StorageWorks by Compaq

Fibre Channel SAN Switch 16-EL

Installation and Hardware Guide

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About This Guide

This guide provides instructions for installing the *StorageWorks™* Fibre Channel SAN Switch 16-EL by Compaq, and also includes information on operation, troubleshooting, and future upgrades.

Document Structure

This guide contains the following information:

Chapter 1: Overview

- Introduction
- Front panel features
- Compatibility

Chapter 2: Installing the Fibre Channel SAN Switch 16-EL

- Installation
- GBIC modules
- Port connections

Appendix C: Specifications

- Switch and environmental specifications

- Rack mount dimensions

- Power supply requirements

Related Documents

In addition to this guide, refer to the Compaq StorageWorks documentation listed in Table 1.

Table 1: Related Documents

Document Title	Part Number
Compaq StorageWorks Fibre Channel SAN Switch 16-EL Release Notes	AA-RNAQC-TE
Fabric Watch Version 2.6 User Guide	AA-RR79B-TE
Extended Fabric Version 2.6 User Guide	AA-RR7DB-TE
Fibre Channel SAN Switch Management Guide	AA-RMMJB-TE
Fibre Channel SAN Switch 8 Installation and Hardware Guide	EK-BCP24-IA.C01
Fibre Channel SAN Switch 8-EL Installation and Hardware Guide	AA-RMMHB-TE
Fibre Channel SAN Switch 16 Installation and Hardware Guide	EK-BCP28-1A.C01
Fibre Channel SAN Switch Remote Switch Services Installation and Hardware Guide	EK-SANRS-AA.D01
Fibre Channel SAN Switch Integrated/32 and Integrated/64 Installation and Hardware Guide	AA-RPDFC-TE
Command Console for Hubs, Switches, and Tape Controllers Getting Started Guide	AA-RHDAD-TE

Text Conventions

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

Keys	Keys appear in boldface. A plus sign (+) between two keys indicates that they should be pressed simultaneously.
USER INPUT	User input appears in a different typeface and in uppercase, except Unix and Telnet case-sensitive commands.
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 electrical shock hazards. Enclosed area contains no operator serviceable parts. **WARNING:** To reduce the risk of injury from electrical shock hazards, do not open this enclosure.
⚠ ⊘	Any RJ-45 receptacle marked with these symbols indicates a Network Interface Connection. **WARNING:** To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.
⚠ ♨	Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists. **WARNING:** To reduce the risk of injury from a hot component, allow the surface to cool before touching.
⚠	Power supplies or systems marked with these symbols indicate the equipment is supplied by multiple sources of power. **WARNING:** To reduce the risk of injury from electrical shock, remove all power cords to completely disconnect power from the system.

Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.
WARNING: To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manual material handling.

Rack Stability

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

The leveling jacks are extended to the floor.

- The full weight of the cabinet rests on the leveling jacks.

- Stabilizing feet are attached to the cabinet if it is a single cabinet installation.

- The cabinets are coupled together in multiple cabinet 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

You are entitled to free hardware technical telephone support for your product for as long as you own the product. A technical support specialist will help you diagnose the problem or guide you to the next step in the warranty process.

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.

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

Outside North America, call the nearest Compaq Technical Support Phone Center. Telephone numbers for worldwide technical support centers are listed on the Compaq website. Access the Compaq website 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 number

■ Applicable error messages

■ Add-on boards or hardware

■ Third-party hardware or software

■ Operating system type and revision

■ Detailed, specific questions

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***

Overview

Introduction

The Fibre Channel SAN Switch 16-EL is a low-cost, high-performance, 16-port, gigabit Fibre Channel switch used to interconnect storage devices, hosts, and servers in a Storage Area Network (SAN). The switch offers 16 full duplex non-blocking ports; each port capable of delivering 100 megabytes per second (MB/s) full duplex. Cut-through routing provides latency of less than 2 microseconds from switch port to switch port.

The Fibre Channel SAN Switch 16-EL is a lower cost variant of the Fibre Channel SAN Switch 16L and is fully compatible with other Fibre Channel SAN Switches.

All 16 ports for the Fibre Channel SAN Switch 16-EL are configured as removable Gigabit Interface Converter (GBIC) slots. The GBIC slots provide the flexibility to configure other physical media and will accept short wave or long wave length optical GBICs.

The Fibre Channel SAN Switch 16-EL is designed as a 1.5U-high device. It may be installed in industry-standard EIA racks or in a tabletop environment. Overall cost is reduced through the use of high reliability components, continuous monitoring of environmental components (fan status and temperature), and a single Field Replaceable Unit (FRU) design strategy.

All switch ports support full fabric capability. Full fabric allows the Fibre Channel SAN Switch 16-EL to be linked or cascaded to other StorageWorks Fibre Channel switches to build a highly scalable SAN fabric. The Fibre Channel SAN Switch 16-EL supports F-port, FL-port, and E-port connections and Distributed Name Server (DNS).

Front Panel

Figure 1–1 shows the front panel of the Compaq StorageWorks Fibre Channel SAN Switch 16-EL.
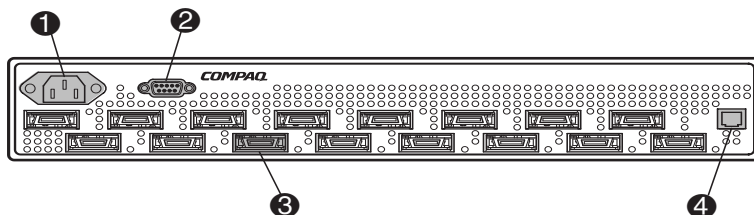
Figure 1–1. Fibre Channel SAN Switch 16-EL

Table 1–1 Front Panel Features	
Identifier	**Description**
❶	AC power connector
❷	DB9 serial port
❸	GBIC module (removable) slot
❹	RJ-45 Ethernet port used for switch management

Compatibility

The Compaq StorageWorks Fibre Channel SAN Switch 16-EL is fully compatible with the SAN Switch 8, 16, and 8-EL switches. In addition, the Compaq StorageWorks Fibre Channel SAN Switch software (version 2.0 and above) is compatible with the Compaq StorageWorks Fibre Channel Switch software (Version 1.6b or 1.6d), allowing both types of switches to operate in the same fabric. To accomplish this compatibility, the Fibre Channel SAN Switch 16-EL must be configured to use a specific addressing mode. This mode is designated VC Encoded Address Mode.

Invoke this mode using the configure command, as described in Appendix A, "Telnet Commands" of the Compaq *StorageWorks Fibre Channel SAN Switch Management Guide*. When using this compatibility mode, the maximum switch count in a fabric is reduced from 239 to 32, and the maximum number of multicast groups is reduced from 256 to 31.

If the compatibility mode is not set, the following error message displays when you interconnect a Fibre Channel SAN Switch 16-EL and a Fibre Channel Switch:

FABRIC, SEGMENTED, LOG_WARNING
Description: Fabric segmented.
Probable Cause: Incompatible fabric parameters/switches or conflict zones.
Action: Reconfigure fabric or zones. See configure command.

Chapter **2**

Installing the Fibre Channel
SAN Switch 16-EL

Installation Overview

This chapter covers the following topics:

- Package contents
- Selecting an operating location
- Selecting a switch mounting method
- Installing a GBIC module
- Cable specifications and connections
- Serial port and Ethernet connections.

Package Contents

The following items are included in the Compaq StorageWorks Fibre Channel SAN Switch 16-EL package (see Figure 2–1 and Table 2–1).
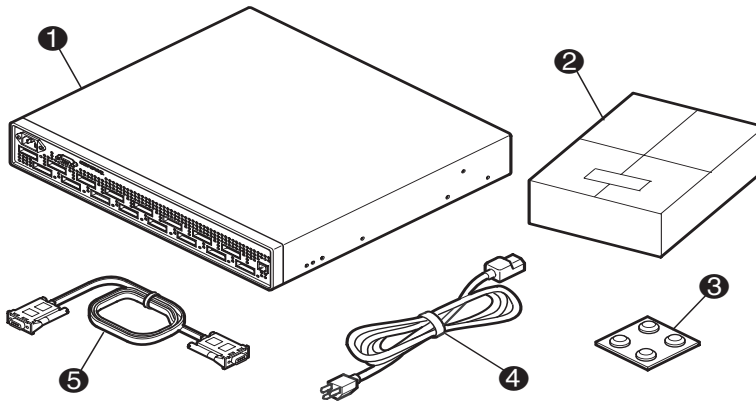
Figure 2–1. Package contents

Table 2–1 Package Contents	
Identifier	**Description**
❶	16-port Fibre Channel Switch
❷	Software and documentation package
❸	Rubber feet
❹	AC power cord
❺	Serial cable

Selecting an Operating Location

The Fibre Channel SAN Switch 16-EL should be located in a secure or limited-access area to ensure that cable connections are not compromised. The switch must meet the cooling air requirements and power requirements described in the following sections.

Cooling Requirements

Cooling air is drawn into the switch chassis by the three fans mounted on the rear of the chassis. Exhausted air is expelled through vents at the front of the chassis.

> △ **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 left side of the front panel. The AC power source must meet these requirements:

■ A properly wired, earth-grounded AC outlet

■ Voltage capability of 85-264 VAC

■ Input voltage frequency of 47-63 Hz

■ Power capability of 75 watts, maximum

The switch has a universal power supply capable of functioning worldwide without voltage jumpers or switches. The power supply is auto ranging in terms of accommodating input voltages and line frequencies.

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 with an optional rack mounting kit, part number 167365-B21.

Surface Mounting

To operate the switch on a surface, place the four rubber feet, provided in the package contents, on the bottom surface of the switch.

Rack Mounting

You can install the switch in a RETMA 41U or 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 a GBIC Module

The switch accommodates 16 hot-pluggable GBIC modules. Use these steps to install a GBIC module.

> **CAUTION:** The GBIC modules contain static-sensitive components. Use electrostatic discharge (ESD) precautions (see Appendix B).

