Definition
No light showing	No light or signal carrier (no GBIC module or cable installed) for media interface LEDs
Steady amber	Receiving light or signal carrier, but not online yet
Slow flashing amber	Disabled, flashes every 2 seconds
Fast flashing amber	Error or fault with port, flashes every ½ second
Steady green	Online (connected to device over cable)
Slow flashing green	Online but cannot make a proper fabric connection (loopback cable is installed, fabric is segmented, or switch is connected to an incompatible switch), flashes every 2 seconds
Fast flashing green	Internal loopback (diagnostic), flashes every ½ second
Flickering green	The port is active and transferring data and frame traffic

Verifying the Power-On Self-Test

The switch uses the POST to determine status and isolate problems. When a test completes successfully, the message "Passed" displays on the front panel display.

If the POST is completed successfully, the switch is ready to operate. Should the switch fail to complete the POST successfully, the green power LED indicator on the front panel will flash. This indicates a fault in one of the initial stages of POST and signifies that the processor is unable to bring up the operating environment. If this error occurs, the switch could require repair.

If the switch's operating system completely boots but other errors are encountered during POST, those errors are logged in the system error log.

NOTE: Error messages are stored in RAM and are lost when power is removed from the switch. Access the error message log to view any error messages before removing power from the switch.

Setting the IP Address

The SAN Switch 16 has a default IP address. This IP address is used to establish a network connection to the switch through the external Ethernet connection. To set a compatible network address before connecting the switch to the network, change the IP address through the front panel controls.

To set the IP address using the front panel controls:

1. Select the Configuration menu using the right front panel button.
2. Scroll down to the Ethernet IP Address option. Select this option using the right button.
3. Use the Up and Down buttons to change the IP address value. Use the left front panel button to move to the next set of values.
4. When all values are set, press the right button to finish.
5. Confirm that the IP address is correct (select *Yes* to store the address in flash memory).

NOTE: To be completely accessible on the network, the switch can require netmask and gateway addresses. See your network administrator to determine if additional addresses are necessary. These addresses can also be set through options on the Configuration menu.

Initiating a Telnet Session

A Telnet session is initiated through an Ethernet connection between the network and the switch's Ethernet RJ-45 connector.

Through a Telnet session, you can manage the switch, perform diagnostics, and view error messages. To initiate a Telnet session:

1. Launch Telnet from a workstation connected to the network.

   NOTE: For Windows 95/98/NT, select Run from the Start menu. Type Telnet, then click OK.

2. From Telnet, connect to the switch using the IP address.

   NOTE: For Windows 95/98/NT, select Remote System from the Connect menu on the Telnet window. Enter the IP address of the switch in the Host Name box.

3. Press **Enter** to display the login prompt. At the prompt, enter admin.
4. At the password prompt, enter password.
5. When the prompt switchName:userName> displays, enter a Telnet command. You can change the password by using the passwd command.

For more information on managing the switch remotely, refer to the *Compaq StorageWorks SAN Switch Fabric Operating System Management Guide* or the *Compaq StorageWorks SAN Switch QuickLoop Management Guide* that came with your switch.

Chapter 4

Front Panel Switch Management

This chapter contains general information and examples on managing and monitoring the switch using the front panel buttons.

Control Buttons

Figure 4-1 shows the front panel buttons. Table 4-1 lists the primary control button functions. The function of a button changes depending on the menu level. Buttons either control navigation through the menus or increment and decrement numeric values.

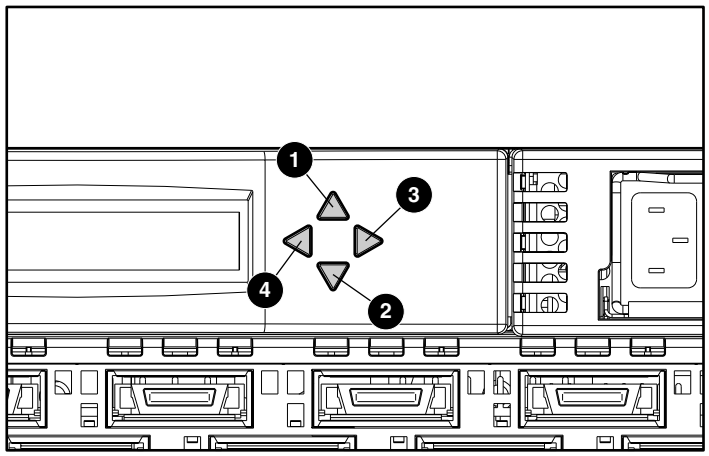


Figure 4-1. Front panel functionality

Table 4-1
Control Buttons

Identifier	Description	Function
❶	Down	Scrolls down the command list and decrements numeric values
❷	Up	Scrolls up the command list and increments numeric values
❸	Enter	Accepts input and executes a selected function
❹	Tab/Esc	Tabs through options and reverses through previous commands

When entering a number, the <Up> and <Down> buttons start in the slow mode and change to the fast mode if either button is held down. Most numbers go to a maximum of 255. For a large number, it can be faster to use the <Down> button.

Activating the Menu Display

The switch's front panel display is not normally illuminated. Pressing the front panel buttons activates the display. If no command is issued within 30 seconds, the display turns off.

Menus

The following menus are controlled using the front panel buttons:

Table 4-2
Menu Hierarchy

Configuration Menu	Operation Menu	Status Menu	Test Menu
Ethernet IP Address	Switch Offline	Switch Name	Switch Offline
Ethernet Subnetmask	Switch Online	Worldwide Name	Switch Online
Fibre Channel IP Address	Port Disable	Firmware Version	Memory Test
Fibre Channel Subnetmask	Port Enable	Current Date	Port Register Test
Gateway Address	QuickLoop Disable	Booted At	Central Memory Test
Domain	QuickLoop Enable	Firmware Date	CMI Conn Test
BB_credit	QuickLoop Port Disable	Flash Date	CAM Test
R_A_TOV	QuickLoop Port Enable	Boot Prom Date	Port Loopback Test
E_D_TOV	Close Telnet Session	Up Time	Cross Port Test
Data Field Size	Reboot	Powered Time	Spin Silk Test
Non-SCSI Tachyon Mode		PortType	SRAM Data Retention Test
Disable Device Probing		Module Type	CMEM Data Retention Test
VC Encoded Address Mode		Port Throughput	Display Test
Per-Frame Route Priority		Temperature	Display Test (long)
VC Priorities		Error Log	Push Button Test
Disable Fan Frames		Licenses	
Always Send RSCN?			
Set QuickLoop Port			
Unset QuickLoop Port			
QuickLoop Partner WWN			
QuickLoop No AL_PA 0x00			
Reset to Default			

Commands

The following table shows the front panel commands and their equivalent Telnet commands.

Table 4-3
Front Panel and Telnet Commands

Menu	Front Panel	Telnet Command	Default
Configuration	Ethernet IP Address	ipAddrSet	10.77.77.77
	Ethernet Submask	ipAddrSet	none
	Fibre Channel IP Address	ipAddrSet	none
	Fibre Channel Subnetmask	ipAddrSet	none
	Gateway Address	ipAddrSet	none
	Domain	configure	0
	BB_credit	configure	16 (G_Port) - 0 (FL_Port)
	R_A_TOV	configure	10000
	E_D_TOV	configure	2000
	Data Field Size	configure	2112
	Non-SCSI Tachyon Mode	configure	0
	Disable Device Probing	configure	0
	VC-Encoded Address Mode	configure	0
	Per-Frame Route Priority	configure	0
	VC Priorities	configure	0,1,2,2,2,2,3,3
	Disable Fan Frames	configure	0
	Always Send RSCN?	configure	0
	Set QuickLoop Port	qlPortEnable <port #>	0
	Unset QuickLoop Port	qlPortDisable <port #>	0
	QuickLoop Partner WWN	qlPartner	00:00:00:00:00:00:00:00
	QuickLoop No AL_PA 0x00	configure	0
	Reset to Default	configDefault	N/A

continued

Table 4-3
Front Panel and Telnet Commands *continued*

Menu	Front Panel	Telnet Command	Default
Operation	Switch Offline	switchDisable	N/A
	Switch Online	switchEnable	N/A
	Port Disable	portDisable <port #>	N/A
	Port Enable	portEnable <port #>	N/A
	QuickLoop Disable	qlDisable	N/A
	QuickLoop Enable	qlEnable	N/A
	QuickLoop Port Disable	qlPort Disable	N/A
	QuickLoop Port Enable	qlPort Enable	N/A
	Close Telnet Session	logout	N/A
	Reboot	reboot	N/A
Status	Switch Name	switchName	N/A
	Worldwide Name	switchShow	N/A
	Firmware Version	version	N/A
	Current Date	date	N/A
	Booted At	version	N/A
	Firmware Date	version	N/A
	Flash Date	version	N/A
	Boot Prom Date	version	N/A
	Up Time	uptime	N/A
	Powered Time	uptime	N/A
	Port Type	switchShow	N/A
	Module Type	switchShow	N/A
	Port Throughput	portPerfShow	N/A
	Temperature	tempShow	N/A
	Error Log	errShow	N/A
	Licenses	licenseShow	N/A

continued

Table 4-3
Front Panel and Telnet Commands *continued*

Menu	Front Panel	Telnet Command	Default
Test	Switch Offline	switchDisable	N/A
	Switch Online	switchEnable	N/A
	Memory Test	ramTest	N/A
	Port Register Test	portRegTest	N/A
	Central Memory Test	centralMemoryTest	N/A
	CMI Conn Test	cmiTest	N/A
	CAM Test	camTest	N/A
	Port Loopback Test	portLoopbackTest	N/A
	Cross Port Test	crossPortTest	N/A
	Spin Silk Test	spinSilk	N/A
	SRAM Data Retention Test	sramRetention Test	N/A
	CMEM Data Retention Test	cmemRetentionTest	N/A
	Display Test	N/A	N/A
	Display Test (long)	N/A	N/A
	Push-Button Test	N/A	N/A

Configuration Menu

Configure the switch using the Configuration menu. To choose commands, press <Enter> while Configuration Menu displays on the front panel.

