Compaq StorageWorks

SAN Switch QuickLoop

Management Guide

First Edition (October 1999)
Part Number EK-P20QL-GA. A01 / 161360-001
Compaq Computer Corporation

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About This Guide

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

Text Conventions

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

Keys	Keys 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.
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.

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.

Getting Help

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

Compaq Technical Support

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

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

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

- Technical support registration number (if applicable)
- Product serial number
- Product model name and numbers
- Applicable error messages
- Add-on boards or hardware

- Third-party hardware or software
- Operating system type and revision level

Compaq Website

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

Compaq Authorized Reseller

For the name of your nearest Compaq authorized reseller:

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

Chapter 1

Introduction

The Compaq StorageWorks SAN Switch QuickLoop is a unique Fibre Channel topology that combines the services of fabric and Fibre Channel Arbitrated Loop (FC-AL) management. QuickLoop allows hosts with non-fabric-aware drivers to perform I/O operations with storage devices within a loop.

Overview

QuickLoop is a logical Private Loop Fabric Attach (PLFA) consisting of multiple private Arbitrated Loops (looplets) interconnected by a fabric. Although NL_Port devices are attached to different Arbitrated Loops, the fabric and the physical device locations are transparent. All NL_Ports share one Arbitrated Loop Physical Address (AL_PA) space and operate in accordance with the FC-AL.

QuickLoop lets you use switches instead of hubs in environments where all attached devices are private. No fabric login (FLOGI) is required from these devices. Host drivers that are Private Loop Direct Attach- (PLDA) capable do not need modification to perform I/O operations with storage devices in QuickLoop.

QuickLoop allows a logical loop of two switches maximum if the switches have Fabric Operating System licenses installed. The loop can include all or a subset of the U_Ports in a switch. QuickLoop can be part of a large fabric, and multiple QuickLoops (either single- or dual-switch) can coexist in a single fabric.

QuickLoop makes the fabric existence and the physical connectivity transparent to the NL_Ports by allowing them to communicate with one another using AL_PAs for device addressing. The NL_Ports operate the same as in a PLDA environment. QuickLoop creates a single logical loop that provides a reliable connection between private hosts and storage devices connected to multiple U_Ports (looplets). Loop initializations are propagated to all looplets while faults are isolated to a local looplet when detected.

Benefits

QuickLoop provides a migration path from a single private loop to a fully scalable fabric for constructing Storage Area Networks (SANs). QuickLoop-enabled switches can replace hubs when a SAN is first deployed. When Nx_Port devices become fabric capable, you can upgrade the SAN to mix QuickLoop and fabric, and continue to expand toward a full fabric.

As an alternative to using Fibre Channel hubs, QuickLoop offers many advantages due to the blending of private arbitrated loops and a fabric. These advantages include:

- **More aggregated bandwidth**—Each looplet has its own unshared bandwidth.
- **Higher performance**—Loop tenancies can occur in parallel in different looplets.
- **Better fault isolation**—A faulty device is localized within a looplet.

Features

The SAN Switch QuickLoop:

- Consists of any set of ports from any two switches in a fabric.
- Supports a dual-switch configuration for two switches with Fabric Operating System licenses installed.
- Supports up to 126 devices per QuickLoop.
- Conforms to Fibre Channel standards.
- Combines up to 32 ports (Compaq StorageWorks SAN Switch 16) or 16 ports (Compaq StorageWorks SAN Switch 8). Each loop attached to a port is referred to as a looplet.

Additional features include:

- Each looplet supports transfer rates of 100 MB/s. Multiple devices can communicate simultaneously in different looplets.
- A fabric can have several QuickLoops, but a switch can only be in one QuickLoop.
- Devices on the QuickLoop are logically attached to the fabric. Each device is entered into the Name Service and the device address is translated from a 24-bit fabric address to an 8-bit private address.
- Public hosts that support an arbitrated loop attached to QuickLoop ports are treated as private devices.
- Hosts attached to QuickLoop can communicate to all devices attached to QuickLoop.
- Other public hosts connected to the fabric through nonQuickLoop ports can communicate with devices attached to QuickLoop using single translative mode.
- Individual looplets can be taken out of service manually or automatically if a looplet error is detected. The looplet is reinstated when the error condition is cleared.
- Individual QuickLoop ports can be converted to Fabric Loop Attach (FLA) compliant FL_Ports on switches with a Fabric Operating System license by disabling QuickLoop mode on that port. This provides a good migration strategy as host drivers are upgraded to fabric-aware capabilities.
- QuickLoop port management is achieved using the Telnet interface.

Implementation

QuickLoop is implemented with a combination of hardware and software components. The hardware components transport frames among looplets and across switches, while the software components initialize the QuickLoop, detect faults, and isolate and recover from errors.

Initialization

QuickLoop initialization is a two-pass process that includes:

1. Sequential looplet initialization
2. Full QuickLoop initialization

The first pass allows each device in a looplet to register with the switch, and the second pass assigns a unique AL_PA to each device and starts QuickLoop operations.

Sequential Looplet Initialization

Each QuickLoop device obtains a unique AL_PA in a single AL_PA space. Only looplets from which LIPs are received are initialized using the loop initialization procedure described in FC-AL. AL_PA's of devices in other looplets (those from which no LIPs are received) are preserved during the initialization. Operations performed during sequential looplet initialization are:

- Propagation of LIPs to all looplets and force them into the OPEN-INIT state.
- Collection of a super set AL_PA bitmap that includes all AL_PAs in looplets from which no LIPs are received.
- Initialization of the loop as described in FC-AL and application of the super set AL_PA bitmap to initialize a looplet from which LIPs are received.
- Addition of the AL_PAs of the newly initialized looplet to the super set AL_PA bitmap. If the newly initialized looplet has a hard-assigned AL_PA in conflict with a soft-assigned AL_PA of another looplet, the soft-assigned AL_PA is reinitialized.