1. Insert a GBIC module into the Fibre Channel port on the front panel.

> **CAUTION:** The GBIC module is keyed and can only be inserted one way. Do not force the GBIC module into a port if you feel resistance.

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

2. Insert a protective plug over the GBIC module fiber-optic connectors.

3. Repeat the steps 1and 2 for each GBIC module to be installed.

Fibre Channel Cable Specifications

All cables connect at the front of the switch. Recommended cabling supports a transfer rate of 1.0625 gigabyte per second (GB/s).

Fibre Channel Cables

Optical cables for the switch must be ordered separately. 1,641 ft (500 m) or less cables should be multi-mode Fibre Channel cables. Cables that are longer than 1,641 ft (500 m) should be single-mode. Multi-mode optical cables are connected to the shortwave GBIC modules in the switch. Single-mode optical cables are connected to the longwave GBIC modules in the switch. Multi-mode cables should use 50/125 optical fibers, SC Duplex connectors with a PC finish. Use of 62.5/125 should be restricted to situations where 62.5/125 optical fiber was previously installed and the link lengths are to be kept shorter than 656 ft (200 m). Single-mode cables typically use 9/125 optical fibers for distances up to 84,480 ft (10 km).

Table 2–2 lists the cabling specifications for Fibre Channel cables.

Table 2–2 Fibre Channel Cabling Specifications			
Cable Type	**Cable Specifications**	**Maximum Length**	**GBIC Module**
Multi-mode fiber	Duplex SC plug connectors 50 μm core diameter 125 μm cladding diameter duplex cable	1,641-ft (500 m)	780-860 μm without open fiber control (non-OFC) Short wave fiber optic
Single-mode fiber	Duplex SC plug connectors 9 μm core diameter 125 μm cladding diameter duplex cable	84,480 ft (10 km)	1270-1350 μm without open fiber control (non-OFC) Long wave fiber optic

Table 2–3 lists the Fibre Channel cable part numbers and length.

Table 2–3 Fibre Channel Cabling Part Numbers

Compaq Part Number	Cable Type	Cable Length
234457-B21	Multi-mode fiber	6.6 ft (2 m)
234457-B22	Multi-mode fiber	16.4 ft (5 m)
234457-B23	Multi-mode fiber	49.2 ft (15 m)
234457-B24	Multi-mode fiber	98.4 ft (30 m)
234457-B25	Multi-mode fiber	164 ft (50 m)

Serial Cable

The serial cable, part number 188851-B21 (30-56154-01), is provided with the switch.

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

Connecting the Storage Subsystem and Host

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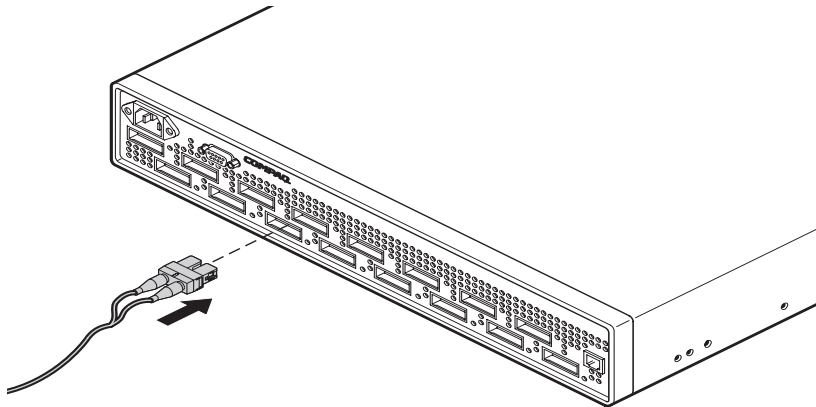
Figure 2–2. Connecting a cable to a GBIC module in a Fibre Channel port

Connecting the AC Power Cord

The Fibre Channel SAN Switch 16-EL does not have a power switch. When the AC power cord is connected the switch is powered on.

> **NOTE:** The Fibre Channel SAN Switch 16-EL meets IEC 61000-4-5 surge voltage requirements; however, there is no other surge protection built into the AC module.

Connect the AC power cord to the AC connector on the left side of the front panel (see Figure 2–3).
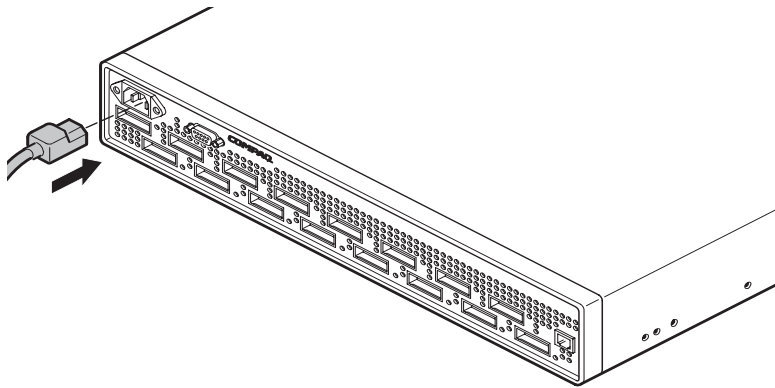
Figure 2–3. Connecting the AC power cord

Connecting the Serial and Ethernet Ports

The switch has a serial port connection and an Ethernet connection for initial configuration and remote monitoring, testing and management.

Connecting the Serial Cable

The switch has a serial port for initial configuration of the IP address and for service recovery. Do not use the serial port during normal operation or for regular maintenance. After initial setup, remove the serial port cable and, using the dust cover supplied with the switch, cover the serial port connection during normal operation of the switch.

The following are the settings for the serial port:

- 8-bit
- No parity
- One stop bit
- 9600 baud
- No flow control

Table 2–4 lists the signal and description of the serial port pinouts.

Table 2–4 Serial Port Pinouts		
Pin	Signal	Description
2	TxData	Transmit Data
3	RxData	Receive Data
5	GND	Logic

Connecting the Ethernet

To gain access to the internal Web, SNMP agent in the switch and for remote Telnet access, connect to an existing Ethernet 10/100Base-T LAN through the front panel RJ-45 connector (see Figure 2–4). This connection works for Web, SNMP, and Telnet access and can be used for remote monitoring and testing.
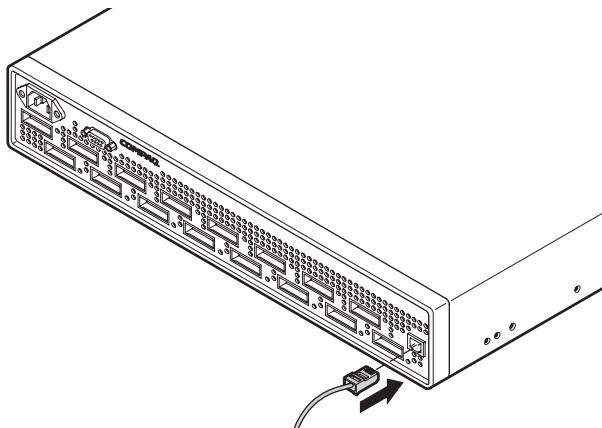
Figure 2–4. Connecting the Ethernet cable

Typical Fibre Channel Switch Configuration

Figure 2–5 and Table 2–5 show a typical configuration of a single Fibre Channel SAN Switch 16-EL connected to two rack-mounted servers and a storage subsystem. The system is configured for redundant operation.
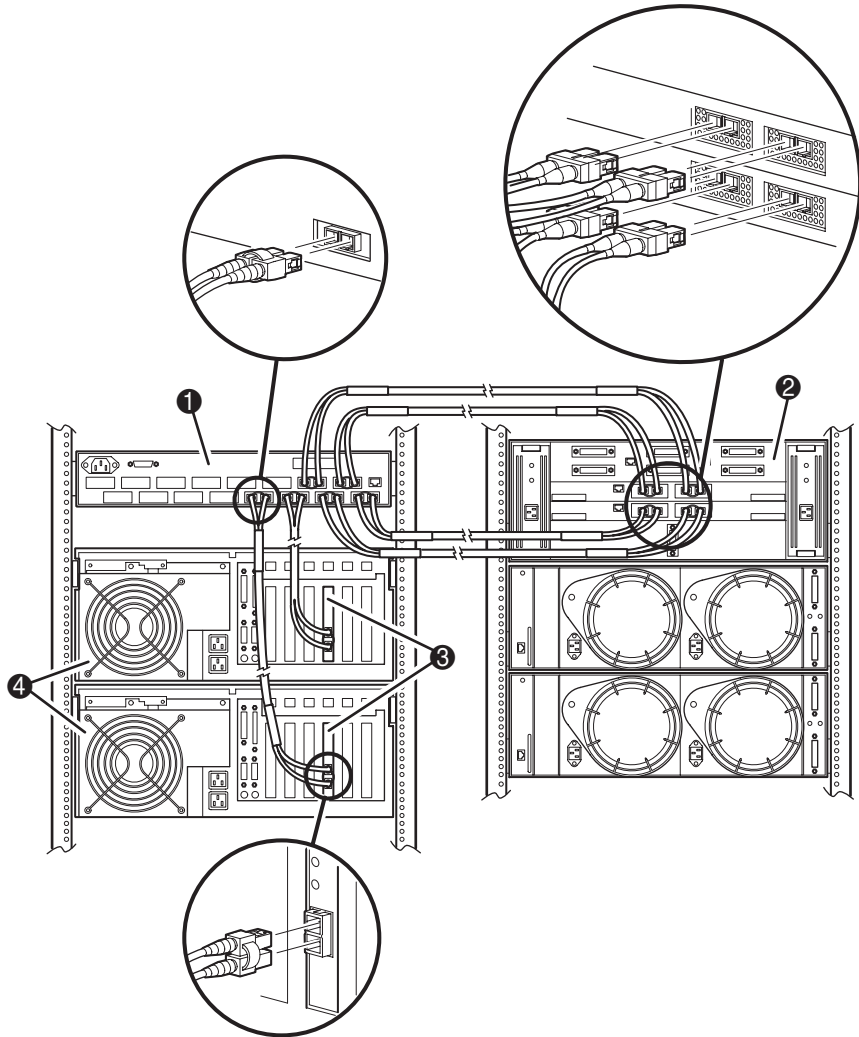
Figure 2–5. Fibre Channel SAN Switch 16-EL connected to a storage system

Table 2–5 Connecting to a Storage System	
Identifier	**Description**
❶	Fibre Channel SAN Switch 16-EL
❷	Compaq storage subsystem
❸	Fibre Channel host adapters
❹	Rack-mounted Compaq servers

Installing a Single Fibre Channel SAN Switch 16-EL

Figure 2-5 shows a configuration of a single Fibre Channel SAN Switch 16-EL connected to a storage system.