NOTE: After changing any of the following menus from the front panel or a Telnet connection, you must reboot the switch for the changes to take effect.

Ethernet IP Address

To view the switch's Ethernet IP address, press <Enter> while Ethernet IP Address displays on the front panel. The switch's default IP address is a temporary address. To enter a new IP address:

1. Use <Up> and <Down> to increment or decrement the displayed value. The underlined cursor indicates the numbers to modify.
2. After you enter a number, press <Tab/Esc> to modify the next field.
3. After setting the IP address, press <Enter> to store the value.

Ethernet Subnetmask

To view the Ethernet subnet mask value, press <Enter> while Ethernet Subnetmask displays on the front panel. To enter a new subnet address, use <Up> and <Down> to increment or decrement the value. See your network administrator for the appropriate subnet mask.

Fibre Channel IP Address

To view the switch's Fibre Channel IP address, press <Enter> while Fibre Channel IP Address displays on the front panel. To change the Fibre Channel IP address:

1. Use <Up> and <Down> to increment or decrement the displayed value.
2. After you enter a number, press <Tab/Esc> to modify the next field.
3. After setting the Fibre Channel IP address, press <Enter> to store the value.

Fibre Channel Subnetmask

To view the Fibre Channel subnet mask, press <Enter> while Fibre Channel Subnetmask displays on the front panel. To enter a new subnet mask, use <Up> and <Down> to increment or decrement the value. See your network administrator for the appropriate subnetmask.

Gateway Address

To view the gateway address, press <Enter> while Gateway address displays on the front panel. To enter a new gateway address:

1. Use <Up> and <Down> to increment or decrement the value.
2. After you enter a number, press <Tab/Esc> to move the cursor and modify the next field.
3. After setting the gateway address, press <Enter> to store the value.

Domain

To view the domain number, press <Enter> while Domain displays on the front panel. The domain number uniquely identifies each switch in a fabric. The domain number can be any value between 1 and 239. If VC-Encoded Address Mode is in effect, the value can by any number between 0 and 31. Normally, the switch assigns itself a domain, but you can also assign this number manually.

BB_credit

To view the buffer-to-buffer credit, press <Enter> while BB_credit displays on the front panel. The number that displays represents the number of buffers, from 1 to 16, available to the host.

R_A_TOV

To view the Resource Allocation Time Out Value, press <Enter> while R_A_TOV displays on the front panel. You can adjust this value in 1-second increments using front panel controls, but it displays in milliseconds.

NOTE: Use the flashSet command during a Telnet session to set the R_A_TOV value for values other than whole seconds.

R_A_TOV works with the Error Detect Time Out Value (E_D_TOV) to determine the switch's actions when presented with an error condition. Allocated circuit resources with detected errors are not released until the time value has expired. If the condition is resolved prior to timing out, the internal time out clock resets. The R_A_TOV value can range from 1 to 120 seconds.

NOTE: The set value for R_A_TOV must be larger than the set value for E_D_TOV.

E_D_TOV

To view the Error Detect Time Out Value, press <Enter> while E_D_TOV displays on the front panel. You can adjust this value in 1-second increments using the front panel controls, but it displays in milliseconds.

NOTE: Use the flashSet command during a Telnet session to set the E_D_TOV value for values other than whole seconds.

The E_D_TOV flags a potential error condition when an expected response is not received (for example, an acknowledgment or reply in response to packet receipt) within the set time limit. If the time for an expected response exceeds the set value, an error condition results. The E_D_TOV value can range from 1 to 60 seconds.

NOTE: The set value for E_D_TOV must be smaller than the set value for the R_A_TOV.

Data Field Size

To view the data field size, press <Enter> while Data Field Size displays on the front panel. You can adjust this value using the front panel controls. The data field size specifies the largest possible value, in bytes, for the size of a type 1 (data) frame. The switch advertises this value to other switches in the fabric during fabric construction and to new devices that connect to the fabric for the first time. Setting this to a value smaller than 2112 can result in decreased performance.

Non-SCSI Tachyon Mode

When set, multiple sequences from different sources are interleaved to Tachyon-based controllers at sequence boundaries rather than at frame boundaries, resulting in better performance from Tachyon-based controllers.

Disable Device Probing

When set, devices that do not register themselves with the Name Server will not be present in the Name Server database.

VC-Encoded Address Mode

When set, frame source and destination addresses use an address format compatible with some first-generation switches.

Per-Frame Route Priority

In addition to the eight virtual channels used in frame routing priority, support is also available for per-frame based prioritization when this value is set. When set, the virtual channel ID is used in conjunction with a frame header to form the final virtual channel ID.

Virtual Channels

You can tune the switch for a specific application. The first two channels are not available because the switch reserves them for its internal functions.

NOTE: The default virtual channel settings are already optimized for switch performance. Changing the default values, if properly selected, can improve switch performance somewhat, but can also severely degrade switch performance. Do not change these settings without fully understanding the effects.

VC Priorities

To view the priorities assigned to each virtual channel, press <Enter> while VC Priorities displays on the front panel. The first two numbers are fixed, and display a 0 and a 1, respectively. The 0 in the first position indicates that this virtual channel, assigned to handle internal switch traffic, has the highest priority. The 1 in the second position shows the priority assigned by the virtual channel link control. Positions three through eight can only be a 2 or 3, indicating that the channel gives priority to Class 2 and Class 3 frame traffic.

Disable Fan Frames

This command specifies whether fabric address notification (FAN) frames are sent to notify public loop devices of their node ID and address. To disable FAN frames, press <Enter> while Disable Fan Frames displays on the front panel. Set the value to 1 and FAN frames will not be sent. Set the value to 0 to enable FAN frames.

Always Send RSCN?

Following the completion of loop initialization, a registered state change notification (RSCN) is issued when Fx_Ports detect the presence of new devices or the absence of preexisting devices. When this feature is set, a RSCN will always be issued following the completion of loop initialization, regardless of the presence or absence of new or preexisting devices.

Set QuickLoop Port

To set a QuickLoop Port, press <Enter> while Set QuickLoop Port displays on the front panel. Use <Up> and <Down> to scroll to the desired port (0 to 15). Select the port by pressing <Tab/Esc>.

Unset QuickLoop Port

To unset a QuickLoop Port, press <Enter> while Unset QuickLoop Port displays on the front panel. Use <Up> and <Down> to scroll to the desired port (0 to 15). Press <Enter> to select *Yes* and <Tab/Esc> to select *No*.

QuickLoop Partner WWN

To enter a QuickLoop partner's WWN, press <Enter> while QuickLoop Partner WWN displays on the front panel. Use <Tab/Esc> to move through the fields.

QuickLoop No AL_PA 0x00

When this feature is set, the FL_Port's AL_PA (0x00) will not be used in loop primitives. The FL_Port will not respond to OPENs at AL_PA 0. Instead, the FL_Port will reserve AL_PA 0x1 as OPN, ARB, and so on.

Reset to Default

To reset all values in the Configuration menu to default conditions, press <Enter> while Reset to Default displays on the front panel. Select *Yes* and press <Enter>. If you have customized the Ethernet IP address and switch name for your environment, these do not reset to default values.

NOTE: Resetting the switch to default conditions causes all configuration settings, names, and passwords entered to revert to default settings.

Operation Menu

You can control the switch's overall operational state using the Operation menu. To select commands, press <Enter> while Operation Menu displays on the front panel.

Switch Offline

To initiate the shutdown process, press <Enter> while Switch Offline displays on the front panel.

NOTE: You can verify the shutdown process by watching the front panel LEDs change color from green to amber as each port goes inactive.

After all multicast and broadcast paths have been rerouted, the F_Ports and FL_Ports go offline. All routes through the switch become unavailable by increasing path cost to hex. E_Ports go offline individually as all routes are eliminated.

Switch Online

To bring the switch online, press <Enter> while Switch Online displays on the front panel.

Port Disable

To disable a port, press <Enter> while Port Disable displays on the front panel. From the submenu, select the port you want disable and press <Enter>. The LED associated with the port changes from green to amber, indicating that the port is disabled.

Port Enable

To enable a port, press <Enter> while Port Enable displays on the front panel. From the submenu, select the port you want to enable and press <Enter>. The LED associated with the port changes from amber to green, indicating that the port is enabled. When you enable FL_Ports, the port attempts to be the master and initializes the loop.

QuickLoop Disable

To disable QuickLoop, press <Enter> while QuickLoop Disable displays on the front panel. Press <Enter> to select *Yes*.

QuickLoop Enable

To enable QuickLoop, press <Enter> while QuickLoop Enable displays on the front panel. Press <Enter> to select *Yes*.

QuickLoop Port Disable

To disable a QuickLoop port, press <Enter> while QuickLoop Port Disable displays on the front panel. Use <Up> and <Down> to choose the desired port (0 to 15). Press <Enter> to select *Yes* and <Tab/Esc> to select *No*.

QuickLoop Port Enable

To enable a QuickLoop port, press <Enter> while QuickLoop Port Enable displays on the front panel. Use <Up> and <Down> to choose the desired port (0 to 15). Press <Enter> to select *Yes* and <Tab/Esc> to select *No*.

Close Telnet Session

To close a Telnet session, press <Enter> while Close Telnet Session displays on the front panel.

Reboot

To reboot the switch, press <Enter> while Reboot displays on the front panel. From the submenu, select *Yes*. To exit this function, select *No* or press <Tab/Esc>.

NOTE: Rebooting the switch causes it to immediately exit all current processes and states and start the POST process. Exercise caution using the reboot command on a switch connected to the fabric.