Full Initialization

Full initialization sets up QuickLoop as a single logical PLDA. This is done by making all assigned AL_PAs addressable by any device in a looplet regardless of whether the destination device and the source device is in the same physical looplet. If the destination device is not in the same physical looplet as the source device, the hidden FL_Port in the source device looplet acts on behalf of the destination device. The hidden FL_Port in the destination device looplet acts on behalf of the source device while the fabric provides the transport service. Devices that are not physically located in a looplet but are addressable by a local device in the looplet are called phantom devices. Operations performed during full initialization are:

- Initialization of all looplets.
- Set up of phantom devices in each looplet.
- Set up of the transport paths across all looplets.
- Reinitialization of all looplets to an operational state.

QuickLoop Master

The QuickLoop initialization process must be driven by only one switch in a dual-switch QuickLoop. The switch that drives a QuickLoop initialization is called the QuickLoop Master. Switches use the following criteria to elect the QuickLoop Master:

- If one of the switches receives LIPs from one (or more) of its looplets and the other switch does not, the switch that receives the LIPs becomes the QuickLoop Master.
- If both of the switches receive LIPs from their respective looplets, the switch that has the lower Domain ID becomes the QuickLoop Master.

NOTE: A dual-switch QuickLoop configuration requires that both switches have a Fabric Operating System license installed.

NOTE: The role of the QuickLoop Master is not fixed in one switch. It is determined dynamically upon each instance of QuickLoop initialization.

Address Translation

Address translation is achieved through hardware translative mode (phantom mode). A phantom device is a device addressable by a unique AL_PA (called phantom AL_PA) in a looplet, but not physically located in the local looplet. The phantom device is in the same fabric as the local looplet.

- Standard Translative Mode allows public devices to communicate with private initiator devices across the fabric.
- QuickLoop Mode allows private devices to communicate with other private devices across the fabric.
- Devices connected to a U_Port in QuickLoop mode are treated strictly as private devices, even if they are FLA capable devices. The QuickLoop-enabled U_Port drops the class 3 FLOGI if an NL_Port sends one.
- QuickLoop utilizes the Translative Mode of the switch to achieve the physical connection transparency.
- Three Operation Modes:
  - Fabric Mode
  - QuickLoop Mode
  - Mixed

Operation Modes

The operation modes are managed with Telnet commands. The system configuration has three control levels:

- **Fabric mode**—No U_Port participates in any logical PLDAs and all U_Ports operate as FC-FLA-compliant devices (default mode). This is level 1: fabric level.
- **QuickLoop mode**—All U_Ports participate in a logical PLDA (or dual-switch), unless a U_Port is overridden by a level 3 configuration. This is level 2: switch level.
- **Mixed mode**—Per port configuration that overrides level 2 configurations and can be set during installation. U_Ports can be configured as part of a logical PLDA (QuickLoop Mode) or as a standard U_Port within the switch. This is level 3: port level.

NOTE: Operation modes cannot be configured through the Web or SNMP.

QuickLoop Configurations

QuickLoop supports two basic configurations:

- **Single-switch**—All looplets of a QuickLoop reside in one switch.
- **Dual-switch**—Looplets of a QuickLoop span across two cascaded switches.

Both configurations allow up to 126 NL_Port devices in one QuickLoop. In addition to the two basic configurations, QuickLoop can be scaled to coexist within a fabric. In this case, you can reconfigure some of the original QuickLoop looplets to become fabric ports (F_Ports or FL_Ports), and additional fabric switches can be added as QuickLoop switches.

In a mixed QuickLoop and fabric configuration, fabric devices (public) can access QuickLoop devices (private) but not vice versa. There can be multiple QuickLoops within a fabric and each can be either single- or dual-switch. However, devices in two different QuickLoops cannot communicate with each other.

Sample Configurations

The following examples show possible QuickLoop configurations. In each example the dotted lines represent the logical QuickLoop or the ports that form the QuickLoop. Although many other possible configurations exist, these examples show how QuickLoop operates.

Configuration 1

Figure 1-1 shows a high performance multi-initiator and multitarget connectivity to a single logical PLDA where the entire switch operates in QuickLoop mode. The switch serves as a concentrator, similar to a hub, offering throughput performance on each looplet of 100 MB/s.