1. Install a GBIC in each port to be used, see "Installing a GBIC. Module."

2. Install a Fibre Channel adapter in each server, following the procedure outlined in your adapter documentation.

3. Connect one Fibre Channel cable to each adapter.

4. Connect up to four Fibre Channel cables to the storage system.

5. Connect the free ends of the Fibre Channel cables from the storage system and servers to the Fibre Channel ports on the switch's front panel.

6. Connect the power cord to the AC connector on the switch. The switch performs a Power On Self-Test (POST), which can take approximately 2.5 minutes.

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

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

7. The factory set IP address is 10.77.77.77, and the class C Subnet Mask is: 255.255.255.0.

    a. If the factory set IP address is compatible with your network, connect the Ethernet cable.

    b. If the factory set IP address is not compatible with your network, follow the procedures outlined in Chapter 3, "Setting up the Fibre Channel SAN Switch 16-EL," to make a serial connection through a workstation and to set the IP address.

Installing Multiple Switches into an Existing SAN

Use these steps to install multiple switches.

1. Connect the appropriate components as outlined in the "Installing a Single Fibre Channel SAN Switch 16-EL" section of this chapter.

2. Connect the serial cable, provided in the package contents, between a host computer and the serial port of the switch. See Chapter 3, "Making a Serial Connection" to make a serial connection through a workstation and to set the IP address.

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

4. Connect the power cord to the AC connector on the switch. The switch performs POST, which can take approximately 2.5 minutes.

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

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

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

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

Cascading Switches

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

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

Chapter **3**

Setting up the Fibre Channel SAN Switch 16-EL

This chapter covers the following topics:

- Making a serial connection
    - ❏ Connecting through a workstation
    - ❏ Setting the IP address
    - ❏ Resetting factory defaults
- Save and restore switch configuration settings
- Status indicators

Making a Serial Connection

Use the serial connection on the Fibre Channel SAN Switch 16-EL to verify Power On Self-Test (POST), view and change the IP address of the switch, and reset the switch to factory default values.

To make a serial connection, connect the serial cable that is provided in the kit, part number 188851-B21 (30-56154-01), to the Fibre Channel SAN Switch16-EL serial port on the front panel and to a COM port on a workstation.

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

Connecting Through a Workstation

To execute initial switch operations through a workstation connected to the serial port on the Fibre Channel SAN Switch 16-EL:

1. On the workstation, launch a terminal emulation program.

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

2. Follow the prompts in the communication program. Be sure to connect using the COM port you used to connect the workstation to the switch.

3. The following are settings for the serial port:

   - 8-bit
   - No parity
   - One stop bit
   - 9600 baud
   - No flow control

4. Press the **Enter** key to display the remote communication prompt.

Setting the IP Address

To enable a connection to a Fibre Channel SAN Switch 16-EL, the switch must have a valid IP address. You can set two IP addresses: one for the external out-of-band Ethernet port and one for in-band Fibre Channel network (IP) access.

A default Ethernet IP address of 10.77.77.77 and a default Ethernet network IP subnet mask of 255.255.255.0 are preinstalled on the switch. Use the default address for the external Ethernet connection to the network and then change the address with a Telnet command.

You might need to set a compatible network address before you can connect the switch to the network. In this case, set the address using the front panel RS-232 serial connection.

To set the IP address through the serial port:

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

    admin
    password "password"

2. The following prompt confirms the connection:

    switchName:userName>

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

    Ethernet IP Address [current address shown]: [enter new address if needed]
    Ethernet Subnetmask [current]: [enter new subnet mask if needed]
    Fibre Channel IP Address [current]: [enter new address if needed]
    Fibre Channel Subnetmask [current]: [enter new subnet mask if needed]
    Gateway Address [current]: [enter new address if needed]

4. After you enter the values, disconnect the serial cable and store it in a secure location.

5. Access the switch through the network connection. You can manage the switch using Web Management Tools or Telnet commands.

For detailed information on the ipAddrSet command and managing your switch, refer to the *Fibre Channel SAN Switch Management Guide*.

Resetting Factory Defaults

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

1. Power down the switch by unplugging the power cord.

2. Connect the serial cable from the host serial port to the switch serial port.

3. Power up the switch by plugging in the power cord.

4. Establish a connection between the host and the switch using a terminal emulation program such as HyperTerminal.

5. When prompted, enter the Telnet command configDefault to reset usernames and passwords.

> ⚠ **CAUTION:** The configDefault command resets the password as well as many other switch parameters. Be sure you understand the effects of this command before you issue it.

For more information on Telnet commands, refer to the *Fibre Channel SAN Switch Management Guide*.

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

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

Saving and Restoring the Switch Configuration Settings

Configuration settings can be lost upon switch failure. It is recommended that you save your switch configuration settings using the configUpload Telnet command for a switch failure emergency. In order to restore your saved configuration settings, use the configDownload Telnet command.

When replacing an old switch with a new one, a configUpload should be taken from the old switch to retain the configuration and parameter settings information. This information should then be downloaded to the new switch. Before installing the new switch, the zoning information should be cleared to ensure that a zoning mismatch does not occur. This can be done by invoking the cfgClear Telnet command on the new switch, or by inserting the word "clear" into the configuration file that is to be downloaded to the new switch immediately before the zoning lines.

configUpload

This command saves the switch configuration to a host file. The upload process uses either File Transfer Protocol (FTP) or the RSHD protocol (TCP service 514). Both of these services are widely available on UNIX hosts, but less so on Microsoft Windows hosts.

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

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

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

Figure 3–1 shows an example of the configUpload command.

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

Figure 3–1. configUpload command example 1

If the upload fails, it is due to one of the following reasons:

■ The switch does not recognize the host name.

■ The host IP address cannot be contacted.

■ The user does not have permission on the host.

■ The user runs a script that prints something at login.

■ The RSHD or FTP server is not running on the host.

The configuration file contains two types of lines, comments and name:value pairs. Comments are written with "[" as the first character of the line. When read back using configDownload, a line beginning with any punctuation character is treated as a comment (see Table 3–1).

Table 3–1 Syntax of a Name: Value Pair	
Name	**Value Pair**
line	whitespace name whitespace ":" whitespace value
name	component {"." component}
whitespace	{" " | " "}
component	{"a"-"z" | "A"-"Z" | "0"-"9" | "_" | "-"}
value	{<any character not including "">}

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

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

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

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

Parameters

■ host—A host name or IP address in quotes, for example "citadel" or "192.168.1.48". The configuration file is downloaded from this host.

■ user—A user name in quotes, for example "jdoe." This user name is used to gain access to the host.

■ file—A file name in quotes, for example "config.txt." Absolute path names may be specified using forward slash /. Relative path names look for the file in the user's home directory on Unix hosts and in the directory where the FTP or RSHD server is running on Windows hosts.

■ passwd—If present, selects FTP.

Figure 3–2 shows an example of the configUpload command.

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

Figure 3–2. configUpload command example 2

configDownload

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

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

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

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

Figure 3–3 shows an example of the configDownload command.

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

Figure 3–3. configDownload command example 1

If the download fails, it is due to one of the following reasons:

■ The switch does not recognize the host name.

■ The host IP address cannot be contacted.

■ The user does not have permission on the host.

■ The user runs a script that prints something at login.

■ The file does not exist on the host.

■ The file is not a switch configuration file.

■ The RSHD or FTP server is not running on the host.

■ The configuration data contains errors.

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

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

The download process is additive; for example, the lines read from the file are added to the current switch configuration. It is therefore possible to change a single configuration variable by downloading a file with a single line. All other variables remain unchanged.

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

Parameters

- host—A host name or IP address in quotes, for example "citadel" or "192.168.1.48". The configuration file is downloaded from this host.

- user—A user name in quotes, for example "jdoe." This user name is used to gain access to the host.

- file—A file name in quotes, for example "config.txt." Absolute path names may be specified using forward slash "/". Relative path names look for the file in the user's home directory on UNIX hosts and in the directory where the FTP or RSHD server is running on Windows hosts.

- passwd—If present, selects FTP.

Figure 3–4 shows an example of the configDownload command.

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

Figure 3–4. configDownload command example 2

Status Indicators

Each port contains an indicator that shows the status for that port (see Table 3–2).

Table 3–2 Port Status Indicators

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

The AC module contains an indicator that shows its status. Table 3–3 shows descriptions of the AC module status indicators.

Table 3–3 AC Module Status Indicators

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

Chapter 4

Diagnostics

This chapter covers the following topics:

■ Overview of diagnostic tests

■ Commands

■ Diagnostic error messages

Overview

The Fibre Channel SAN Switch 16-EL is designed for maintenance-free operation. The self-diagnostic capabilities of the switch aid in isolating equipment or fabric failures. You can perform diagnostics when using a Telnet session.

Isolating a System Fault

Various loopback paths are built into 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.

Rebooting or Removing Power

Error messages are stored in RAM and are lost when the switch is rebooted or power is removed from the switch. Before rebooting or removing power from the switch, view the error log messages. You can view the error log by issuing either the errShow or errDump command. When all data-transferring processes external to the switch are complete, removing power from the switch does not disrupt the fabric.

Refer to the *Fibre Channel SAN Switch Management Guide* for more information on these Telnet commands.