Status Menu

You can retrieve information about the switch using the Status menu. This menu only provides information. You cannot make changes to the switch's status from this menu. To select commands, press <Enter> while Status Menu displays on the front panel.

Switch Name

To view the switch name, press <Enter> while Switch Name displays on the front panel.

Worldwide Name

To view the World Wide Name (WWN), press <Enter> while Worldwide Name displays on the front panel. The WWN identifies each switch with a unique numeric value.

Firmware Version

To view the firmware version, press <Enter> while Firmware Version displays on the front panel.

Current Date

To view the current date, press <Enter> while Current Date displays on the front panel.

Booted At

To view the boot time, press <Enter> while Booted At displays on the front panel.

Firmware Date

To view the date of the switch's firmware, press <Enter> while Firmware Date displays on the front panel. This date reflects the firmware assembly date and the date code of the currently executing firmware on the processor.

> **NOTE:** If you upgrade the switch with new firmware but do not reboot the switch, the firmware date and flash date options display different dates. When the switch is rebooted, the flash code becomes the executing processor code, and both dates match.

Flash Date

To view the flash date, press <Enter> while Flash Date displays on the front panel. This date reflects the day and time of the last flash firmware update. If you upgrade the firmware in flash memory with a different firmware version, the date you installed the new firmware displays.

Boot Prom Date

To view the date and time of the Boot Prom manufacture, press <Enter> while Boot Prom Date displays on the front panel. You can use this date to establish the Boot Prom version.

Up Time

To view the time the switch has been up since the last reboot, press <Enter> while Up Time displays on the front panel.

Powered Time

To view the time the switch has been powered on, press <Enter> while Powered Time displays on the front panel.

Port Type

To view the status of each port on the switch, press <Enter> while Port Type displays on the front panel. Information displays starting with the top left port. The definitions are summarized in the following table.

Table 4-4
Port Type Definitions

Display	Port Type	Definition
E	E_Port	An interswitch expansion port used to connect to an E_Port on another switch to build a larger switch fabric
F	F_Port	The fabric access port used to connect an N_Port on another switch to control and manage the switch fabric
L	FL_Port	A switch port connected to an arbitrated loop
G	G_Port	A generic port that can operate either as an E_Port or an F_Port, but has not yet assumed a specific function in the fabric
U	U_Port	A universal port that can operate as any other port type
N	N_Port	Used within the switch for internal switch control traffic; does not have an external physical port
X	N/A	Indicates that no GBIC module is installed

Module Type

To view the type of GBIC module installed in a port, press <Enter> while Module Type displays on the front panel. The output includes:

- L = long-wavelength
- S = short-wavelength

Port Throughput

To view the port throughput on the switch, press <Enter> while Port Throughput displays on the front panel. The throughput number represents the number of bytes received plus the number of bytes transmitted per second and is displayed as bytes per second (B/s), kilobytes per second (KB/s), or megabytes per second (MB/s). You can select different ports using <Up> and <Down> to monitor a single port or aggregate port performance.

Temperature

To view the temperature of the switch from five sensors on the motherboard, press <Enter> while Temperature displays on the front panel. Using <Up> or <Down>, you can toggle between Centigrade and Fahrenheit temperature values. The temperature readings display on the front panel at a rate of one reading per second. Readings obtained during a Telnet session represent a single reading made at command execution.

Error Log

To view the error log, press <Enter> while Error Log displays on the front panel. The error log stores the last 64 error types sensed by the switch. The front panel display shows:

- Error number (01-64)
- Date and time of the last occurrence
- Total number of occurrences of each error type
- Error type
- Error level for each error type
  - 0—Panic (when this level is reached, the switch automatically reboots and the display no longer shows the error)
  - 1—Critical
  - 2—Error
  - 3—Warning
  - 4—Info
  - 5—Debug

Licenses

To view a list of the licensed options on a switch, press <Enter> while Licenses displays on the front panel. Possible values are:

- 1—Web Management
- 2—Zoning
- 3—QuickLoop
- 4—Fabric Operating System

Test Menu

Tests are available from the Test menu as part of the switch's diagnostic and fault isolation capabilities. For more information on diagnostics, see Chapter 5, "Diagnostics."

Chapter 5

Diagnostics

This chapter discusses diagnostic testing using the front panel controls. See Chapter 6, "Error Messages," for information about the error messages generated by diagnostic tests.

Diagnostic Overview

The Compaq StorageWorks SAN Switch 16 is designed for maintenance-free operation. The switch's self-diagnostic capabilities aid in isolating equipment or fabric failures. You can perform diagnostics when using the front panel controls or a Telnet session. Since the front panel displays a two-line limit, more detailed test results display through a Telnet session.

Isolating a System Fault

Various loopback paths are built in to the switch hardware for diagnostic purposes. A loopback path test within the switch verifies the proper internal Fibre Channel port logic functions and the paths between interfaces and central memory. The switch diagnostics also support external loops, which include the motherboard and GBIC modules in cross-port configurations. These port-to-port diagnostics let you check for installed fiber cables and isolate port faults.

Removing Power

Error messages are stored in RAM and are lost when power is removed from the switch. Access the error message log to view any error messages before removing power from the switch. When all data transferring processes external to the switch complete, removing power from the switch does not disrupt the fabric.

Power-On Self-Tests

Table 5-1 lists the diagnostic tests automatically run during the Power-On Self-Test (POST).

Table 5-1
POST Tests

Test Name	Description	Telnet Command
Memory test	Checks processor RAM memory	ramTest
Port Register test	Checks the ASIC registers and SRAMs	portRegTest
Central Memory test	Checks the motherboard SRAMs	centralMemoryTest
CMI Conn test	Checks the CMI bus between ASICs	cmiTest
CAM test	Checks the CAM	camTest
Port Loopback test	Checks all of the switch's hardware (frames are transmitted, looped back, and received)	portLoopbackTest

NOTE: POST execution after a cold boot executes the long version of the Memory test, while POST execution after a warm boot executes a shorter version of the Memory test. A switch rebooted with POST disabled generates the DIAG-POST_SKIPPED error log message.

Diagnostic Tests

The following tests are available from the switch front panel. For detailed information on executing diagnostic tests through a Telnet session, refer to the *Compaq StorageWorks SAN Switch Fabric Operating System Management Guide* or the *Compaq StorageWorks SAN Switch QuickLoop Management Guide* that came with your switch.

Test Menu

To execute diagnostic tests from the switch's front panel, press <Enter> while Test Menu displays on the front panel. The following options are available:

- Switch Offline
- Switch Online
- Memory Test
- Port Register Test
- Central Memory Test
- CMI Conn Test
- CAM Test
- Port Loopback test
- Cross Port Test
- Spin Silk Test
- SRAM Data Retention Test
- CMEM Data Retention Test
- Display Test
- Display Test (long)
- Push Button Test

Table 5-2
Offline and Online Tests

Offline Tests	Offline and Online Tests
Port Register test	Memory test
Central Memory test	Cross Port test
CMI Conn test	
SRAM Data Retention test	
CMEM Data Retention test	
CAM test	
Port Loopback test	
Spin Silk test	

Switch Offline

Diagnostic tests that jeopardize data transmission cannot be executed while the switch is online. To take the switch offline, press <Enter> while Switch Offline displays on the front panel.

Switch Online

To place the switch online, press <Enter> while Switch Online displays on the front panel.

Memory Test

To test the processor memory, press <Enter> while Memory Test displays on the front panel. Related error messages are DIAG-MEMORY, DIAG-MEMSZ, and DIAG-MEMNULL.

Port Register Test

To test the switch's application specific integrated circuit (ASIC) registers, press <Enter> while Port Register Test displays on the front panel. Ports 0 to 15 are tested. Related error messages are DIAG-REGERR, DIAG-REGERR_UNRST, and DIAG-BUS_TIMEOUT.

Central Memory Test

To test the central memory in each ASIC, press <Enter> while Central Memory Test displays on the front panel. This test ensures that:

- The built-in self-repair (BISR) circuit in each ASIC chip does not report failure to repair bad cells (bisr test).
- The data cells can be uniquely written and read correctly (data write/read test).
- The data in any one ASIC can be read from any other ASIC (asic-asic test).
- Bad parity can be detected and flagged in the error register and an interrupt can be posted (parity error test).
- Buffer number error can be detected and flagged in the error register and an interrupt can be posted (buffer number error test).
- Chip number error can be detected and flagged in the error register and an interrupt can be posted (chip number error test).

Related error messages are DIAG-CMBISTRO, DIAG-CMBISRF, DIAG-LCMTO, DIAG-LCMRS, DIAG-LCMEM, DIAG-LCMEMTX, DIAG-CMNOBUF, DIAG-CMERRTYPE, DIAG-CMERRPTN, DIAG-PORTABSENT, DIAG-BADINIT, and DIAG-TIMEOUT.

CMI Conn Test

To verify that control messages can be correctly sent from any ASIC to any ASIC, press <Enter> while CMI Conn Test displays on the front panel. Related error messages are DIAG-BADINIT, DIAG-INTNIL, DIAG-CMISA1, DIAG-CMINOCAP, DIAG-CMIINVCAP, DIAG-CMIDATA, and DIAG-CMICKSUM.

CAM Test

To verify that the SID translation required by QuickLoop and implemented using content addressable memories (CAM) is functioning correctly, press <Enter> while CAM Test displays on the front panel. Related error messages are DIAG-CAMINIT, DIAG-CAMSID, and DIAG-XMIT.