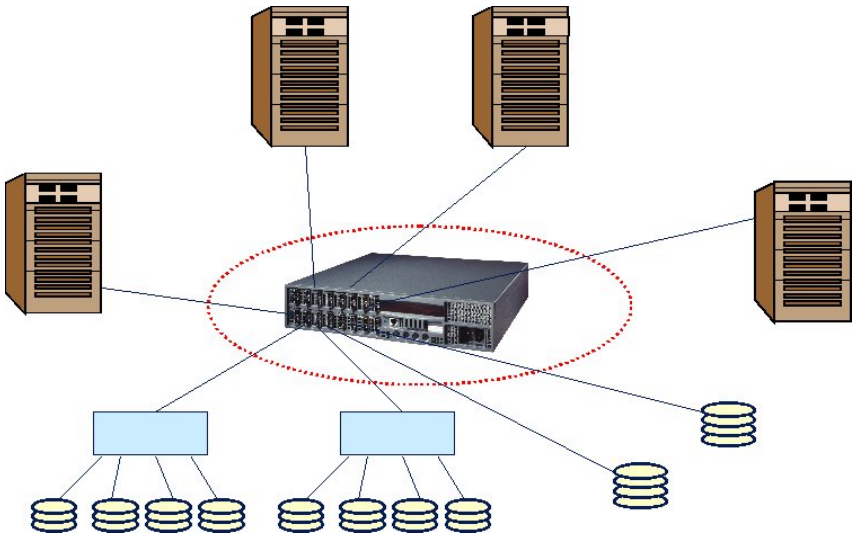

Figure 1-1. QuickLoop configuration example 1

Configuration 2

Figure 1-2 shows two cascaded switches in a single logical PLDA. The switches operate in QuickLoop mode and are used to interconnect devices separated by a distance up to 10 km.

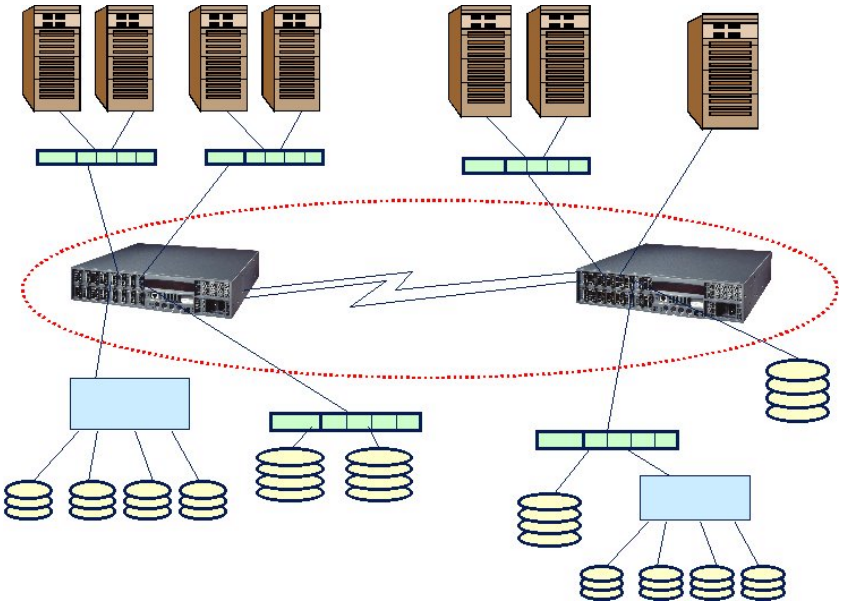

Figure 1-2. QuickLoop configuration example 2

Fault Isolation

Fault isolation is very important in a QuickLoop; a QuickLoop configuration can consist of multiple looplets across one or two switches. The goal of fault isolation is to minimize the impact of faulty looplets or switches on the normal QuickLoop functions.

Switch Level

In a dual-switch QuickLoop, the following conditions will trigger a fault.

- No switch configured with the partner switch's World Wide Name (WWN) is found in the fabric.
- No response was received from the partner switch during initial communication.
- Inconsistent response received from the partner switch
- Response from the partner was not received in time during QuickLoop initialization.

When a switch is determined to be faulty, it is omitted from QuickLoop initialization.

Port Level

The following conditions are considered faulty in regard to the related looplet:

- A U_Port fails to become the Loop Initialization Master (of the local looplet) within a time limit after LIPs are received from or sent to the port.
- A loop initialization sequence is not received by a U_Port within a time limit after the same sequence is sent.
- The frequency of LIPs received from a U_Port exceeds a threshold.
- Physical level errors exist, such as loss of sync, laser fault, and so on.

When a looplet is determined to be faulty, it is omitted from QuickLoop initialization.

Recovery

If a switch or a U_Port diagnosed as faulty later recovers, it must be able to participate in the QuickLoop. If two previously disconnected partner switches, each containing QuickLoop with a set of private devices, are cascaded, the two switches reform a single QuickLoop containing both sets of private devices.

Chapter 2

QuickLoop Management

QuickLoop supports legacy devices. The legacy devices are devices that are in a Private Loop Direct Attach (PLDA) environment. The QuickLoop feature allows these devices to be attached to a fabric and operate no differently than in a PLDA environment.

Switch Management Methods

There are several access methods for managing a switch. The following table summarizes the different management access methods.

Table 2-1
Switch Management Access Methods

Method	Description	Local	In-Band (Fibre Channel)	Out-of-band (Ethernet)
Telnet	Managed remotely using a TC/IP connection	No	Yes	Yes
SNMP	Managed remotely using Simple Network Management Protocol	No	Yes	Yes
Web Management Tools	Managed remotely though Web	No	Yes	Yes

continued

Table 2-1
Switch Management Access Methods *continued*

Method	Description	Local	In-Band (Fibre Channel)	Out-of-band (Ethernet)
Command Console	Managed remotely through Command Console	No	Yes	Yes
Front Panel Controls	Managed through control located on switch (Compaq StorageWorks SAN Switch 16 only)	Yes	No	No

Note: An advanced set of testing and debugging controls are available using a Telnet connection. Before a Telnet connection can be established, the switch must have an IP address. To assign an IP address, see "Setting the IP Address" for your model switch in the following section.