Power On Self-Test (POST)

Table 4–1 lists the diagnostic tests automatically run during the POST.

<div align="center">

Table 4–1 Post Tests

</div>

Test Type	Description	Test Name
Memory test	Checks processor RAM memory	ramTest
Port register test	Checks the Application Specific Integrated Circuit (ASIC) registers and SRAMs	portRegTest
Central memory test	Checks the motherboard SRAMs	centralMemoryTest
Control message interface (CMI) conn test	Checks the CMI bus between ASICs	cmiTest
Content addressable memories (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 ramTest, while POST execution after a warm boot executes a shorter version of ramTest. A switch rebooted with POST disabled generates the DIAG-POST_SKIPPED error log message.

Commands

The following tests are available from the switch's local Telnet port:

■ Memory test (ramTest)

■ Port register test (portRegTest)

■ Central memory test (centralMemoryTest)

■ CMI conn test (cmiTest)

■ CAM test (camTest)

■ Port loopback test (portLoopbackTest)

■ SRAM data retention test (sramRetentionTest)

■ CMEM data retention test (cmemRetentionTest)

■ Cross port test (crossPortTest)

■ Spin silk test (spinSilk)

Table 4–2 lists the offline and online tests.

Table 4–2 Offline and Online Tests	
Offline Tests	**Offline and Online Tests**
portRegTest	ramTest
centralMemoryTest	crossPortTest
cmiTest	N/A
sramRetentionTest	N/A
cmemRetentionTest	N/A
camTest	N/A
portLoopbackTest	N/A
spinSilk	N/A

ramTest

Figure 4–1 shows the ramTest command, which checks processor RAM. This test validates proper memory function.

```
switch:admin> ramTest

Running System DRAM Test ......
passed.
```

Figure 4–1. ramTest command example

> **NOTE:** Related error messages are DIAG-MEMORY, DIAG-MEMSZ, and DIAG-MEMNULL.

portRegTest

Figure 4–2 shows the portRegTest command, which checks registers and static memory located on the motherboard. Registers are set under firmware control and are used to control the hardware route selection and other internal hardware functions. This test verifies that all registers are accessible.

> **IMPORTANT:** This test cannot be executed on an operational switch. Before issuing the portRegTest command, disable the switch using the switchDisable command.

```
switch:admin> portRegTest

Running Port Register Test ....
passed.
```

Figure 4–2. portRegTest command example

> **NOTE:** Related error messages are DIAG-REGERR, DIAG-REGERR_UNRST, and DIAG-BUS_TIMEOUT.

centralMemoryTest

Figure 4–3 shows the centralMemoryTest command, which checks the central memory in each ASIC. 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).

> **IMPORTANT:** This test cannot be executed on an operational switch. Before issuing the centralMemoryTest command, disable the switch using the switchDisable command.

```
switch:admin> centralMemoryTest

Running Central Memory Test ...
passed.
```

Figure 4–3. centralMemoryTest command example

> **NOTE:** 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.

cmiTest

Figure 4–4 shows the cmiTest command, which verifies that control messages can be correctly sent from any ASIC to any other ASIC. This command also tests the checksum check.

IMPORTANT: This test cannot be executed on an operational switch. Before issuing the cmiTest command, disable the switch using the switchDisable command.

```
switch:admin> cmiTest

Running CMI Test ..............
passed.
```

Figure 4–4. cmiTest command example

> **NOTE:** Related error messages are DIAG-BADINIT, DIAG-INTNIL, DIAG-CMISA1, DIAG-CMINOCAP, DIAG-CMIINVCAP, DIAG-CMIDATA, and DIAG-CMICKSUM.

camTest

Figure 4–5 shows the camTest command, which verifies that the Source Identifier (SID) translation required by QuickLoop and implemented using CAMs is functioning correctly.

IMPORTANT: This test cannot be executed on an operational switch. Before issuing the camTest command, disable the switch using the switchDisable command.

```
switch:admin> camTest

Running CAM Test ..............
passed.
```

Figure 4–5. camTest command example

> **NOTE:** Related error messages are DIAG-CAMINIT, DIAG-CAMSID, and DIAG-XMIT.

portLoopbackTest

Figure 4–6 shows the portLoopbackTest command, which 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. This command tests the switch circuitry up to the serial output of the ASIC. The command syntax is portLoopbackTest *n*Frames.

> **IMPORTANT:** This test cannot be executed on an operational switch. Before issuing the portLoopbackTest command, disable the switch using the switchDisable command.

If you do not include the *n*Frames parameter, the loopback test runs continuously until you press the **Enter** key.

```
switch:admin> portLoopbackTest

Running Port Loopback Test ....

Diags: (Q)uit, (C)ontinue, (S)tats,
(L)og: s

Diagnostics Status: Sun Jan 1
00:00:00 2000

port#:  0 1 2 3 4 5 6 7

diags: OK OK OK OK OK OK OK OK

state: UP UP UP UP UP UP UP UP

lm0: 4654 frTx 4654 frRx 0 LLI_errs.

lm1: 4654 frTx 4654 frRx 0 LLI_errs.

lm2: 4654 frTx 4654 frRx 0 LLI_errs.

lm3: 4654 frTx 4654 frRx 0 LLI_errs.
```

Figure 4–6. portLoopback Test command example

If the test does not find an error, there is no output. You can choose to continue the test, view statistics, or view an error log. Table 4–3 lists the loopback field descriptions.

Table 4–3 portLoopbackTest Command Field Descriptions

Field	Description
Diagnostics status	The title header displays the time diagShow was executed.
port#	The port number.
diags	Port's current diagnostic status. Possible values include OK or BAD.
state	Port's current state. Possible values include UP (active) or DN (inactive).
lm0-7 (8-port) lm0-15 (16-port)	The frame counts of active ports. The display shows the number of frames transmitted and received and low level interface counts (LLI_errs).
Central memory status	Central memory status. Possible values include OK or FAULTY.
Total Diag Frames Tx	The total diagnostics frames transmitted (Tx) since boot. This number usually corresponds to the total frames received (Rx) but can differ because of failure modes.
Total Diag Frames Rx	The total diagnostics frames received (Rx) since boot. This number usually corresponds to the total frames transmitted (Tx) but can differ because of failure modes.

NOTE: Related error messages are DIAG-INIT, DIAG-PORTDIED, DIAG-XMIT, DIAG-TIMEOUT, DIAG-ERRSTAT, DIAG-STATS, DIAG-DATA, and DIAG-PORTABSENT.

sramRetentionTest

Figure 4–7 shows the sramRetentionTest command, which verifies that data written into the ASIC memories are retained and that data bits do not decrease when read after some amount of delay since the write.

> **IMPORTANT:** This test cannot be executed on an operational switch. Before issuing the sramRetentionTest command, disable the switch using the switchDisable command.

```
switch:admin> sramRetentionTest

Running SRAM Retention Test ...
passed.
```

Figure 4–7. sramRetentionTest command example

> **NOTE:** Related error messages are DIAG-REGERR, DIAG-REGERR_UNRST, and DIAG-BUS_TIMEOUT.

cmemRetentionTest

Figure 4–8 shows the cmemRetentionTest command, which verifies that data written into the SRAMs that make up the central memory is retained and that data bits do not decrease when read after a delay since the write.

> **IMPORTANT:** This test cannot be executed on an operational switch. Before issuing the cmemRetentionTest command, disable the switch using the switchDisable command.

```
switch:admin>
cmemRetentionTest

Running cmemRetention Test ..
passed.
```

Figure 4–8. cmemRetentionTest command example

NOTE: Related error messages are DIAG-LCMEM, DIAG-LCMRS, and DIAG-LCMTO.

crossPortTest

Figure 4–9 shows the crossPortTest command, which verifies the intended functional operation of the switch. 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.

NOTE: All ports on the switch must be connected if the GBIC mode is disabled or if the switch shows an error condition. When running the Cross Port test, set the operating mode value to 0 or 1.

```
switch:admin> crossPortTest
Running Cross Port Test ...........
switchName: JR-6011
switchType: 3.1
switchState: Testing
switchRole: Disabled
switchDomain: 1 (unconfirmed)
switchId: fffc01
switchWwn: 10:00:00:60:69:00:60:11
port 0: sw Testing Loopback->1
port 1: sw Testing Loopback->0
port 2: sw Testing Loopback->7
port 3: sw Testing Loopback->6
port 4: sw Testing Loopback->5
port 5: sw Testing Loopback->4
port 6: sw Testing Loopback->3
port 7: sw Testing Loopback->2
port 8: sw Testing Loopback->9
port 9: sw Testing Loopback->8
port 10: sw Testing Loopback->11
port 11: sw Testing Loopback->10
port 12: sw Testing Loopback->13
port 13: sw Testing Loopback->12
port 14: sw Testing Loopback->15
port 15: sw Testing Loopback->14
Port SNMP Physical Flags
0: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
1: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
2: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
3: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
4: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
5: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
6: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
7: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
8: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
9: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
10: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
11: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
12: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
13: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
14: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
15: Testing In_Sync PRESENT ACTIVE E_PORT G_PORT U_PORT SEGMENTED CBL_LB LOGIN
```

Figure 4–9. crossPortTest command example

> **NOTE:** Related error messages are DIAG-INIT, DIAG-PORTDIED, DIAG-XMIT, DIAG-TIMEOUT, DIAG-ERRSTAT, DIAG-STATS, DIAG-PORTWRONG, DIAG-DATA, and DIAG-PORTABSENT.

crossPortTest Modes

The cross port test behaves differently according to the activated modes.

switchEnabled or switchDisabled mode

■ Online mode (switch enabled before executing the test). In the online mode, only ports cabled loopbacked to ports in the same switch are tested. The test ignores ports connected outside of the switch. To be successful, the test must find at least one port (if the singlePortAlso mode is active) or two ports (if the singlePortAlso mode is not active) cable loopbacked to each other. If not, the test displays the following message:

Need at least 1 port(s) connected to run this test.

Or

Need at least 2 port(s) cross-connected to run this test.