Port Loopback Test

To test the switch circuitry up to the serial output of the ASIC, press <Enter> while Port Loopback Test displays on the front panel. The Port Loopback test verifies the intended functional operation of the switch by sending frames from each port's transmitter back to the same port's receiver through an internal hardware loopback. The Port Loopback test is an internal test that continues to run until you press any button. Related error messages are DIAG-INIT, DIAG-PORTDIED, DIAG-XMIT, DIAG-TIMEOUT, DIAG-ERRSTAT, DIAG-STATS, DIAG-DATA, and DIAG-PORTABSENT.

Cross Port Test

To verify the intended functional operation of the switch, press <Enter> while Cross Port Test displays on the front panel. Each port's transmitter sends frames by means of the GBIC module and external cable to another port's receiver. This test exercises the entire path of the switch.

You can connect any port to any other port in the same switch provided the connection is of the same technology, for example, GBIC-SW ports to GBIC-SW ports and GBIC-LW ports to GBIC-LW ports. Related error messages are DIAG-INIT, DIAG-PORTDIED, DIAG-XMIT, DIAG-TIMEOUT, DIAG-ERRSTAT, DIAG-STATS, DIAG-PORTWRONG, DIAG-DATA, and DIAG-PORTABSENT.

Spin Silk Test

To verify the intended functional operation of the switch, press <Enter> while Spin Silk Test displays on the front panel. Each port's transmitter sends frames by means of the GBIC module and external cable, to another port's receiver at full hardware speed (1 GB/s). The entire path of the switch is exercised. Since the processor does not compare data on each frame, the Spin Silk test does not report the DIAG-DATA error. Other error messages defined for the Cross Port test and the corresponding probable causes and actions are applicable to the Spin Silk test.

NOTE: When running the Spin Silk test, set the operating mode value to 0 or 1.

Related error messages are DIAG-INIT, DIAG-PORTDIED, DIAG-XMIT, DIAG-PORTSTOPPED, DIAG-ERRSTAT, DIAG-ERRSTATS, and DIAG-PORTABSENT.

SRAM Data Retention Test

To verify that data written into the ASIC memories is retained, press <Enter> while SRAM Data Retention Test displays on the front panel. Related error messages are DIAG-REGERR, DIAG-REGERR_UNRST, and DIAG-BUS_TIMEOUT.

CMEM Data Retention Test

To verify that the data written into the SRAMs that make up the central memory is retained, press <Enter> while CMEM Data Retention Test displays on the front panel. Related error messages are DIAG-LCMEM, DIAG-LCMRS, and DIAG-LCMTO.

Display Test

To verify that the front panel display is functioning properly, press <Enter> while Display Test displays on the front panel.

Display Test (long)

To execute a long version of the Display Test, press <Enter> while Display Test (long) displays on the front panel.

Push Button Test

To verify that the front panel control buttons are functioning properly, press <Enter> while Push Button Test displays. Press any front panel button and the corresponding number on the display moves to the second line. To exit the Push Button test, press <Down> and <Enter> simultaneously.

Chapter 6

Error Messages

This chapter explains the error message formats and possible errors associated with switch diagnostics. This section includes:

- System error message formats
- Diagnostic error message formats
- Error message tables

System Error Message Formats

There are two error message formats depending on whether you are gathering information from the front panel or through a Telnet session. In all cases, the last error encountered is the first error displayed. Up to 64 messages are held in a buffer. If the 64-message limit is exceeded, the messages are overwritten in a first in, first out sequence.

Front Panel Format

When errors display on the front panel, the first line indicates the date and time the error occurred. The second line displays the module name (Diag), error name (REGERR_UNRST), and the severity level (1). The possible severity levels are:

- 1—Critical
- 2—Error
- 3—Warning

- 4—Informational
- 5—Debug

To display error messages using the front panel controls:

1. Select the Status menu from the front panel controls.
2. Select Error Log.
3. Scroll through the error log. If no errors are encountered, the front panel displays "No Error."

Telnet Format

During a Telnet session, use the errShow command to display all detected errors. The error counter goes to a maximum of 999. The following information displays for each detected error:

- Number of errors detected
- Task ID and task name (task names are displayed using the i command)
- Error type, date and time, error level, and description
- Number of occurrences (shown in brackets following the date and time stamp)

The error message display pauses after each error and prompts you to press **Enter** to continue or **Q** to quit. Continue pressing **Enter** until the prompt => displays. Only diagnostic errors are assigned error numbers. If no errors encountered, the message "No Error" displays.

To display error messages through Telnet:

1. At the prompt, enter errShow.
2. Type <CR> to scroll through the error list.

Diagnostic Error Message Formats

If any port fails a diagnostic test, it is marked BAD in the display. To retest a port that has been marked BAD, clear the port and set the port to OK using the diagClearError (port #) Telnet command. This command clears the port status only and does not clear the logs or change the port's condition. The diagClearError (port #) command should only be used during diagnostic procedures to reset a bad port for retesting. Some messages contain the following abbreviations:

- sb = should be
- er = bits in error

NOTE: If you run the portStatsShow or the diagShow command before you run a test, errors can display as a result of the normal synchronization process. These errors should be addressed if the number of errors found increases when running the portStatsShow command again.

Table 6-1
Probable Failure Actions

Failed Test	Action
Memory test	Replace DRAM module or motherboard assembly
Port Register test	Replace motherboard assembly
Central Memory test	Replace motherboard assembly
CMI Conn test	Replace motherboard assembly
CMEM Data Retention test	Replace motherboard assembly
SRAM Data Retention test	Replace motherboard assembly
CAM test	Replace motherboard assembly
Port Loopback test	Replace motherboard assembly
Cross Port test	Replace motherboard assembly, GBIC, or fiber cable
Spin Silk test	Replace motherboard assembly, GBIC, or fiber cable

Error Message Numbers

An error number (ERR#xxxx) displays at the end of diagnostic error messages. Use the following table to match each error number with the test that caused the error. Definitions of error names and necessary actions to correct each error are listed in the "Error Message Table" section of this chapter.

Table 6-2
Error Message Numbers

Error Number	Test Name	Error Name
0001	n/a	DIAG-CLEAR_ERR
0004	n/a	DIAG-POST_SKIPPED
0B15	SRAM Data Retention test	DIAG-REGERR
0B16		DIAG-REGERR_UNRST
0B0F		DIAG-BUS_TIMEOUT
1F25	CMEM Data Retention test	DIAG-LCMRS
1F26		DIAG-LCMTO
1F27		DIAG-LCMEM
0110	Memory test	DIAG-MEMORY
0111		DIAG-MEMSZ
0112		DIAG-MEMNULL
0415	Port Register test	DIAG-REGERR
0416		DIAG-REGERR_UNRST
040F		DIAG-BUS_TIMEOUT

continued

Table 6-2
Error Message Numbers *continued*

Error Number	Test Name	Error Name
1020	Central Memory test	DIAG-CMBISRTO
1021		DIAG-CMBISRF
1025		DIAG-LCMRS
1026		DIAG-LCMTO
1027		DIAG-LCMEM
1028		DIAG-LCMEMTX
1029		DIAG-CMNOBUF
102A		DIAG-CMERRTYPE
102B		DIAG-CMERRPTN
102C		DIAG-INTNOTCLR
1030		DIAG-BADINT
106F		DIAG-TIMEOUT
2030	CMI Conn test	DIAG-BADINT
2031		DIAG-INTNIL
2032		DIAG-CMISA1
2033		DIAG-CMINOCAP
2034		DIAG-CMIINVCAP
2035		DIAG-CMIDATA
2036		DIAG-CMICKSUM
223B	CAM test	DIAG-CAMINIT
223C		DIAG-CAMSID

continued

Table 6-2
Error Message Numbers *continued*

Error Number	Test Name	Error Name
2640	Port Loopback test	DIAG-ERRSTAT (ENCIN)
2641		DIAG-ERRSTAT (CRC)
2642		DIAG-ERRSTAT (TRUNC)
2643		DIAG-ERRSTAT (2LONG)
2644		DIAG-ERRSTAT (BADEOF)
2645		DIAG-ERRSTAT (ENCOUT)
2646		DIAG-ERRSTAT (BADORD)
2647		DIAG-ERRSTAT (DISCC3)
264F		DIAG-INIT
265F		DIAG-PORT_DIED
266E		DIAG-DATA
266F		DIAG-TIMEOUT
2660		DIAG-STATS (FTX)
2661		DIAG-STATS (FRX)
2662		DIAG-STATS (C3FRX)
2670		DIAG-PORTABSENT
2671		DIAG-XMIT

continued

Table 6-2
Error Message Numbers *continued*

Error Number	Test Name	Error Name
3040	Cross Port test	DIAG-ERRSTAT (ENCIN)
3041		DIAG-ERRSTAT (CRL)
3042		DIAG-ERRSTAT (TRUNC)
3043		DIAG-ERRSTAT (2LONG)
3044		DIAG-ERRSTAT (BADEOF)
3045		DIAG-ERRSTAT (ENCOUT)
3046		DIAG-ERRSTAT (BADORD)
3047		DIAG-ERRSTAT (DISC3)
304F		DIAG-INIT
305F		DIAG-PORTDIED
3060		DIAG-STATS (FTX)
3061		DIAG-STATS (FRX)
3062		DIAG-STATS (C3FRX)
306E		DIAG-DATA
306F		DIAG-TIMEOUT
3070		DIAG-PORTABSENT
3071		DIAG-XMIT
3078		DIAG-PORTWRONG

continued

Table 6-2
Error Message Numbers *continued*

Error Number	Test Name	Error Name
384F	Spin Silk test	DIAG-INIT
385F		DIAG-PORTDIED
3840		DIAG-ERRSTAT (ENCIN)
3841		DIAG-ERRSTAT (CRC)
3842		DIAG-ERRSTAT (TRUNC)
3843		DIAG-ERRSTAT (2LONG)
3844		DIAG-ERRSTAT (BADEOF)
3845		DIAG-ERRSTAT (ENCOUT)
3846		DIAG-ERRSTAT (BADORD)
3847		DIAG-ERRSTAT (DISCC3)
3870		DIAG-PORTABSENT
3871		DIAG-XMIT
3874		DIAG-PORTSTOPPED

Error Message Table

Table 6-3 defines each error name and describes the actions necessary to correct each error.