Note: Detailed information for managing the Compaq StorageWorks SAN Switch 16 from the front panel controls is included in the *Compaq StorageWorks SAN Switch 16 Installation and Hardware Guide*.

Hardware Setup for Remote Switch Management

To enable a Telnet connection to a Compaq StorageWorks SAN Switch, 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.

Setting the IP Address on the SAN Switch 16

You can set the switch IP address from the front panel controls. To set the IP address:

1. Select the Configuration menu using the right button.
2. Scroll down to the option *Ethernet IP Address*. Select this option using the right front panel control button.
3. Use the left front panel control button to change the IP address value. Use the scroll up/down keys to move to the next set of values.
4. When all values are set, press the right front panel control button to finish.

5. Confirm that the IP address is correct. Select *Yes* to store the address in flash memory.
6. Repeat this procedure for the *Set FC IP Address* option of the Configuration menu.

NOTE: To be completely accessible on the network, the switch can require a netmask and gateway address. See your network administrator to determine if additional addresses are necessary.

Setting the IP Address on the SAN Switch 8

A default IP address is preinstalled on the switch. Use this address for the external Ethernet connection to the network, 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, the IP address can be set using the front panel RS-232 serial connection. To set the IP address:

1. Connect the serial cable to the switch's serial port and to a host or terminal serial interface.
2. Turn on the power to the switch. The switch automatically connects to the host and logs in as admin.
3. 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, access the switch through the network connection. You can manage the switch using Telnet commands.

Resetting Factory Defaults on the SAN Switch 8

To reset an invalid IP address, or if you forget a password or IP address, you can reinitialize the IP address. To revert to factory-default values:

1. Connect a serial cable from the host serial port to the switch serial port.
2. From the host system, log in to the switch.
3. When prompted, enter the user ID admin and the appropriate password.
4. Enter the Telnet command configDefault to reset usernames and passwords. For more information on Telnet commands, see Appendix A, "Telnet Commands."

CAUTION: The configDefault command resets the password as well as many other switch parameters. Do not issue this command without understanding its effects.

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

Managing the Switch Using Telnet

To make a successful Telnet connection to a switch, you need:

- Switch name or IP address
- Username
- Password

NOTE: The switch must have an IP address. To assign an IP address, see the instructions for your switch model earlier in this chapter.

Default Usernames and Security Levels

Each username has an associated security level, with username 3 having the least number of privileges and username 1 having the most.

Table 2-2
Default Usernames

Default Username	Description
User (username 3)	Gives users access to commands that do not change a switch state. This level is recommended for monitoring switch activity.
Admin (username 2)	Gives users access to all commands in the Help menu. Most switch administration is performed at this level.
Root (username 1)	Gives users access to an extensive command set that can significantly alter system performance. Root commands are beyond the scope of this manual. Consult Compaq customer service before using root commands.

The system administrator can assign usernames other than those listed; however, users at the same security level have the same privileges regardless of the name assigned.

CAUTION: Root access should be limited to users responsible for maintaining and modifying the fabric. Commands available to a root user, if used inappropriately, can cause the switch to stop functioning or to function abnormally. Root commands should only be used at the request of Compaq customer service.

Changing Passwords

The initial default password for all usernames is password. To change user passwords:

1. Log in as admin.
2. Issue the command passwd.

   Each username (admin and user) is displayed in sequence, letting you modify each password and name.
3. To replace the existing password, enter a new password or name.

Initiating a Telnet Session

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

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

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

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

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

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

Telnet Commands

Information and examples on managing and monitoring the switch through Telnet are provided in Appendix A of this guide. The following command types are covered:

- **QuickLoop-specific commands** let you manage the QuickLoop topology.
- **General commands** let you control basic switch operations.
- **Diagnosis commands** let you monitor, test, and evaluate the switch.
- **Routing commands** let you view switch routing information.
- **License commands** let you view, add, and remove license keys.

Managing the Switch Using SNMP

The switch's resident SNMP agent allows remote switch management through the IP over Ethernet and Fibre Channel interfaces.

SNMP Management Overview

This section provides an overview of the key concepts in switch management based on Simple Network Management Protocol (SNMP).

SNMP Model

Within the SNMP model, a manageable network consists of one or more manager systems (or network management stations) and a collection of agent systems (or network elements).

- A manager system runs a management application, such as the StorageWorks Command Console (SWCC), that monitors and controls the network elements.
- An agent system is a network device, such as a Fibre Channel switch, a managed hub, or a bridge, that has an agent responsible for carrying out operations requested by the manager. Therefore, an agent is the interface to a managed device.

The manager communicates with an agent by using SNMP. The switch agent supports SNMP version 1 (SNMPv1) and Community-based SNMP version 2 (SNMPv2C). SNMP allows the following management activities:

- A manager can retrieve management information from an agent. There are three operations for this activity:
  - SNMP-GET
  - SNMP-NEXT
  - SNMP-BULKGET (SNMPv2C)
- A manager can change management information on the agent. This operation is called SNMP-SET.
- An agent can send information to the manager without being explicitly polled for it. This operation is called a trap in SNMPv1 and a notification in SNMPv2C. Traps or notifications alert the manager to events that occur on the agent system. For the rest of this guide, the term *trap* is used.