■ Offline mode (switch disabled before executing the test). In the offline mode, all ports cable loopbacked to similar ports in the same switch are tested. The test aborts if one or more ports are not connected. If any pair of ports is improperly connected (improperly seated GBIC modules or cables, bad GBIC modules or cables, improper connection of SW to LW, and so on), the following message displays:

One or more ports is not active, please double check fibres on all ports.

singlePortAlso mode

Specify the singlePortAlso mode by executing the Cross Port test with a second argument value of one.

sw:admin> crossPortTest 0, 1

In this mode, the cross port test allows a port to be cable loopbacked to itself (port M is connected to port M) in addition to the supported cross connection (port M is connected to port N). This configuration can be used to isolate bad ports.

GBIC mode

Activate the GBIC mode by executing the following command before executing the Cross Port test:

    sw:admin> setGbicMode 1

When activated, only ports with GBIC modules are tested. The state of the GBIC mode is activated until it is disabled as follows:

    sw:admin> setGbicMode 0

An example mode of operation would be to disable the switch, set the GBIC mode to 1, and execute the Cross Port test with singlePortAlso mode activated to limit testing to:

■ Ports with GBIC modules installed

■ Ports properly cable loopbacked

■ Port connected to themselves (single port connections)

The command syntax is

    crossPortTest <*n*Frames>, <0 or 1>

where <*n*Frames> determines the number of frames to run, and <0 or 1> determines if a single port connection is allowed (0=not allowed, 1=allowed). If you do not include the <*n*Frames> parameter, the test runs until you press the **Enter** key.

spinSilk

Figure 4–10 shows the spinSilk command, which verifies the intended functional operation of the switch. Each port's transmitter send 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. Because 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.

The state of the GBIC mode affects the operation of the Spin Silk test. To activate the GBIC mode, execute the following command prior to executing the crossPortTest command:

    switch:admin> setGbicMode 1

```
switch:admin> spinSilk 2
Running Spin Silk........
One moment please...
switchName: SR-7371
switchType:2.2
switchState: Testing
switchRole: Disabled
switchDomain: 1 (unconfirmed)
switchId: fffc01
switchWwn: 10:00:00:60:69:00:73:71
port 0: cu Testing Loopback->15
port 1: sw Testing Loopback->11
port 2: sw Testing Loopback->7
port 3: lw Testing Loopback->4
port 4: lw Testing Loopback->3
port 5: sw Testing Loopback->9
port 6: sw Testing Loopback->14
port 7: sw Testing Loopback->2
port 8: sw Testing Loopback->13
port 9: sw Testing Loopback->5
port 10: sw Testing Loopback->12
port 11: sw Testing Loopback->1
port 12: sw Testing Loopback->10
port 13: sw Testing Loopback->8
port 14: sw Testing Loopback->6
port 15: cu Testing Loopback->0
Transmitting...done.
Spinning...
port 15 Rx/Tx 1 of 2 million frames.
port 0 Rx/Tx 1 of 2 million frames.
port 1 Rx/Tx 1 of 2 million frames.
port 2 Rx/Tx 1 of 2 million frames.
port 3 Rx/Tx 1 of 2 million frames.
port 4 Rx/Tx 1 of 2 million frames.
port 5 Rx/Tx 1 of 2 million frames.
port 6 Rx/Tx 1 of 2 million frames.
port 7 Rx/Tx 1 of 2 million frames.
port 8 Rx/Tx 2 of 2 million frames.
port 9 Rx/Tx 2 of 2 million frames.
```

Figure 4-10. spinSilk command example 1

```
port 10 Rx/Tx 2 of 2 million frames.
port 11 Rx/Tx 2 of 2 million frames.
port 12 Rx/Tx 2 of 2 million frames.
port 13 Rx/Tx 2 of 2 million frames.
port 14 Rx/Tx 2 of 2 million frames.
port 8 Rx/Tx 2 of 2 million frames.
port 9 Rx/Tx 2 of 2 million frames.
port 10 Rx/Tx 2 of 2 million frames.
port 11 Rx/Tx 2 of 2 million frames.
port 12 Rx/Tx 2 of 2 million frames.
port 13 Rx/Tx 2 of 2 million frames.
port 14 Rx/Tx 2 of 2 million frames.
port 15 Rx/Tx 2 of 2 million frames.
port 0 Rx/Tx 2 of 2 million frames.
port 1 Rx/Tx 2 of 2 million frames.
port 2 Rx/Tx 2 of 2 million frames.
port 3 Rx/Tx 2 of 2 million frames.
port 4 Rx/Tx 2 of 2 million frames.
port 5 Rx/Tx 2 of 2 million frames.
port 6 Rx/Tx 2 of 2 million frames.
port 7 Rx/Tx 2 of 2 million frames.
```

Figure 4–10. spinSilk command example 1 (Continued)

When activated, only ports with GBIC modules installed are included in the Spin Silk test's list of ports to test. For example, if only ports 0 and 3 have GBIC modules installed and the GBIC mode is activated, the Spin Silk test limits testing to ports 0 and 3. The state of the GBIC mode is saved in flash memory. The GBIC mode stays activated (even after reboots or power cycles) until you disable it with the following command:

sw:admin> setGbicMode 0

An example mode of operation would be to disable the switch, set the GBIC mode to 1, and execute the Spin Silk test to limit testing to:

■ Ports with GBIC modules installed

■ Ports that are properly cable loopbacked

> **IMPORTANT:** This test cannot be executed on an operational switch. Before issuing the spinSilk command, disable the switch using the switchDisable command.

> **NOTE:** When running the Spin Silk test, you must set the operating mode value to 0 or 1. Using operating mode 0 when running the Spin Silk test is recommended.

The command syntax is:

spinSilk *n*Millions

where :*n*Millions is the number of frames for the test to execute expressed in millions of frames. If you do not include the *n*Millions parameter, the Spin Silk test runs until you press the **Enter** key.

Figure 4–11 shows an example of a spinSilk command.

```
Diagnostics Status: Thu Jul 30 14:43:36 1998

    port#: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
    diags: OK OK OK OK OK OK OK OK OK OK OK OK OK OK OK OK
    state: UP UP UP UP UP UP UP UP UP UP UP UP UP UP UP UP
    lm0: 2044334 frTx 2053602 frRx 0 LLI_errs. <looped-15>
    lm1: 2046987 frTx 2049307 frRx 0 LLI_errs.<looped-11>
    lm2: 2046259 frTx 2050415 frRx 0 LLI_errs. <looped-7>
    lm3: 2048907 frTx 2038532 frRx 0 LLI_errs. <looped-4>
    lm4: 2038717 frTx 2049093 frRx 0 LLI_errs. <looped-3>
    lm5: 2049555 frTx 2052277 frRx 0 LLI_errs. <looped-9>
    lm6: 2048260 frTx 2047600 frRx 0 LLI_errs. <looped-14>
    lm7: 2051407 frTx 2047246 frRx 0 LLI_errs. <looped-2>
    lm8: 2055484 frTx 2048350 frRx 0 LLI_errs. <looped-13>
    lm9: 2053018 frTx 2050297 frRx 0 LLI_errs. <looped-5>
    lm10: 2048345 frTx 2048404 frRx 0 LLI_errs. <looped-12>
    lm11: 2051282 frTx 2048962 frRx 0 LLI_errs. <looped-1>
    lm12: 2048944 frTx 2048885 frRx 0 LLI_errs. <looped-10>
    lm13: 2049535 frTx 2056672 frRx 0 LLI_errs. <looped-8>
    lm14: 2049481 frTx 2050141 frRx 0 LLI_errs. <looped-6>
    lm15: 2056950 frTx 2047666 frRx 0 LLI_errs. <looped-0>

    Central Memory OK

    Total Diag Frames Tx: 130432

    Total Diag Frames Rx: 134752
```

Figure 4–11. spinSilk command example 2

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

diagClearError

Figure 4–12 shows the diagClearError command, which clears diagnostic errors detected on a specified port. Issuing this command clears the port status but does not clear the error logs or change the port's condition. The command syntax is diagClearError <port #>. Without the <port #> parameter, all errors are cleared.

```
switch:admin> diagClearError
```

Figure 4–12. diagClearError command example

diagDisablePost

Figure 4–13 shows the diagDisablePost command, which disables POST processing. The boot time without POST processing is approximately 50 to 55 seconds. A switch rebooted without POST generates the DIAG-POST_SKIPPED error.

> **NOTE:** Always execute POST processing to ensure the operational status of the switch during the power up stage.

```
switch:admin> diagDisablePost
Committing configuration...done.
On next reboot, POST will be skipped.
```

Figure 4–13. diagDisablePost command example

diagEnablePost

Figure 4–14 shows the diagEnablePost command, which enables POST processing. The boot time with POST processing is approximately 110 to 120 seconds for warm POST, and 165 to 175 seconds for cold POST. POST processing is enabled by default.

```
switch:admin> diagEnablePost
Committing configuration...done.
On next reboot, POST will be executed.
```

Figure 4–14. diagEnablePost command example

setGbicMode

The GBIC mode, when enabled, forces the Cross Port test or the Spin Silk test to limit testing to only ports with detected GBIC modules. To enable GBIC mode, execute the setGbicMode 1 command (see Figure 4–15).

```
switch:admin> setGbicMode 1
```

Figure 4–15. setGbicMode 1 command example

To disable GBIC mode, execute the setGbicMode 0 command (see Figure 4–16).

```
switch:admin> setGbicMode 0
```

Figure 4–16. setGbicMode 0 command example

supportShow

The supportShow command prints switch information for debugging purposes and executes the following commands in the order shown:

■ version

■ tempShow

■ psShow

■ licenseShow

■ diagShow

■ errDump

■ switchShow

■ portFlagsShow

■ portErrShow

■ mqShow

■ portSemShow

■ portShow

■ portRegShow

■ portRouteShow

■ fabricShow

■ topologyShow

■ qlShow

■ nsShow

■ nsAllShow

■ cfgShow

■ faultShow

■ traceShow

■ portLogDump

Figure 4–17 shows the supportShow command. The command syntax is:

supportShow <firstPort>, <lastPort>, <numLog>

```
switch:admin> supportShow
VxWorks: 5.3.1
Firmware: v2.0_beta3
Made on: Fri Mar 19 16:29:55 PST 1999
Flash: Fri Mar 19 16:30:19 PST 1999
BootProm: Tue Dec 29 17:32:38 PST 1998
none:
No licenses
28 29 30 29 27 Centigrade
82 84 86 84 80 Fahrenheit
Power Supply #1 is absent
Power Supply #2 is OK
```

Figure 4–17. supportShow command example

Table 4–4 describes the supportShow command fields.