Table 6-3
Diagnostic Error Messages

Message	Description	Probable Cause	Action
DIAG-BADINT Err#1030, 2030 [centralMemoryTest, cmiTest]	The port received an interrupt when it was not expecting one.	ASIC failure	Replace motherboard assembly
DIAG-BUS_TIMEOUT Err#0B0F, 4040F [portRegTest, sramRetentionTest]	An ASIC register or ASIC SRAM did not respond to an ASIC data access.	ASIC failure	Replace motherboard assembly
DIAG-CAMINIT Err#223B [camTest]	The port failed to initialize due to one of the following reasons: ■ Switch not disabled ■ Diagnostic queue absent ■ Malloc failed ■ Chip is not present ■ Port is not in loopback mode ■ Port is not active	Software operational setup error or motherboard failure	Retry, reboot or replace motherboard assembly
DIAG-CAMSID Err#223C [camTest]	An ASIC failed SID NO translation test.	ASIC failure	Replace motherboard assembly
DIAG-CLEAR_ERR Err#0001	A port's diag error flag (OK or BAD) is cleared.	Informational Only	None required
DIAG-CMBISRF Err#1021 [centralMemoryTest]	An ASIC's Central Memory SRAMs did not complete the BISR within the timeout period.	ASIC failure	Replace motherboard assembly

continued

Table 6-3
Diagnostic Error Messages *continued*

Message	Description	Probable Cause	Action
DIAG-CMBISRTO Err#1020 [centralMemoryTest]	An ASIC's Central Memory SRAMs did not complete the BISR within the timeout period.	ASIC failure	Replace motherboard assembly
DIAG-CMERRPTN Err#102B [centralMemoryTest]	An error was detected at the wrong port.	ASIC failure	Replace motherboard assembly
DIAG-CMERRTYPE Err#102A [centralMemoryTest]	A port received the wrong CMEM error type.	ASIC failure	Replace motherboard assembly
DIAG-CMICKSUM Err#2036 [cmiTest]	A CMI message received a failed bad checksum test.	ASIC or motherboard failure	Replace motherboard assembly
DIAG-CMIDATA Err#2035 [cmiTest]	CMI data received did not match the data transmitted.	ASIC or motherboard failure	Replace motherboard assembly
DIAG-CMIINVCAP Err#2034 [cmiTest]	An unintended ASIC erroneously received a CMI capture flag.	ASIC or motherboard failure	Replace motherboard assembly
DIAG-CMINOCAP Err#2033 [cmiTest]	A CMI intended receiver ASIC failed to receive a CMI capture flag.	ASIC or motherboard failure	Replace motherboard assembly
DIAG-CMISA1 Err#2032 [cmiTest]	An attempt to send a CMI message from ASIC to ASIC failed.	ASIC failure	Replace motherboard assembly
DIAG-CMNOBUF Err#1029 [centralMemoryTest]	A port could not receive a buffer.	ASIC failure	Replace motherboard assembly

continued

Table 6-3
Diagnostic Error Messages *continued*

Message	Description	Probable Cause	Action
DIAG-DATA Err#266E, 306E [portLoopbackTest, crossPortTest]	The payload received by a port did not match the payload transmitted.	motherboard, GBIC module, or fiber cable failure	Replace motherboard assembly, GBIC module, or fiber cable
DIAG-ERRSTAT Err#2640-2647, 3040- 3047, 3840-3847 [portLoopbackTest, crossPortTest, spinSilk]	The Port Error Statistics counter is non-zero, meaning an error was detected when receiving frames. One of the following status errors occurred. ■ Enc_in – Encoding error, inside frame ■ CRC_err – Cyclic redundancy check on frame failed ■ TruncFrm – Truncated frame ■ FrmTooLong – Frame too long ■ BadEOF – Bad end of file ■ Enc_out – Encoding error, outside frame ■ BadOrdSet – Bad symbol on fiber-optic cable ■ DiscC3 – Discarded Class 3 frames	ASIC, motherboard, GBIC module, or fiber cable failure	Replace motherboard assembly, GBIC module, or fiber cable
DIAG-INIT Err#264F, 304F, 384F [portLoopbackTest, crossPortTest, spinSilk]	A port failed to activate in the loopback mode requested.	ASIC, motherboard, GBIC module, or fiber cable failure	Replace motherboard assembly, GBIC module, or fiber cable

continued

Table 6-3
Diagnostic Error Messages *continued*

Message	Description	Probable Cause	Action
DIAG-INTNIL Err#2031 [cmiTest]	An ASIC failed to receive a CMI error (interrupt).	ASIC failure	Replace motherboard assembly
DIAG-INTNOTCLR Err#102C [centralMemoryTest]	The interrupt bit could not be cleared.	ASIC failure	Replace motherboard assembly
DIAG-LCMEM Err#1027 [centralMemoryTest, cmemRetentionTest]	Data read from the Central Memory location did not match data previously written into the same location	ASIC failure	Replace motherboard assembly
DIAG-LCMEMTX Err#1F27, 1028 [centralMemoryTest]	A Central Memory transmit path failed: ASIC 1 failed to read ASIC 2 through the transmit path.	Motherboard failure	Replace motherboard assembly
DIAG-LCMRS Err#1F25, 1025 [centralMemoryTest, cmemRetentionTest]	The Central Memory read short: M bytes were requested but less than M bytes were received.	ASIC failure	Replace motherboard assembly
DIAG-LCMTO Err#1F26, 1026 [centralMemoryTest, cmemRetentionTest]	The Central Memory timed out: the data transfer initiated did not complete within the timeout period.	ASIC failure	Replace motherboard assembly
DIAG-MEMNULL Err#0112 [ramTest]	The test failed to malloc.	Motherboard failure	Replace motherboard assembly
DIAG-MEMSZ Err#0111 [ramTest]	The memory size to be tested is less than or equal to zero.	Motherboard failure	Replace motherboard assembly

continued

Table 6-3
Diagnostic Error Messages *continued*

Message	Description	Probable Cause	Action
DIAG-MEMORY Err#0110 [ramTest]	Data read from the RAM location did not match previously written data into the same location.	CPU RAM failure	Replace motherboard assembly or DRAM module
DIAG-PORTABSENT Err#2670, 3070, 3870 [portLoopbackTest, crossPortTest, spinSilk]	A port is not present.	ASIC or motherboard failure	Replace motherboard assembly
DIAG-PORTDIED Err#265F, 305F, 385F [portLoopbackTest, crossPortTest, spinSilk]	A port was in loopback mode and then went inactive.	ASIC, GBIC module, or fiber cable failure	Replace motherboard assembly, GBIC module, or fiber cable
DIAG-PORTSTOPPED Err#3874 [spinSilk]	A port is no longer transmitting: the Number Of Frames Transmitted counter is stuck at N frames.	ASIC, GBIC module, or fiber cable failure	Replace motherboard assembly, GBIC module, or fiber cable
DIAG-PORTWRONG Err#3078 [crossPortTest]	A frame was erroneously received by port M instead of the intended port N.	ASIC failure	Replace motherboard assembly
DIAG-POST_SKIPPED Err# 0004 [switch initialization]	POST is skipped. A message recommends that POST be executed.	Informational Only	None required
DIAG-REGERR Err#0B15, 0415 [portRegTest, sramRetentionTest]	Data read from an ASIC register or an ASIC SRAM did not match data previously written into the same location.	ASIC failure	Replace motherboard assembly

continued

Table 6-3
Diagnostic Error Messages *continued*

Message	Description	Probable Cause	Action
DIAG-REGERR_UNRST Err#0B16, 0416 [portRegTest, sramRetentionTest]	A port failed to unreset.	ASIC failure	Replace motherboard assembly
DIAG-STATS Err#2660-2662, 3060 -3062 [portLoopback Test, crossPortTest]	The port counter value did not match the number of frames actually transmitted. Possible counters reporting: ■ FramesTx - number of frames transmitted ■ FramesRx - number of frames received ■ CI3FrmRx - number of Class 3 frames received	ASIC, GBIC module, or fiber cable failure	Replace motherboard assembly, GBIC module, or fiber cable
DIAG-TIMEOUT Err#266F, 306F, 386F [portLoopbackTest, crossPortTest, centralMemoryTest]	For portLoopbackTest and crossPortTest: A port failed to receive a frame within the time out period. For centralMemoryTest: A port failed to detect an interrupt within the time out period.	ASIC, GBIC module, or fiber cable failure	Replace motherboard assembly, GBIC module, or fiber cable
DIAG-XMIT Err#2271, 2671, 3071, 3871 [portLoopbackTest, crossPortTest, spinSilk, camTest]	A port failed to transmit a frame.	ASIC failure	Replace motherboard assembly
CONFIG CORRUPT	The switch configuration information has become irrevocably corrupted.	OS error	The system resorts to default configuration settings
CONFIG OVERFLOW	The switch configuration information has grown too large to be saved or has an invalid size.	OS error	Contact customer support