Management Information Base

The information on an agent is known as the Management Information Base (MIB). It is an abstraction of configuration and status information. A specific type or class of management information is known as a MIB object or MIB variable. For example, the MIB variable sysDescr describes an agent system. The existence of a particular value for a MIB object in the agent system is known as a MIB object instance, or simply an instance. Some MIB objects have only a single instance for a given agent system. For example, the system description and the instance are denoted as sysDescr.0. Other MIB objects have multiple instances. For example, the operational status of each Fibre Channel port on a switch and a particular instance can be denoted as swFCPortOperStatus.5.

MIB objects are conceptually organized in a hierarchical tree structure. Each branch in the tree has a unique name and numeric identifier. Intermediate branches of the tree serve as a way to group related MIB objects together and the leaves of the tree represent the MIB objects. Figure 2-1 illustrates the tree structure.

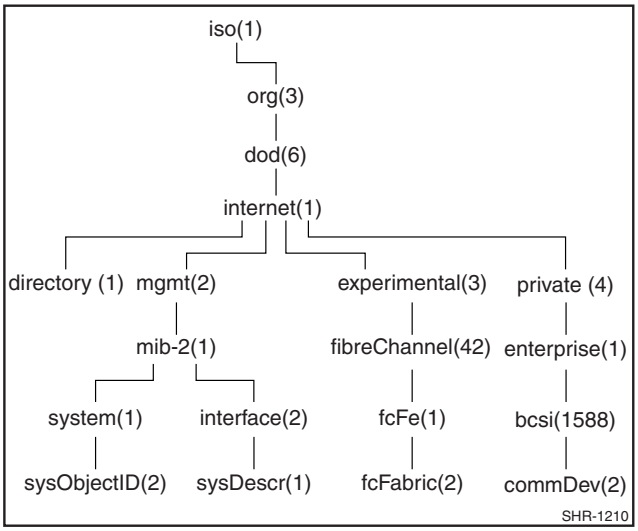

Figure 2-1. Management Information Base (MIB) tree

A MIB object is identified by its position in the tree. A full object identifier consists of the identifier of each branch along the path through the tree. For example, the object sysObjectID has the full identifier of 1.3.6.1.2.1.1.2. For readability, the notation {system 1} can be used.

The switch's agent supports the following:

- SNMPv1 and SNMPv2c
- Command line utilities to provide access to and configuration of the agent
- MIB-II system group, interface group, and SNMP group
- Fabric element MIB
- Vendor-specific MIBs
- Standard generic traps
- Enterprise-specific traps

SNMP Transports

The SNMP agent residing on the embedded processor supports UDP/IP over the Ethernet interface or any FC-IP interface. This transport provides an immediate plug-and-play support for the switch once the IP address has been assigned.

MIB-II Support

There are 11 groups of objects specified in MIB-II. The Compaq StorageWorks SAN Switch SNMP agent supports three of these groups. The three supported groups include:

1. System group (object ID is {iso, org, dod, internet, mgmt, mib-2, 1})
2. Interfaces group (object ID is {iso, org, dod, internet, mgmt, mib-2, 2})
3. SNMP group (object ID is {iso, org, dod, internet, mgmt, mib-2, 11})

The following variables can be modified by using the SNMP set command, given an appropriate community with read-write access:

- SysDescr—The system description; the default value is set as Fibre Channel Switch
- SysObjectID—The system object identifier vendor's authoritative identification (1.3.6.1.4.1.1588.2.1.1.1)
- SysUpTime—The time since the agent was last initialized

- SysContact—The identification and contact information for this system. By default, this is set as *Field Support*.
- SysLocation—The node's physical location. The default setting is *End User Premise*.

The interface group supports three interface drivers: software loopback, Ethernet, and Fibre Channel IP.

Fabric Element MIB Support

There are five object groups defined for fabric element MIB support:

- Configuration group
- Operation group
- Error group
- Accounting group
- Capability group

The SNMP agent supports all groups.

Specific MIBs

There are five groups of MIBs defined for fabric support:

- Switch System group
- Fabric group
- SNMP Agent Configuration group
- Fibre Channel Port group
- Name Server group

Generic Traps

Setting up the switch's SNMP connection to an existing managed network lets the network system administrator receive the following generic traps:

- coldStart—Indicates that the agent has reinitialized itself such that the agent's configuration can be altered. This also indicates that the switch has booted.
- linkDown—Indicates an IP interface (Ethernet, loopback, or embedded N_Port) has gone down and is not available.
- linkUp—Indicates an IP interface (Ethernet, loopback, or embedded N_Port) has become available.

  NOTE: The linkUp and linkDown traps are not associated with removing or adding an Ethernet cable. This is strictly a driver indication that the interface is configured, operational, and available, and does not necessarily mean that the physical network cable is affected.

- authenticationFailure—Indicates that the agent received a protocol message that is not properly authenticated. This trap is disabled by default, but it can be enabled with the command agtcfgSet.

Enterprise-Specific Traps

The fabric supports three enterprise-specific traps. They are:

- swFault—Indicates that the diagnostics detected a fault in the switch.
- swSensorScn—Indicates that the operational state in an environment sensor, such as a fan, has changed.
- swFCPortScn—Indicates that the operational state in a Fibre Channel port has changed.

  NOTE: SNMP swFCPortScn traps are generated on GBIC insertion and removal even though the state remains offline.

Parameters can be configured with the SNMPv1 SET command with an appropriate community. These parameters can also be configured through a Telnet connection with the agtcfgSet command.

Agent Configuration

NOTE: Changes to SNMP parameters are not displayed in SNMP until the switch is rebooted. This is because SNMP runs from cache while the active settings run from the flash ROM.