Table 4–4 supportShow Fields Descriptions	
Field	**Description**
firstPort	The first port in a range of ports about which information is printed. The default (if no operand is specified) is to print the state of port 0. If only firstPort is specified, only the information for firstPort is printed.
lastPort	The last port in a range of ports about which information is printed. If firstPort is specified but lastPort is not specified, only firstPort information is printed for the port-based commands (portShow, portRegShow, and portRouteShow).
*n*Log	Number of lines of portLogDump to print:
	0 means dump all lines (default)
	N means dump the last N lines
	<0 means skip portLogDump

diagShow

Figure 4–18 shows the diagShow command, which summarizes the diagnostics results, including POST results, since the switch was last booted. Table 4–5 lists the field descriptions.

The diagShow command can be looped. For example, diagShow 4 executes diagShow every four seconds until you stop it by pressing the **Enter** key. This command can be used to isolate a bad GBIC module. A port with a changing LLI_errs value is prefixed by ** in the display.

```
switch:admin> diagShow

Diagnostics Status: Sun Jan 1 00:00:00 2000

port#: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
diags: OK OK OK OK OK OK OK OK OK OK OK OK OK OK OK OK
state: UP UP UP UP UP UP UP UP UP UP UP UP UP UP UP UP

lm0: 39624101 frTx 40128685 frRx 0 LLI_errs. <looped-15>
lm1: 39309877 frTx 40007305 frRx 0 LLI_errs<looped-11>
lm2: 39750791 frTx 39885106 frRx 0 LLI_errs. <looped-6>
lm3: 39501243 frTx 40065867 frRx 0 LLI_errs. <looped-4>
lm4: 40066092 frTx 39501463 frRx 0 LLI_errs. <looped-3>
lm5: 40075160 frTx 40257190 frRx 0 LLI_errs. <looped-8>
lm6: 39886034 frTx 39751716 frRx 0 LLI_errs. <looped-2>
lm7: 39989371 frTx 39960595 frRx 0 LLI_errs. <looped-12>
lm8: 40257892 frTx 40075855 frRx 0 LLI_errs. <looped-5>
lm9: 39154671 frTx 40250787 frRx 0 LLI_errs. <looped-14>
lm10: 39767848 frTx 39798346 frRx 0LLI_errs. <looped-13>
lm11: 40009605 frTx 39312144 frRx 0 LLI_errs. <looped-1>
lm12: 39961890 frTx 39990666 frRx 0 LLI_errs. <looped-7>
lm13: 39799377 frTx 39768879 frRx 0 LLI_errs. <looped-10>
lm14: 40252478 frTx 39156315 frRx 0 LLI_errs. <looped-9>
lm15: 40132745 frTx 39628100 frRx 0 LLI_errs. <looped-0>

Central Memory OK

Total Diag Frames Tx: 419264

Total Diag Frames Rx: 447200
```

Figure 4–18. diagShow command example

Table 4–5 diagShow Command Field Descriptions

Field	Description
Diagnostics status	The title header displays the time diagShow was executed.
port#	The port number.
diags	Port's current diagnostic status. Possible values include OK or BAD.
state	Port's current state. Possible values include UP (active) or DN (inactive).
lm0-7 (8-port) lm0-15 (16-port)	The frame counts of active ports. The display shows the number of frames transmitted and received and low level interface counts (LLI_errs).
Central memory status	Central memory status. Possible values include OK or FAULTY.
Total diag frames Tx	The total diagnostics frames transmitted (Tx) since boot. This number usually corresponds to the total frames received (Rx) but can differ because of failure modes.
Total diag frames Rx	The total diagnostics frames received (Rx) since boot. This number usually corresponds to the total frames transmitted (Tx) but can differ because of failure modes.

Diagnostic Error Messages

Error messages are stored in volatile RAM and are lost when you reboot or remove power from the switch. Access the error message log to view error messages before powering down the switch.

Error messages are displayed through a Telnet session. The messages are stored in the switch log and display when you execute the errShow or errDump command.

> **NOTE:** If you run the portStatsShow command or the diagShow command before running 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.

Where multiple probable cause and corrective actions follow an error message, they are listed with the most probable cause and action first and the least probable cause and action last.

If a port fails a diagnostic test, it is marked BAD in the status display and is ignored until the system is rebooted. To retest a port that has been marked BAD, clear the port and set it to OK using the diagClearError port # command. This command clears the port status, but does not clear the error logs or change the port's condition. Only use the diagClearError port # command during diagnostic procedures to reset a bad port for retesting.

For more detailed error message information, see Chapter 5, "Error Messages."

Chapter **5**

Error Messages

This chapter covers the following topics:

■ Switch error message formats

■ Diagnostic error message formats

■ Error message numbers

Switch Error Message Formats

There is one error message format for the switch whether you are gathering information from the local RS-232 serial port or using a remote 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.

The errShow command displays all detected errors. The error counter goes to a maximum of 999. The following information is displayed for each detected error:

■ Number of errors detected

■ Task ID and task name (task names are displayed using the l 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 the **Enter** key to continue or press the **Q** key to quit. Continue pressing the **Enter** key until the prompt => displays. Only diagnostic errors are assigned error numbers. If no errors are encountered, the message "No Error" displays.

To display error messages through Telnet:

1. At the prompt, enter errShow.

2. Press the **Enter** key 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# 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 5–1 lists the failed test and the action required.

Table 5–1 Probable Failure Actions

Failed Test	Action
ramTest	Replace DRAM module or switch assembly.
portRegTest	Replace switch assembly.
centralMemoryTest	Replace switch assembly.
cmiTest	Replace switch assembly.
cmemRetentionTest	Replace switch assembly.
sramRetentionTest	Replace switch assembly.
camTest	Replace switch assembly.
portLoopbackTest	Replace switch assembly.
crossPortTest	Replace switch assembly, GBIC, or Fibre cable.
spinSilk	Replace switch assembly, GBIC, or Fibre cable.

Error Message Numbers

An error number (ERR#*xxxx*) displays at the end of diagnostic error messages. Use Table 5–2 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 Table 5–3.

Table 5–2 Error Message Numbers

Error Number	Test Name	Error Name
0001	n/a	DIAG-CLEAR_ERR
0004	n/a	DIAG-POST_SKIPPED
0B15	sramRetentionTest	DIAG-REGERR
0B16		DIAG-REGERR_UNRST
0B0F		DIAG-BUS_TIMEOUT
1F25	cmemRetentionTest	DIAG-LCMRS
1F26		DIAG-LCMTO
1F27		DIAG-LCMEM
0110	ramTest	DIAG-MEMORY
0111		DIAG-MEMSZ
0112		DIAG-MEMNULL
0415	portRegTest	DIAG-REGERR
0416		DIAG-REGERR_UNRST
040F		DIAG-BUS_TIMEOUT
1020	centralMemoryTest	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
103O		DIAG-BADINT
106F		DIAG-TIMEOUT

Table 5–2 Error Message Numbers (Continued)		
Error Number	**Test Name**	**Error Name**
2030	cmiTest	DIAG-BADINT
2031		DIAG-INTNIL
2032		DIAG-CMISA1
2033		DIAG-CMINOCAP
2034		DIAG-CMIINVCAP
2035		DIAG-CMIDATA
2036		DIAG-CMICKSUM
223B	camTest	DIAG-CAMINIT
223C		DIAG-CAMSID
2640	portLoopbackTest	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

Table 5–2 Error Message Numbers (Continued)

Error Number	Test Name	Error Name
3040	crossPortTest	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
384F	spinSilk	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 Tables

Table 5–3 lists each diagnostic error name and describes the actions necessary to correct each error.

Table 5–3 Diagnostic Error Messages			
Message	**Description**	**Probable Cause**	**Action**
DIAG-BADINT Err#1030, 2030 (centralMemoryTest)	The port received an interrupt when it was not expecting one.	Application Specific Integrated Circuit (ASIC) failure.	Replace switch 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 switch assembly.
DIAG-CAMINIT Err#223B (camTest)	The port failed to initialize due to one of the following reasons: 1. Switch not disabled 2. Diagnostic queue absent 3. Malloc failed 4. Chip is not present 5. Port is not in loopback mode 6. Port is not active	Software operational setup error or switch failure.	Retry, reboot, or replace switch assembly.
DIAG-CAMSID Err#223C (camTest)	An ASIC failed SID NO translation test.	ASIC failure.	Replace switch assembly.
DIAG-CLEAR_ERR Err#0001	A port's diag error flag (OK or BAD) is cleared.	Informational only.	No action required.
DIAG-CMBISRF Err#1021 (centralMemoryTest)	An ASIC's central memory SRAMs did not complete the BISR within the timeout period.	ASIC failure.	Replace switch assembly.