continued

Table 6-3
Diagnostic Error Messages *continued*

Message	Description	Probable Cause	Action
CONFIG VERSION	The switch has encountered an unrecognized version of the switch configuration.	OS error	The system resorts to default configuration settings
FABRIC, SEGMENTED, LOG_WARNING	The fabric is segmented.	■ Fabric parameters or switches not compatible ■ Conflict zones	Reconfigure the fabric or zones
FABRIC, NO_ALIASID, LOG_WARNING	There is no free multicast alias.	Too many multicast groups in use	Remove some of the groups
FABRIC, BADILS, LOG_WARNING	There is a bad ISL-ELS size.	The ISL-ELS payload is wrong.	Contact customer support
FLASH, BAD_MIRROR, LOG_WARNING	The system's flash memory has encountered an error.	OS error	The system attempts to recover from its mirrored backup; contact customer support
RPC, SVC_EXIT	An RPC service daemon has terminated prematurely or unexpectedly.	OS error	Contact customer support
RPC, SVC_REG	An RPC service daemon could not establish service for a particular protocol handler.	OS error	Contact customer support
TEMP, 1_FAILED, LOG_WARNING	The switch overheated.	Fan Failure	Contact customer support
TEMP, 2_FAILED, LOG_ERROR	The switch overheated.	Fan Failure	Contact customer support
TEMP, 3_FAILED, LOG_CRITICAL	The switch overheated.	Fan Failure	Contact customer support
TEMP, 4_FAILED, LOG_CRITICAL	The switch overheated.	Fan Failure	Contact customer support

continued

Table 6-3
Diagnostic Error Messages *continued*

Message	Description	Probable Cause	Action
TEMP, 5_FAILED, LOG_CRITICAL	The switch overheated.	Fan Failure	Contact customer support
FANS, 1_FAILED, LOG_WARNING	The switch overheated.	Fan Failure	Contact customer support
FANS, 2_FAILED, LOG_ERROR	The switch overheated.	Fan Failure	Contact customer support
FANS, 3_FAILED, LOG_CRITICAL	The switch overheated.	Fan Failure	Contact customer support
FANS, 4_FAILED, LOG_CRITICAL	The switch overheated.	Fan Failure	Contact customer support
FANS, 5_FAILED, LOG_CRITICAL	The switch overheated.	Fan Failure	Contact customer support
FANS, 6_FAILED, LOG_CRITICAL	The switch overheated.	Fan Failure	Contact customer support
POWER, 1_FAILED, LOG_CRITICAL	A switch power failure occurred.	Power Supply Failure	Contact customer support
POWER, 2_FAILED, LOG_CRITICAL	A switch power failure occurred.	Power Supply Failure	Contact customer support
FCIU, IUBAD, L, S	The IU is invalid.	OS error	Contact customer support
FCIU, IUCOUNT, L, S	The total number of Ius Count is less than 0.	OS error	Contact customer support
FCPH, EXCHBAD, L, S	There was a bad exchange.	OS error	Contact customer support
FCPH, EXCHFREE, L, S	Unable to free an exchange.	OS error	Contact customer support
MQ, QWRITE, L, M	The message queue overflowed.	Task blocked	Contact customer support
MQ, QREAD, L, M	The message queue is unread.	OS error	Contact customer support
MQ, MSGTYPE, E, M	There is an unknown message type.	OS error	Contact customer support
SEMA, SEMGIVE, L, M	Unable to give a semaphore.	OS error	Contact customer support

continued

Table 6-3
Diagnostic Error Messages *continued*

Message	Description	Probable Cause	Action
SEMA, SEMTAKE, L, M	Unable to take a semaphore.	OS error	Contact customer support
SEMA, SEMFLUSH, L, M	Unable to flush a semaphore.	OS error	Contact customer support
PANIC, TASKSPAWN, LOG_PANIC	The task creation failed.	OS error	Contact customer support
PANIC, SEMCREATE, LOG_PANIC	Semaphore creation failed.	OS error	Contact customer support
PANIC, SEMDELETE, LOG_PANIC	Semaphore deletion failed.	OS error	Contact customer support
PANIC, QCREATE, LOG_PANIC	The message queuer failed.	OS error	Contact customer support
PANIC, QDELETE, LOG_PANIC	Message queuer deletion failed.	OS error	Contact customer support
PANIC, MALLOC, LOG_PANIC	Memory allocation failed.	OS error	Contact customer support
PANIC, FREE, LOG_PANIC	Memory free failed.	OS error	Contact customer support
PANIC, INCONSISTENT, LOG_PANIC	Data is out of sync.	OS error	Contact customer support
PANIC, INTCONTEXT, LOG_PANIC	Data is out of sync.	OS error	Contact customer support
PANIC, ZOMTIMSET, LOG_PANIC	There was an attempt to set a zombie timer.	OS error	Contact customer support
PANIC, ZOMTIMKILL, LOG_PANIC	The zombie timer was destroyed.	OS error	Contact customer support
PANIC, FREETIMRLSD, LOG_PANIC	The free timer was released.	OS error	Contact customer support
PANIC, TIMEUSECNT, LOG_PANIC	The timer use count was exceeded.	OS error	Contact customer support

continued

Table 6-3
Diagnostic Error Messages *continued*

Message	Description	Probable Cause	Action
PANIC, LSDB_CKSUM, LOG_PANIC	The Link State Database checksum failed.	OS error	Contact customer support
SYS, NOMEM, LOG_CRITICAL	There is no memory.	OS error	Contact customer support
SYS, SYSCALL, LOG_ERROR	The system call failed.	OS error	Contact customer support
SYS, BADPTR, LOG_ERROR	There is a bad system pointer.	OS error	Contact customer support
SYS, INTRPT, LOG_CRITICAL	There was a bad system interrupt.	OS error	Contact customer support
SYS, FLASHRD, LOG_ERROR	There was a FLASH memory read error.	OS error	Contact customer support
SYS, FLASHWR, LOG_ERROR	There was a FLASH memory write error.	OS error	Contact customer support
TIMERS, ENQFAIL, LOG_CRITICAL	There was an invalid timeout value.	OS error	Contact customer support
TIMERS, MSG,LOG_WARNING	There was an invalid message.	OS error	Contact customer support
FLANNEL, PHANTOM, LOG_WARNING	A port's PLT limit was exceeded.	OS error	Contact customer support
ASIC, MINI_BUFFER, LOG_WARNING	An ASIC failed.	Bad motherboard	Contact customer support
LSDB, LSID, LOG_ERROR .	The Link State ID is out of range.	OS error	Contact customer support
LSDB, NOLOCALENTRY, LOG_CRITICAL	There is no database entry for local Link State Record.	OS error	Contact customer support
LSDB, NOLSR, LOG_WARNING	There is no Link State Record for the domain.	OS error	Contact customer support
LSDB, MAXINCARN, LOG_WARNING	The Local Link State Record reached maximum incarnation.	OS error	Contact customer support

continued

Table 6-3
Diagnostic Error Messages *continued*

Message	Description	Probable Cause	Action
FLOOD, INVLSU, LOG_WARNING	The received LSU was discarded.	OS error	Contact customer support
FLOOD, INVLSR, LOG_WARNING	There is an unknown LSR type.	OS error	Contact customer support
FLOOD, LSRLEN, LOG_ERROR	The LSU has an excessive length.	OS error	Contact customer support
HLO, INVHLO, LOG_ERROR	An invalid Hello was received from a port.	OS error	Contact customer support
HLO, HLOTIMEOUT, LOG_ERROR	An incompatible Hello time out was received from a port.	OS error	Contact customer support
HLO, DEADTIMEOUT, LOG_ERROR	Incompatible inactivity time out received from a port.	OS error	Contact customer support
FSPF, SCN, LOG_WARNING	There is an illegal SCN.	OS error	Contact customer support
FSPF, NBRCHANGE, LOG_WARNING	The wrong neighbor ID is in a Hello message from a port.	OS error	Contact customer support
FSPF, INPORT, LOG_ERROR	The input port is out of range.	OS error	Contact customer support
FSPF, VERSION, LOG_ERROR	The FSPF version is not supported.	OS error	Contact customer support
FSPF, SECTION, LOG_ERROR	The section ID is wrong.	OS error	Contact customer support
FSPF, REMDOMAIN, LOG_ERROR	The remote Domain ID is out of range.	OS error	Contact customer support
NBFSM, NGBRSTATE, LOG_ERROR	Input to neighbor FSM is wrong.	OS error	Contact customer support
MCAST, ADDPORT, LOG_WARNING	A port failed to add.	OS error	Contact customer support
MCAST, REMPORT, LOG_WARNING	A port failed to remove.	OS error	Contact customer support
MCAST, ADDBRANCH, LOG_ERROR	A branch failed to add.	OS error	Contact customer support

continued

Table 6-3
Diagnostic Error Messages *continued*

Message	Description	Probable Cause	Action
MCAST, REMBRANCH, LOG_ERROR	A branch failed to remove.	OS error	Contact customer support
MCAST, NOPARENT, LOG_ERROR	There is a null parent.	OS error	Contact customer support
MCAST, NOPARENTLSR, LOG_ERROR	There is a null lsrP.	OS error	Contact customer support
UCAST, ADDPATH, LOG_CRITICAL	A path failed to add.	OS error	Contact customer support
UCAST, ADDPORT, LOG_WARNING	A port failed to add.	OS error	Contact customer support
UCAST, REMPORT, LOG_WARNING	A port failed to remove.	OS error	Contact customer support
UCAST, RRTIM, LOG_CRITICAL	There is an invalid reroute timer ID.	OS error	Contact customer support
UCAST, SPFCOST, LOG_WARNING	There is no minimum cost path in the candidate.	OS error	Contact customer support
UCAST, RELICPDB, LOG_WARNING	A relic PDB sent to the Domain.	OS error	Contact customer support

Chapter 7

Repair and Replacement

Repair and Replacement Overview

This chapter covers the recommended and supported field repair and replacement for the Compaq StorageWorks SAN Switch 16. This chapter includes:

- Field Replaceable Units
- Replacing the Power Supply
- Replacing a GBIC Module
- Replacing the Fan Assembly
- Replacing the Motherboard
- Replacing the Chassis

NOTE: Any switch repair or part replacement that is not explained in this chapter must be performed at a factory authorized repair facility.

Field Replaceable Units

Table 7-1 lists the field replaceable units (FRUs) and their related part numbers available for the SAN Switch 16. Contact your sales representative for price, delivery, and shipping information.