The agent parameters that can be configured include:

- SNMPv1 communities (up to six)
- Trap recipients (one per community)

NOTE: You must reboot the switch for changes in the SNMPv1 communities or trap recipient parameters to take effect.

- sysName
- sysContact
- sysLocation

NOTE: The sysName, sysContact, and sysLocation parameters can be configured by the SNMPv1 SET command with an appropriate community. These parameters can also be configured using a Telnet connection and the agtcfgSet command.

- authenticationFailure
- swEventTrap level

  The swEventTrap parameter is a trap that specifies the severity level in conjunction with the security level of an event. When an event occurs, and if its severity level is at or below the set value, the trap is sent to configured recipients.

  By default, the event trap value is zero, implying that no swEventTrap is sent. Possible values are:

  - 0—None
  - 1—Critical
  - 2—Error
  - 3—Warning
  - 4—Informational
  - 5—Debug

  These parameters can be changed through SNMP or through Telnet with the agtcfgSet command.

Tools for Managing with SNMP

The Compaq StorageWorks Command Console (SWCC) software provides an easy way to set up and manage the switch. The SNMP MIBs are integrated into the SWCC software. Refer to the SWCC documentation included on the software CD for more information.

You can set up trap definitions with a number of tools, including SWCC, HP OpenView, and others. If you choose to use a tool other than the SWCC, information is provided on the software CD for Compaq CNMS and HP OpenView.

Compaq CNMS SNMP Setup

Complete the following steps to incorporate the Fibre Channel standard MIB and the Compaq-specific MIB into an SNMP management station:

1. Install Compaq-CNMS on your computer.
2. Log in to your computer.
3. Double-click the Compaq-CNMS icon.

When the User Settings wizard displays:

1. Choose *Normal* and click *Next*.
2. Choose *Default Polling* and click *Next*.
3. Change the default (write) community string to *private* and click *Next*.
4. Leave the email choices at their default values and click *Next*.
5. Leave the Web choices at their default values and click *Next*.
6. Leave the wizard choices at their default values and click *Next*.
7. Choose *Yes* for “manageable devices automatically discovered” and click *Next*.
8. Enter the gateway router IP address (provided by your network administrator).
9. Leave the “other community strings for read” at their default values and click *Next*.
10. Leave the “automatic layout settings” at their default values and click *Next*.
11. At the next window, click *Begin Discovery Now*. This completes the User Settings wizard entries.

To configure the system for the switch:

1. Go to the Tools pull-down menu and click *Create Custom Device*. You will be prompted for a Device Type Name.
2. Enter a name, such as "FC Switch," and click *Next*. You will be prompted for an icon.
3. Click *none selected*, choose an icon, and click *Next*.
4. Skip the batch file prompt. You will be prompted for the type of MIB this device supports.
5. From the list, select *RFC1213-MIB* and click *Next*.
6. The next window asks you for the SysObject ID. This is the string of numbers that defines the object ID for SNMP. Enter 1.3.6.1.4.1.1588.2.1.1.1 and click *Next*.
7. The next window prompts for a Physical Port. Enter a name for the Ethernet port, such as "Ethernet Mgmt Port." Click *Add Port* and choose *Ethernet* as the protocol.
8. At the next window, click *Finish*. A message displays stating that you successfully created a custom device type. Exit the program and restart Compaq CNMS for the device type to take effect.
9. When the program starts, the User Settings wizard displays. Click *Cancel*. The FC Switch icon displays in the networking devices area. This is the custom device type you created.
10. Drag the icon with your mouse and drop it in the window labeled Main. A picture of the FC Switch displays in the Main window.
11. A description of the switch displays. Enter a name and the IP address for your switch. Click *OK*.
12. Place the cursor on the switch and click the right mouse button. From the menu, choose *SNMP Statistics*, then *System Information*. A new window displays the information about the switch as configured through the Telnet command `agtCfgSet`. The values that display are the default settings. Change them if necessary. After you change the values, verify they are set on the switch through Telnet using the `agtcfgShow` command or through SNMP.
13. Go back to the SNMP Statistics window and choose *Protocols* for a list of supported protocols.

14. Go back to statistics and choose *MIB Browser*. A window displays with three items in a tree. Choose *Parse MIBS*.
15. Click *OK*, then choose *Browse MIB to parse* from the next window.
16. Choose *sw.mib* to compile the MIB. Exit the Parse MIB window, then exit the MIB Browser window.

HP OpenView SNMP Setup

The following example explains how to integrate a Switch Enterprise MIB to the SNMP database through HP OpenView in a Windows NT environment. For specific SNMP site requirements, see your system administrator.

To integrate the Enterprise MIB into the SNMP database:

1. Rename and place the copy of the femib.mib or swmib.mib definition under the appropriate subdirectory under HP OpenView. The default path is C:\OV\MIBS.
2. Start the OpenView manager and click *Control* on the Menu bar. Choose the SNMP Manager and the Manage Database options.
3. Click *Select*. Choose the C:\OV\MIBS\femib.mib or the C:\OV\MIBS\swmib.mib option.
4. Click the *Compile* button. You are now ready to create a submap and queries and perform SNMP operations on the switch.