	Table 5–3 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 switch assembly.
DIAG-CMERRPTN Err#102B (centralMemoryTest)	An error was detected at the wrong port.	ASIC failure.	Replace switch assembly.
DIAG-CMERRTYPE Err#102A (centralMemoryTest)	A port received the wrong CMEM error type.	ASIC failure.	Replace switch assembly.
DIAG-CMICKSUM Err#2036 (cmiTest)	A CMI message received a failed bad checksum test.	ASIC or motherboard failure.	Replace switch assembly.
DIAG-CMIDATA Err#2035 (cmiTest)	CMI data received did not match the data transmitted.	ASIC or motherboard failure.	Replace switch assembly.
DIAG-CMIINVCAP Err#2034 (cmiTest)	An unintended ASIC erroneously received a CMI capture flag.	ASIC or motherboard failure.	Replace switch assembly.
DIAG-CMINOCAP Err#2033 (cmiTest)	A CMI intended receiver ASIC failed to receive a CMI capture flag.	ASIC or motherboard failure.	Replace switch assembly.
DIAG-CMISA1 Err#2032 (cmiTest)	An attempt to send a CMI message from ASIC to ASIC failed.	ASIC failure.	Replace switch assembly.
DIAG-CMNOBUF Err#1029 (centralMemoryTest)	A port could not receive a buffer.	ASIC failure.	Replace switch assembly.

Table 5–3 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 Fibre cable failure.	Replace switch assembly, GBIC module, or Fibre 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 Fibre-optic cable DiscC3 — Discarded Class 3 frames	ASIC, motherboard, GBIC module, or Fibre cable failure.	Replace switch assembly, GBIC module, or Fibre 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 Fibre cable failure.	Replace switch assembly, GBIC module, or Fibre cable.

Table 5–3 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 switch assembly.
DIAG-INTNOTCLR Err#102C (centralMemoryTest)	The interrupt bit could not be cleared.	ASIC failure.	Replace switch 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 switch 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 switch 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 switch 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 switch assembly.
DIAG-MEMNULL Err#0112 (ramTest)	The test failed to malloc.	Motherboard failure.	Replace switch assembly.
DIAG-MEMSZ Err#0111 (ramTest)	The memory size to be tested is less than or equal to zero.	Motherboard failure.	Replace switch assembly.

Table 5–3 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 switch assembly or DRAM module.
DIAG-PORTABSENT Err#2670, 3070, 3870 (portLoopbackTest, crossPortTest, spinSilk)	A port is not present.	ASIC or motherboard failure.	Replace switch assembly.
DIAG-PORTDIED Err#265F, 305F, 385F (portLoopbackTest, crossPortTest, spinSilk)	A port was in loopback mode and then went inactive.	ASIC, GBIC module, or Fibre cable failure.	Replace switch assembly, GBIC module, or Fibre 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 Fibre cable failure.	Replace switch assembly, GBIC module, or Fibre cable.
DIAG-PORTWRONG Err#3078 (crossPortTest)	A frame was erroneously received by port M instead of the intended port N.	ASIC failure.	Replace switch assembly.
DIAG-POST_SKIPPED Err# 0004 (switch initialization)	POST is skipped. A message recommends that POST be executed.	Informational Only.	No action 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 switch assembly.

Table 5–3 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 switch 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 Cl3FrmRx — number of Class 3 frames received	ASIC, GBIC module, or Fibre cable failure.	Replace switch assembly, GBIC module, or Fibre 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 Fibre cable failure.	Replace switch assembly, GBIC module, or Fibre cable.
DIAG-XMIT Err#2271, 2671, 3071, 3871 (portLoopbackTest, crossPortTest, spinSilk, camTest)	A port failed to transmit a frame.	ASIC failure.	Replace switch assembly.

Table 5–4 defines each system error name and describes the actions necessary to correct each error.

Table 5–4 System Error Messages			
Message	**Description**	**Probable Cause**	**Action**
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.
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.

Table 5–4 System Error Messages (Continued)

Message	Description	Probable Cause	Action
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.
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.
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.

Table 5–4 System Error Messages (Continued)			
Message	**Description**	**Probable Cause**	**Action**
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.
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.

Table 5–4 System Error Messages (Continued)

Message	Description	Probable Cause	Action
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.
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.

Table 5–4 System Error Messages (Continued)

Message	Description	Probable Cause	Action
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.
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 timeout was received from a port.	OS error	Contact customer support.
HLO, DEADTIMEOUT, LOG_ERROR	Incompatible inactivity timeout 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.

Table 5–4 System Error Messages (Continued)

Message	Description	Probable Cause	Action
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.
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.

Table 5–4 System Error Messages (Continued)			
Message	**Description**	**Probable Cause**	**Action**
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.
QL, QUICKLOOP	The QuickLoop partner switch is running a lower version (earlier than version 2.1.3) of the software.	OS error	Upgrade the Fabric Operating System version.

Chapter **6**

Repair and Replacement

This chapter covers the following topics:

- Replacing a GBIC module
- Replacing a Switch

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

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

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

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

Replacing a GBIC

The GBIC module is installed and removed by sliding it into and out of the slot, Fibre Channel port, on the front of the unit. A GBIC module is hot-pluggable.

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

Removing a GBIC Module

If you are using a GBIC module with a locking bar, pull down the metal swing bar on the front of the GBIC and pull out the bar. Carefully wiggle the GBIC module from side to side to unseat it. Figure 6–1 shows a GBIC module with locking bar.
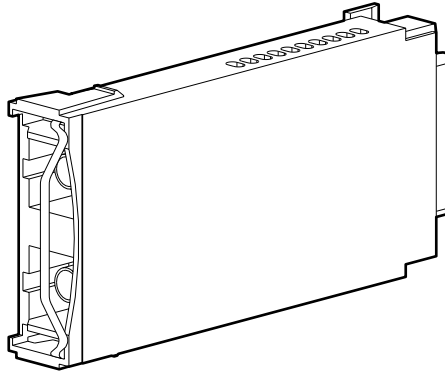
Figure 6–1. GBIC module with locking bar

If you are using any other type of GBIC module, squeeze the side prongs and carefully pull out the GBIC module. Figure 6–2 shows a squeeze-prong GBIC module.
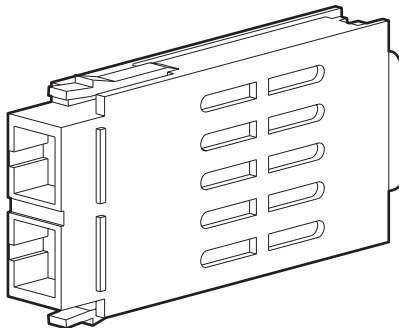
Figure 6–2. Squeeze-prong GBIC module

Installing a GBIC Module

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

> **CAUTION:** 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 a Switch

Use these steps to replace the switch assembly.

1. If possible, save the switch configuration settings using the configUpload Telnet command. See "Save and Restore the Switch Configuration Settings" in Chapter 3 "Setting up the Fibre Channel SAN Switch 16-EL" for more detailed information.

2. Unplug the power cord.

3. Label or mark the Fibre Channel and network cables.

4. Remove the Fibre Channel and network cables.

5. Remove the GBIC module. See "Removing a GBIC Module" in this chapter.

6. Replace the switch.

7. Plug in the power cord.

8. If the switch is in a single-switch configuration, restore the switch configuration settings using the configDownload Telnet command. See "Save and Restore Switch Configuration Settings" in Chapter 3 for more detailed information

   If the switch is in a multiple switch configuration, clear the new switch configuration settings with the cfgClear Telnet command (the new switch will acquire the configuration settings from the other switches in the SAN once the Fibre channel cables are reattached).

   Refer to Appendix A of the *Fibre Channel SAN Switch Management Guide* for detailed information on these Telnet commands.

9. Install the GBIC module. See "Installing a GBIC Module" in this chapter for the installation procedure.

10. Plug in the Fibre Channel cables, as labeled prior to removal.

    See Chapter 3, "Setting up the Fibre Channel SAN Switch 16-EL," for information on setting up the switch.

Chapter **7**

Upgrading Firmware

This chapter covers the following topics:

■ Rolling upgrades

■ Upgrading firmware:

❏ Using Web Management Tools

❏ Using a Telnet command

❏ Downloading from the Compaq website

The Fibre Channel SAN Switch 16-EL comes with preloaded firmware. In most cases there is no need to update the firmware on the new switch. The firmware version can be determined by using:

■ The version Telnet command

■ The Switch Management Application page in Web Management Tools

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

Rolling Upgrades

Because of a compatibility issue that affects the way switches are displayed in the TopZoneNS page, the Fibre Channel SAN Switch 16-EL will display as a Fibre Channel SAN Switch 16 on the TopZoneNS page. This will occur only in the TopZoneNS page; the correct switch graphics will be displayed elsewhere.

The compatibility issue occurs only when interconnecting switches with firmware version 2.0.3a and Fibre Channel SAN Switch 16-EL switches with firmware version 2.1.7 or later. In environments with switches at different firmware levels, the TopZoneNS page will not display any switches if the Web Management Tools is launched from a switch running firmware version 2.0.3a.

In environments where all switches have firmware version 2.1.7 or later, you may choose to change the way the Fibre Channel SAN Switch 16-EL icon is displayed in the fabric view page to the correct graphics. This can be accomplished by issuing the fakeModel Telnet command for Fibre Channel SAN Switch16-EL switches.

The default parameter for the Fibre Channel SAN Switch 16-EL is 3, which displays the Fibre Channel SAN Switch 16-EL as a Fibre Channel SAN Switch 16 in mixed firmware environment.

Set the fakeModel parameter to 0 which resets the Fibre Channel SAN Switch 16-EL to display the correct graphics in the TopZoneNS screen with firmware version 2.17 or later.

> **NOTE:** This command should only be used to change the parameter to 0 when all switches are running firmware version version 2.1.7 or later.

Upgrading Firmware Using Web Management Tools

The Fibre Channel SAN Switch 16-EL comes with preloaded switch firmware. In the event a firmware upgrade is needed, use the following procedure.

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

To download the firmware:

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

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

   D:\DSGGC\FIRMWARE\NTINTEL\CAT.EXE

   D:\DSGGC\FIRMWARE\NTINTEL\2.6

   where D:\ is the drive letter for the CD and version v2.6 is the latest version of firmware.

2. Double-click *RSHD.EXE*. RSHD is a server program that allows the switch to request the firmware from the host over an Ethernet connection. Leave RSHD running in a separate window.