Table 7-1
Field Replaceable Units

Description	Part Number
Motherboard Assembly	159665-001 (29-34650-01)
Power Supply	159663-001 (29-34648-01)
Fan Assembly	159666-001 (29-34651-01)
Chassis	159667-001 (29-34652-01)
GBIC-SW	234458-001 (FE-09086-01)
GBIC-LW	FD-89504-01

Replacing the Power Supply

There are no user-serviceable parts inside the power supply chassis. Opening the power supply voids its warranty and certification. The entire power supply unit can be removed according to the procedure outlined in the following section.

Removing the Power Supply

To remove the switch's power supply:

1. Turn off the power to the power supply you are removing.
2. Remove the power cord attached to the power supply.

3. Pull down the metal handle on the top of the power supply unit.

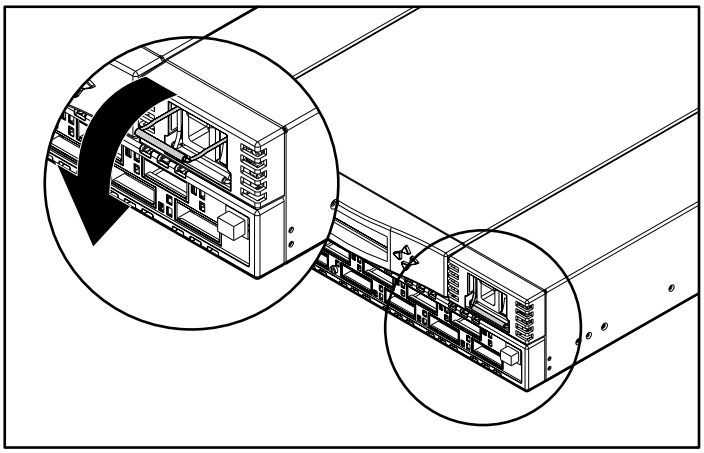


Figure 7-1. Metal handle on the power supply

4. Gently pull out the unit.

NOTE: If you feel resistance when removing the power supply, pull the handle at an upward angle and slide the unit out.

Installing the Power Supply

To install a new power supply:

1. Slide the new power supply into its slot until the unit is flush with the front panel.
2. Lock the metal handle into the power supply by pushing the handle up and locking it into place.
3. Reattach the power cord to the power supply.
4. Turn on the power to the switch. The switch automatically runs POST when power is applied to the switch.

NOTE: If you have a dual-redundant power supply configuration, the switch will only run POST if both power supplies are turned off and then turned on.

5. Check for error messages through Telnet.

Replacing a GBIC Module

The GBIC modules are installed and removed by sliding them into and out of the slots on the front of the unit.

CAUTION: The GBIC modules contain static-sensitive components. Use electrostatic discharge (ESD) precautions while handling GBIC modules.

Removing a GBIC Module

If you are using an IBM GBIC module, pull down the metal swing bar on the front of the GBIC and pull out the bar. Carefully wiggle the GBIC module from side to side to unseat it. The following figure shows an IBM GBIC module.

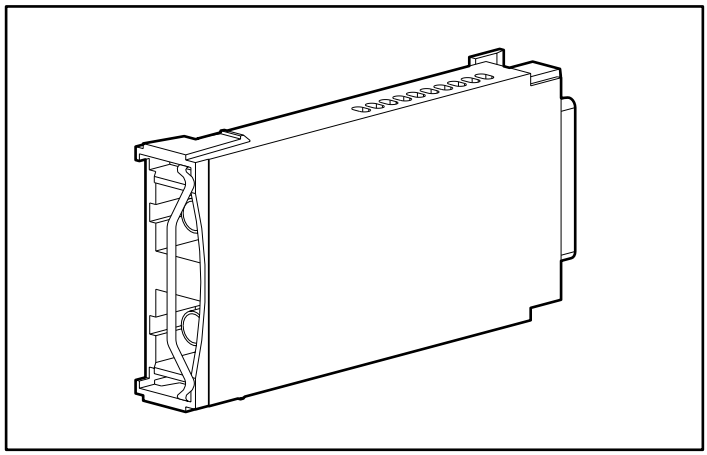


Figure 7-2. IBM GBIC module

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

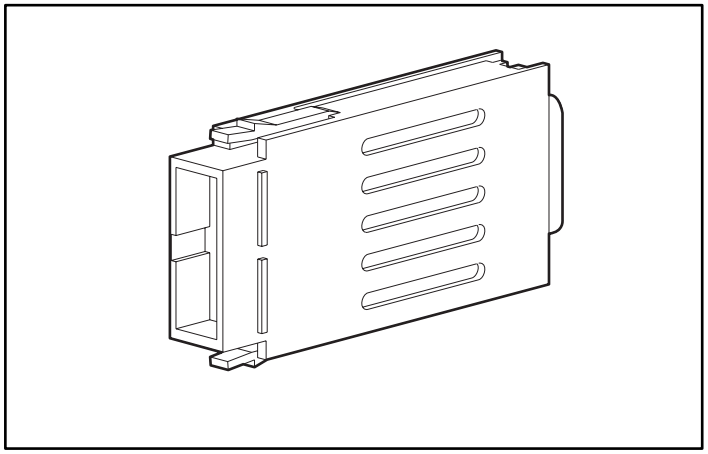


Figure 7-3. Squeeze-prong GBIC module

Installing a GBIC Module

Insert the GBIC module into the appropriate port until its connector is firmly seated into the port. If you are using an IBM GBIC module, lock the module in place with the locking bar. For other GBIC modules, the latch prongs automatically lock to prevent accidental removal of the GBIC module.

NOTE: The GBIC module is keyed so it can be inserted only one way. Do not force the insertion if the module does not slide in easily.

Replacing the Fan Assembly

To replace the fan assembly, remove the existing fan assembly, then install a new fan assembly.

NOTE: You need a #2 Phillips head screwdriver to remove and install the fan assembly.

NOTE: You do not need to power off the switch to replace the fan assembly. The switch can safely run for up to 8 minutes under average conditions while the fan assembly is being replaced.

Removing the Fan Assembly

To remove the fan assembly:

1. Unfasten the four captive screws on the rear of the switch.
2. Carefully pull the fan assembly out of the chassis rear panel.

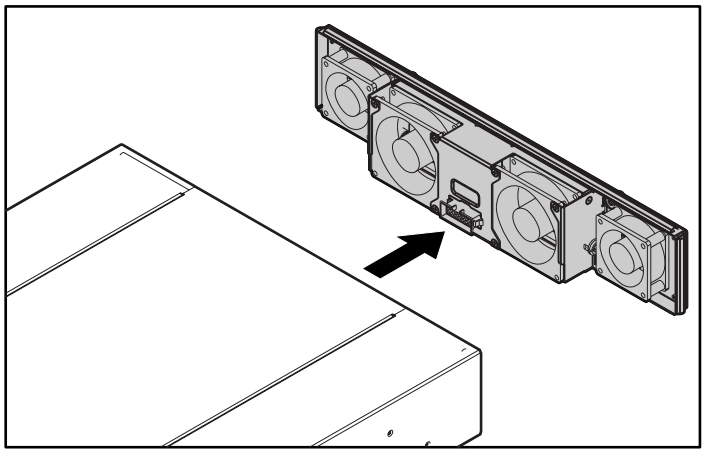


Figure 7-4. Fan assembly

Installing the Fan Assembly

To install the fan assembly:

1. Slide the assembly into the back of the switch chassis.

   NOTE: Make sure that the fan's connector is oriented properly. Do not force the connector.

2. Fasten the four captive screws on the rear of the chassis.

Replacing the Motherboard

To replace the motherboard, remove the existing motherboard assembly, then install the new motherboard assembly.

NOTE: You need a #4 flat head screwdriver to remove and install a motherboard.

Removing the Motherboard

CAUTION: The motherboard contains static-sensitive components. Use electrostatic discharge (ESD) precautions when handling the motherboard.

1. Turn off all the power to the switch.
2. Remove all power cables and fiber optic cables attached to the front panel.
3. Remove all GBIC modules. See “Removing a GBIC Module” earlier in this chapter.
4. Remove the power supply or supplies. See “Removing the Power Supply” earlier in this chapter.
5. Unscrew the captive screw on the front panel. You will notice the assembly slowly moving forward as the screw loosens, exposing the copper connectors on the sides of the assembly.

   Continue unscrewing until there is no resistance.
6. Pull gently to detach the motherboard assembly from the back panel and slide it out.

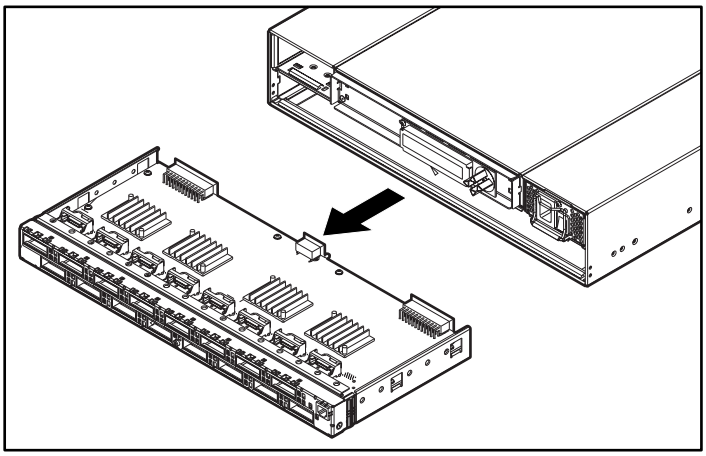


Figure 7-5. Motherboard assembly

7. Remove the new motherboard from its antistatic bag and place the old motherboard into the bag.

Installing the Motherboard

1. Align the motherboard assembly with the mounting screw on the bottom of the switch chassis and slide the motherboard assembly into the chassis.
2. Turn the mounting screw on the front panel clockwise to fasten it. Continue turning the screw until it no longer moves.
3. Push the motherboard assembly into the chassis to be sure it is properly seated.
4. Reinstall the power supply or supplies. See "Installing the Power Supply" earlier in this chapter.
5. Reinstall the GBIC modules. See "Installing a GBIC Module" earlier in this chapter.
6. Reconnect all external cabling.
7. Turn on the switch's power supplies. The switch automatically runs POST.
8. Check for error messages through Telnet.