Managing the Switch Using Web Management Tools

A SAN comprised of Compaq switches and other SAN devices can be managed remotely using Web Management Tools. To manage devices remotely, log on to a switch from a host with a Java-enabled Web browser through the Internet or your company Intranet. Web Management Tools let you dynamically interact with any switch in the SAN, providing remote access to the following features:

- Fabric topology and routing information
- Switch and port configurations
- Real-time graphical switch and port status and statistics reports
- Secure management
- Extensive help functions

- Out-of-band interface through a 10/100BaseT Ethernet connection
- Switch management tools
- Administrative functions

For more information on managing your switch over the Web, refer to the *Compaq StorageWorks SAN Switch Web Management Tools Reference Guide*.

Managing the Switch Using the StorageWorks Command Console

The Compaq StorageWorks Command Console (SWCC) software lets you manage the switch, fabric, and storage subsystems from a common user interface. The window organizes the Fibre Channel network devices into an expandable and collapsible directory tree, simplifying navigation. The Web Management Tools are accessible from the SWCC user interface, providing additional ease and flexibility in device management.

For more information on managing your switch through the command console, refer to the *Compaq StorageWorks Command Console for the SAN Switch Installation Guide*.

Fabric Management through a Single Ethernet Port

Multiple Compaq switches can be managed through a single IP connection to one of the switches using Telnet services, Web Management Tools, or SNMP commands. Each switch supports a 10/100BaseT Ethernet connection, which is the general link for IP services. A second IP connection, the Fibre Channel IP or in-band support, is also available for use when managing a switch.

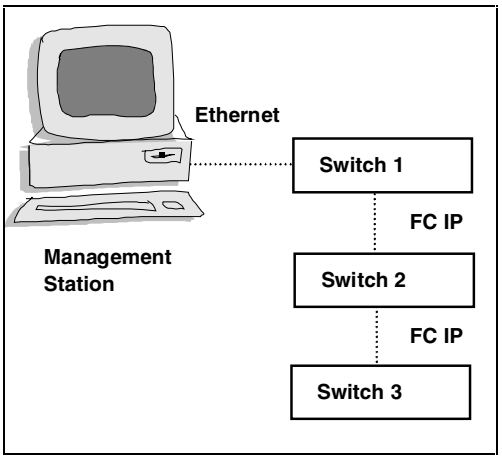

Figure 2-2. Single-port management of switches

There are no host bus adapters that can initiate in-band Fibre Channel IP connection. At least one switch must have an Ethernet connection. From that entry point you can manage the remaining switches in the fabric using in-band IP services. The management workstation runs a Web browser, a Telnet session, or SNMP to address the switch that has an Ethernet connection. Therefore, the management workstation and the Ethernet IP address of the switch must be in the same subnet. In addition, the management station must have either a static route to the Fibre Channel IP subnet, or the switch must be the default gateway for the management workstation. This allows the management station to direct IP to or through the switch.

The switches not connected to the Ethernet connection must have:

- The same default gateway value as the switch that is connected to the Ethernet connection.
- FC IP addresses in a different subnet from the Ethernet IP addresses of the management station.
- FC IP addresses in the same subnet as the FC IP address of the switch that is connected to the Ethernet connection.

Table 2-3
Example IP Address Settings

	Management Station	Switch 1	Switch 2	Switch 3
Ethernet IP Address	192.168.1.09	192.168.1.10	204.1.1.11	204.1.1.12
FC IP Address	192.168.65.09	192.168.65.10	192.168.65.11	192.168.65.12
Default Gateway	192.168.1.10	any	192.168.65.10	192.168.65.10

Syslog Daemon

A UNIX-style syslog daemon (syslogd) reads system events, forwards system messages to users, and writes the events to log files according to your system configuration.

Introduction

Syslogd categorizes events by facility and severity. Refer to the manual pages on your UNIX system for a list of facilities and severity levels.

The log process documents errors and system events on the local machine and sends the information to a user or system administrator. The daemon is constantly running and ready to receive messages from system processes. The events are logged according to the statements in the configuration file.

In addition, syslogd can receive messages from a remote machine. Syslogd listens to UDP port 514 for system events. A remote machine does not have to be running UNIX to forward messages to syslogd, but it must follow the basic syslog message format standard.

An example entry in a syslogd log file is:

```
Jul 18 12:48:00  sendmail[9558]: NOQUEUE: SYSERR(uucp):
/etc/mail/sendmail.cf: line 0: cannot open: No such file or directory
```

The first two items are the event's date and time (as known by the machine on which syslogd is running) and the name of the machine that issued the error. This would be the local machine if the message is generated by a task running on the same machine as syslogd, or a remote machine if the message was received on UDP port 514. The first two items are always present while other entries are message-specific.

> **NOTE:** The log file can be located on a different machine and be remotely mounted. A local error is an error that occurs where syslogd is running, not on the machine where the error log physically resides.

Syslogd applications for Microsoft Windows NT and Windows 95 are available at no charge on several FTP servers on the Internet.

Syslogd Support

Switch firmware maintains an internal log of all error messages. The log is implemented as a circular buffer with a storage capability of 30 errors. After 30 errors have been logged, the next error message overwrites the oldest message at the beginning of the buffer.

The switch can be configured to send internal error messages to syslog by sending a UDP packet to port 514 on the syslogd machine. This allows storage of switch errors on a syslogd-capable machine and avoids the limitations of the circular buffer.

Syslogd provides system error support by means of a single log file and can notify a system administrator in real time of error events. The daemon also provides dial home capability.

Error Message Format

Each logged error message sends the following information:

- Error number (1 for the first error after boot, incremented by one with each new error)
- The error message, exactly as it is stored in the error log (and printed by the `errShow` command)

The error number helps identify the error and determine when a switch rebooted. For example, if a log of error number `N` from the switch is followed by a log of error number `0`, then the switch rebooted between the two errors.