3. Click the switch whose firmware you want to upgrade. The Switch Management Application page displays.

4. Click the Admin button on the Switch Management Application page.

5. Click the Firmware upgrade tab. The following screen is displayed:

Figure 7–1. Firmware Upgrade page example

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

    NOTE: For Windows 9x/Windows 2000/Windows NT only, enter the IP address.

7. Enter a user name in the Remote User Name field.

    NOTE: For Windows 9x, Windows 2000, and Windows NT only, enter the default name user.

8. In the Download File From field, enter the path name where the firmware resides.

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

    NOTE: When the firmware file is located in the same directory as the *Cat.exe* and *Rshd.exe* files, the directory path can be omitted.

9. Click the Download Flash Now! button.

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

The firmware is downloaded. Use this procedure for each switch to be upgraded.

Upgrading Firmware Using a Telnet Command

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

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

To upgrade the firmware of a Fibre Channel SAN Switch 16-EL, use the latest version of the Fibre Channel SAN Switch CD. Use one of the following three procedures (Windows NT Intel, Windows NT Alpha, or Compaq Tru64 UNIX).

Host with NT Intel

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

1. Copy the files *RSHDE.EXE* and *CAT.EXE* to the root directory (example = C:) on the host system. These files are found in

   D:\DSGGB\FIRMWARE\NTINTEL\RSHD.EXE D:\DSGGB\Firmware\NTIntel\Cat.exe D:\DSGGB\FIRMWARE\NTINTEL\V2.6

   where D:\ is the drive letter for the CD and version v2.6 is the latest version of firmware.

2. Double-click RSHD.EXE. RSHD is a server program that allows the switch to request the firmware from the host over an Ethernet connection. Leave RSHD running in a separate window.

3. Click Start > Run and enter TELNET.

4. Click Connect > Remote System.

5. In the Host Name field, type the IP address of your Fibre Channel SAN Switch 16-EL and click the Connect button.

6. Log in as:

   admin
   password: password

7. At the prompt, type:

   firmwareDownload "192.168.60.200" , "administrator" , "v2.6"

   where "192.168.60.200" is the IP address of your host computer, "administrator" is the account you are using to run *RSHD.EXE*, and "v2.6" is the firmware image to be downloaded to the switch.

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

   The output displays as follows:

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

8. Click the RSHD window and click File > Exit.

9. Click the Telnet window and enter reboot. The switch reboots and copies the firmware into RAM.

Host with NT Alpha

To load the firmware from an NT Alpha machine:

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

    D:\DSGGB\FIRMWARE\NTALPHA\RSHD.EXE D:\DSGGB\FIRMWARE\NTALPHA\CAT.EXE
    D:\DSGGB\FIRMWARE\NTALPHA\v2.6

    where D:\ is the drive letter for the CD and Version v2.6 is the latest version of firmware.

2. Double-click *RSHD.EXE*. RSHD is a server program that allows the switch to request the firmware from the host over an Ethernet connection. Leave RSHD running in a separate window.

3. Click Start > Run and enter TELNET.

4. Click Connect > Remote System.

5. In the Host Name field, type the IP address of your Fibre Channel SAN Switch 16-EL and click the Connect button.

6. Log in as:

    admin
    password: password

7. At the prompt, type:

    firmwareDownload "192.168.60.200" , "administrator" , "v2.6"

    where "192.168.60.200" is the IP address of your host computer, "administrator" is the account you are using to run *RSHD.EXE,* and "v2.6" is the firmware image to be downloaded to the switch.

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

    The output displays as follows:

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

8. Click the RSHD window and click File > Exit.

9. Click the Telnet window and enter reboot. The switch reboots and copies the firmware into RAM.

Host with Tru64 UNIX

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

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

    mount –t cdfs –r /dev/rz5c /mnt

2. Change to the CD directory by entering:

    cd mnt

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

    CP DSGGB/FIRMWARE/v2.6 /MARY/TMP/V2.6

    where: *mary* is the user name on the Tru64 host system and version 2.6 is the firmware image to be downloaded to the switch.

    > **NOTE:** The Fibre Channel SAN Switch 16-EL uses the remote shell capabilities of UNIX to log in to the Tru64 UNIX host and copy the firmware image. The user (*mary*) and the switch's IP address must be in the *.rhosts* file on the Tru64 UNIX host to allow login without a password.

4. Telnet to the switch by entering:

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

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

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

    firmwareDownload "16.140.32.60", "mary", "/tmp/v2.6"

    where "16.140.32.60" is the IP address of the host system with the firmware image, "mary" is the user to RSH, and "/tmp/v2.6" is the firmware image to be loaded into the switch flash ROM.

    > **NOTE:** The quote marks are very important in the firmwareDownload command line.
    >
    > RSH without a password must be enabled for the user that RSH is executing under. To enable RSH without a password, add the switch IP name to ~<user>/.rhosts). The format of .rhosts is: hostname [user].

6. Enter reboot at the Telnet prompt. The switch reboots and copies the firmware into RAM.

Downloading Firmware from the Compaq Website

To download the firmware from the Compaq website, go to
www.compaq.com/products/storageworks.

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

Appendix **A**

Regulatory Compliance Notices

Regulatory Compliance Identification Numbers

For the purpose of regulatory compliance certifications and identification, your Compaq StorageWorks SAN Switch 16-EL is assigned a Compaq series number. The Compaq series number for this product is: Series NA2104. The SAN Switch16-EL 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-EL.

Federal Communications Commission Notice

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

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

Class A Equipment

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

Class B Equipment

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

■ Reorient or relocate the receiving antenna.

■ Increase the separation between the equipment and receiver.

■ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

■ Consult the dealer or an experienced radio or television technician for help.

For questions regarding this FCC declaration, contact:

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

Or call 1-800-OK COMPAQ

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

Modifications

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

Network and Serial Cables

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

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.)

Canadian Notice (Avis Canadien)

Class A Equipment

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

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

Class B Equipment

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

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

European Union Notice

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

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

■ EN55022 (CISPR 22)—Electromagnetic Interference

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

■ EN60950 (IEC950)—Product Safety

■ Also approved under UL 1950, 3rd Edition/CSA C22.2 No. 950-95, Safety of Information Technology Equipment

Japanese Notice (July 14, 1998 Shigeru Joraku)

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 (July 14, 1998)

<div align="center">

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。

</div>

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.

CLASS 1 LASER PRODUCT

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

Laser Information

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

Battery Replacement Notice

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

> **WARNING:** Your switch contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery. There is risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:
>
> ■ Do not attempt to recharge the battery.
>
> ■ Do not expose to temperatures higher than 140°F (60°C).
>
> ■ Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

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

Appendix **B**

Electrostatic Discharge

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

To prevent electrostatic damage, observe the following precautions:

■ Avoid hand contact by transporting and storing products in static-safe containers

■ Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.

■ Place parts on a grounded surface before removing them from their containers.

■ Avoid touching pins, leads, or circuitry.

■ Always make sure you are properly grounded when touching a static-sensitive component or assembly.

Grounding Methods

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

■ Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm ± 10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.

■ Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.

■ Use conductive field service tools.

■ Use a portable field service kit with a folding static-dissipating work mat.

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

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

Appendix **C**

Specifications

This appendix covers the following topics:

- Switch specifications
- Environmental specifications
- Dimensions
- Power supply requirements.

Switch Specifications

The specifications for the Fibre Channel SAN Switch 16-EL are listed in Table C–1.

Table C–1 Fibre Channel SAN Switch 16-EL Specifications

Specification	Description
Fabric initialization	Complies with FC-SW 3.2
IP over Fibre Channel (FC-IP)	Complies with FC-IP 2.3 of the FCA profile
System architecture	Non-blocking shared-memory switch
System processor	Superscalar 33-Mhz Intel i960RP
Number of Fibre Channel ports	16 ports, GBIC
Modes of operation	Fibre Channel Class-2 service and Fibre Channel Class-3 connectionless service
Aggregate switch I/O bandwidth	8 Gbps, full duplex
Frame buffers	16 buffers per port at 2112 bytes per frame
Port to port latency	Less than 2 microseconds with no contention
Data transmission range	Up to 500 m (1,640 ft.) for short wavelength optical link
	Up to 10 km (84,480 ft.) for long wavelength optical link
Chassis type	Back-to-front airflow (AC power connection out front)

Environmental

The environmental ranges for the switch are listed in Table C–2.

Table C–2 Environmental Specifications	
Specification	**Value**
Temperature (operating)	50°F to 104°F (10°C to 40 °C)
Temperature (non-operating)	-31°F to 147°F (-35°C to 63.89 °C)
Operating humidity	5% to 85% non condensing @ 104°F (40°C)
Non-operating humidity	95% RH non-conducting @ 104°F (40°C)
Operating altitude	0 to 3 kilometers (1.9 mi.) above sea level
Non operating altitude	0 to 12 kilometers (7.5 mi.) above sea level
Operating shock	4g, 11MS duration, half sine
Non-operating shock	20g, 11MS duration, sq.wave
Operating vibration	5, 5-500-5Hz@1.0 octave/minute
Non operating vibration	10, 5-500-5Hz@1.0 octave/minute

Dimensions

The switch may be configured for either rack mount or desktop use. Table C–3 lists the switch dimensions.

Table C–3 Dimensions	
Specification	**Value**
Rack Mount Dimensions	1.5U, 19-in. rack mount (EIA compliant)
	D:45.0 cm (17.72 in)
Weight	7.7 kg (17 lb.)

Power Supply

The switch has a universal power supply capable of functioning worldwide without voltage jumpers or switches. The power supply module is auto ranging in terms of accommodating input voltages and line frequencies (see Table C–4).

Table C–4 Power Supply Requirements	
Specification	**Value**
Total power	75 watts maximum
Input voltage	85 VAC minimum auto-ranging to 264 VAC maximum
Input line frequency	47 Hz minimum to 63 Hz maximum
Harmonic distortion	Power factor correction per IEC1000-3-2
BTU rating	110 watts x 3.412 BTU/hr/watts = 375 BTU/hr

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