Replacing the Chassis

To replace the chassis assembly, you must remove the switch's GBIC modules, cover, motherboard, power supply or supplies, and fan assembly from the current chassis, and install them into the new chassis assembly.

Removing the Switch Components

To remove the switch components:

1. Turn off the power to the switch.
2. Remove all external cabling from the front panel.
3. Remove the power supply or supplies. See "Removing the Power Supply" earlier in this chapter.
4. Remove all GBIC modules. See "Removing a GBIC Module" earlier in this chapter.

5. Remove the fan assembly. See “Removing the Fan Assembly” earlier in this chapter.
6. Remove the motherboard assembly. See “Removing the Motherboard” earlier in this chapter.

Installing the Switch Components

To install the switch components into a new chassis:

1. Install the motherboard. See “Installing the Motherboard” earlier in this chapter.
2. Install the fan assembly. See “Installing the Fan Assembly” earlier in this chapter.
3. Install the GBIC modules. See “Installing a GBIC Module” earlier in this chapter.
4. Install the power supply or supplies. See “Installing the Power Supply” earlier in this chapter.
5. Reconnect all external cabling.
6. Turn on the power to the switch. The switch automatically runs POST.
7. Check for error messages through Telnet.

Appendix **A**

Regulatory Compliance Notices

Regulatory Compliance Identification Numbers

For the purpose of regulatory compliance certifications and identification, your Compaq StorageWorks SAN Switch 16 is assigned a Compaq Series Number. The Compaq Series Number for this product is: Series NA2102. The Compaq StorageWorks SAN Switch 16 Series Number can be found on the product label, along with the required approval markings and information. When requesting certification information for this product always refer to this Series Number. This Series Number should not be confused with the marketing name or model number for your Compaq StorageWorks SAN Switch 16.

Federal Communications Commission Notice

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

The FCC requires devices in both classes to bear a label indicating the interference potential of the device as well as additional operating instructions for the user.

The rating label on the device shows which class (A or B) the equipment falls into. Class B devices have an FCC logo or FCC ID on the label.
Class A devices do not have an FCC ID on the label. Once the class of the device is determined, refer to the following corresponding statement.

Class A Equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Class B Equipment

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

Declaration of Conformity for Products Marked with the FCC logo – United States Only

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

For questions regarding your product, contact:

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

or call 1-800-652-6672 (1-800-OK COMPAQ). For continuous quality improvement, calls may be recorded or monitored.

For questions regarding this FCC declaration, contact:

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

or call 281-514-3333.

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

Modifications

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

Canadian Notice (Avis Canadien)

Class A Equipment

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

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

Class B Equipment

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

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

Mouse Compliance Statement

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

European Union Notice

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

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

- EN55022 (CISPR 22) - Electromagnetic Interference
- EN50082-1 (IEC801-2, IEC801-3, IEC801-4) - Electromagnetic Immunity
- EN60950 (IEC950) - Product Safety

Japanese Notice

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

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

VCCIマークが付いていない場合には、次の点にご注意下さい。

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

Taiwanese Notice

警告使用者：

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

Laser Devices

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

Laser Safety Warnings

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

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

Compliance with CDRH Regulations

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

Compliance with International Regulations

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

Laser Product Label

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

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

Laser Information

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

Appendix ***B***

Electrostatic Discharge

To prevent damage to the system, heed the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor can damage system boards or other static-sensitive devices. This type of damage can 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 be properly grounded when touching a static-sensitive component or assembly.

Grounding Methods

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

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

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

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

Appendix ***C***

Specifications

General Specifications

Table C-1
Switch Specifications

Specification	Description
ANSI Fibre Channel protocol for SCSI (FCP)	Complies with ANSI Standard to transmit SCSI commands and data
ANSI Fibre Channel protocol	Fibre Channel ANSI Standard (FC-PH)
Fabric initialization	Complies with FC-SW 3.2
IP Over Fibre Channel (FC-IP)	Complies with 2.3 of the FCA profile
System architecture	Nonblocking shared-memory switch
System processor	Superscalar 33-MHz Intel i960RP
Number of Fibre Channel ports	16 ports
Fibre Channel port speed	1.0625 GB/s, full duplex
Modes of operation	Fibre Channel Class-2 service and Fibre Channel Class-3 connectionless service
Aggregate switch I/O bandwidth	16 GB/s, full duplex

continued

Table C-1
Switch Specifications *continued*

Specification	Description
Frame buffers	16 buffers per port at 2112 bytes per frame
Fabric latency	<2 microseconds with no contention
Data transmission range	Up to 1,625 ft (500 m) for short-wavelength optical link Up to 84,480 ft (10 km) for long-wavelength optical link
Chassis types	Back-to-front airflow (power supply out front)

Fabric Management Specifications

Table C-2
Fabric Management Specifications

Standard Features	Description
Fabric management	Simple Name Server, Alias Server, SNMP, Telnet, World Wide Web
User interface	RJ-45 front panel connector for 10/100Base-T Ethernet or in-band

Safety Specifications

Table C-3
Safety Specifications

Country	Specification	EMC
Canada	CSA 22.2 No. 950 Third Edition	CSA C108.8 Class A
United States	UL 1950 Third Edition	FCC Part 15 Class A
Japan	EN60950+A1+A2+A3+A4+A11	VCCI Class A
International	EN60950+A1+A2+A3+A4+A11	EN55022 Level A/CISPR22 Class A
United Kingdom/Ireland	EN60950+A1+A2+A3+A4+ A11;73/23/EEC	EN55022 Level A; 89/336/EEC

continued

Table C-3
Safety Specifications *continued*

Country	Specification	EMC
France	EN60950+A1+A2+A3+A4+ A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Germany	EN60950+A1+A2+A3+A4+ A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Austria	EN60950+A1+A2+A3+A4+ A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Spain/Portugal/Italy	EN60950+A1+A2+A3+A4+ A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Sweden	EN60950+A1+A2+A3+A4+ A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Norway	EN60950+A1+A2+A3+A4+ A11	
Finland	EN60950+A1+A2+A3+A4+ A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Denmark	EN60950+A1+A2+A3+A4+ A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Australia		AS/NZS 3548:1995 Class A
New Zealand		AS/NZS 3548:1995 Class A

Optical Port Specifications

The Fibre Channel interfaces of a Compaq StorageWorks SAN Switch 16 system are equipped with optical port interfaces that use a shortwave (780 to 850 nm) or long wavelength (1270 to 1350 nm) laser transmitter. The laser complies with 21 CFR (J) Class 1 laser safety requirements. The Fibre Channel interfaces use Non-Open Fibre Control Optical GBIC modules in the switch circuit. Safe Class 1 operation is guaranteed by limiting optical power emitted by the port, thereby eliminating the need for physical shutters. The optical GBIC module uses the duplex-SC connector scheme.

Environmental Specifications

The SAN Switch 16 primary operating environments are server rooms, network equipment closets, and office environments. The acceptable environmental ranges for the switch are listed in Table C-4.

Table C-4
Environmental Specifications

Specification	Value
Temperature (operating)	32°F to 104°F (0°C to 40°C)
Temperature (non-operating)	-31°F to 149°F (-35°C to 65°C)
Operating humidity	5% to 85% RH noncondensing @ 104°F (40°C)
Nonoperating humidity	95% RH noncondensing @ 104°F (40°C)
Operating altitude	0 to 9,843 ft (0 to 3 km) above sea level
Nonoperating altitude	0 to 39,372 ft (0 to 12 km) above sea level
Operating shock	5g, 11MS duration, half sine
Nonoperating shock	20g, 11MS duration, sq.wave
Operating vibration	5, 5-500-5Hz@1.0 octave/minute
Nonoperating vibration	10, 5-500-5Hz@1.0 octave/minute

Dimensions

Table C-5
Dimensions

Feature	Description
Rack-mount dimensions	2U, 19-in. rack mount (EIA compliant) H: 1.71 in. (43.4 mm), W: 16.88 in. (428.6 mm), D: 17.72 in. (450.0 mm)
Surface-mount dimensions	H: 1.86 in. (47.2 mm), W: 16.88 in. (428.8 mm), D: 17.72 in. (450.0 mm)
Weight	25 lb

Power Supply

The SAN Switch 16 has a Universal Power Supply capable of functioning worldwide without voltage jumpers or switches. The supply is autoranging in terms of accommodating input voltages and line frequencies. The power supply meets the requirements outlined in the following table.

Table C-6
Power Supply Requirements

Feature	Requirement
Total power	150 watts
Input voltage	85 to 265 VAC
Input line frequency	47 to 63 Hz
Inrush current	10 amps peak > 300 usec - hot/cold start
Harmonic distortion	Active power factor correction per IEC1000-3-2
Input line protection	Fused in both hot and neutral lines
Maximum dimensions	H: 1.5 in. (38.1 mm), W: 3.5 in. (88.9 mm), L: 11 in. (279.4 mm)
Redundancy	Dual power supplies - Hot-pluggable

The power supply plugs directly into the enclosure through the front panel, mating to an internal blind-mate connector. The power supply supports a dual-redundant power supply configuration in which the supplies are hot-pluggable.

An integral on/off switch, input filter, and power indicator are provided in the power supply.

Index

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

U

V

W