The error message includes the switch that reported the error and the following event information:

- ID of the task that generated the error
- Name of the task that generated the error
- Date and time when the error occurred, as seen by the switch. This can be different from the first item in the log file, which is the time of the error as seen by the syslogd machine. These two time values are different if the clocks in the switch and in the syslogd machine are not in sync.
- Error identifier consisting of a module name, a dash, and an error name

- Error severity
- Optional informational part
- Optional stack trace

Example:

Syslogd running on switch sw9 is sending log events to the UNIX machine called example. The following is an example of a no memory error generated by the shell. This is a severity 1 (LOG_CRITICAL) error. Syslogd is configured to store the errors in the /VAR/ADM/SILKWORM file similar to the following.

```
example% egrep sw9 /var/adm/silkworm
Jul 11 16:48:25 sw9 1 0x103d8620 (tShell): Jul 11 16:48:19
      Jul 11 16:48:25 sw9Error SYS-NOMEM, 1, No memory
      Jul 11 16:48:25 sw9 Traceback:
      Jul 11 16:48:25 sw9 _tl+0x40 (0x103a2030)
      Jul 11 16:48:25 sw9 _yystart+0x95c (0x1017128c)
      Jul 11 16:48:25 sw9 _yyparse+0x694 (0x10172dc4)
      Jul 11 16:48:25 sw9 _execute+0xdc (0x1014c06c)
      Jul 11 16:48:25 sw9 _shellTask+0x964 (0x1003aea4)
      Jul 11 16:48:25 sw9 _shellTask+0x198 (0x1003a6d8)
      Jul 11 16:48:25 sw9 _vxTaskEntry+0x10 (0x10114d14)
      Jul 11 16:48:25 sw9
```

Message Classification

Syslogd messages are classified according to facility and priority (severity code), which lets a system administrator take different actions for different errors. The action taken, based on the message's facility and priority, is defined in the syslog configuration file. Example configurations are provided in a following section.

The switch uses the facility local7 for all error messages sent to the syslogd.

UNIX provides eight priorities and the switch provides four severity codes [code LOG_PANIC (0) causes a reboot and is not sent to the syslogd]. The mapping between the switch's severity codes and UNIX syslogd priorities is provided in the following table.

Table 2-4
Syslog Message Classification

Switch	UNIX
LOG_CRITICAL (1)	Alert
LOG_ERROR (2)	Err
LOG_WARNING (3)	Warning
LOG_DEBUG (4)	Debug

Switch Configuration

To start the syslogd, type the following command:

```
syslogdIp <IP address of the syslogd machine>
```

The syslogdIp command with no parameter prints the IP address of the current target syslogd machine. An IP address of 0.0.0.0 disables the forwarding of error messages to syslogd. In this case, error messages are logged internally to the switch, but the messages are not forwarded to the syslogd.

Examples

Enable and verify syslogd support:

```
syslogdIp "10.0.0.1"
syslogdIp
syslog daemon's address: 10.0.0.1
```

Disable syslogd support:

```
syslogdIp "0.0.0.0"
syslogdIp
syslog daemon's address: 0.0.0.0
```

Syslogd Configuration

The syslog configuration provides the syslogd with instructions for handling different messages. The following are example entries in a syslog configuration file (/ETC/SYSLOG.CONF) that show the switch error messages that are stored in different files. Refer to the syslog manual pages on your UNIX system for the full documentation of the syslog configuration file. The following entry in /ETC/SYSLOG.CONF causes all messages from the switch of UNIX priority warning or higher (switch severity LOG_WARNING or higher) to be stored in the file /VAR/ADM/SILKWORM.

```
local7.warning          /var/adm/silkworm
```

The following entries in /ETC/SYSLOG.CONF cause the messages from the switch of UNIX priority alert (switch severity LOG_CRITICAL) to be stored in the file /VAR/ADM/ALERT, and all other messages from the switch to be stored in the file /VAR/ADM/SILKWORM.

```
local7.alert            /var/adm/alert
local7.debug            /var/adm/silkworm
```

The local7 prefix identifies the message from a switch. A file must exist and have the proper permission in order for the syslogd to write to it.

Appendix ***A***

Telnet Commands

Introduction

This appendix contains information and examples on managing and monitoring Compaq StorageWorks SAN Switches using Telnet with:

- QuickLoop-specific commands
- General commands
- Diagnostic commands
- Routing commands
- License commands

You can configure, operate, and test the switch using the following commands and settings through the Telnet interface.

NOTE: Screen displays in this appendix are generic. Your display will vary depending on your configuration, licenses, and port type.

QuickLoop-Specific Telnet Commands

QuickLoop-specific Telnet commands let you manage the QuickLoop topology.

qlDisable

The following figure shows the qlDisable command, which disables QuickLoop on a switch with a Fabric Operating System license. This command resets the switch to fabric mode and reenables the ports as U_Ports.

```
admin> qlDisable
Setting switch to Fabric mode,
Committing configuration...done.
Re-enable FL_Ports
```

Figure A-1. qlDisable command example

qlEnable

The following figure shows the qlEnable command, which enables QuickLoop on a switch with a Fabric Operating System license. This command sets the switch to QuickLoop mode.

```
admin> qlEnable
Setting switch to QuickLoop mode,
Committing configuration...done.
Initialize QuickLoop
```

Figure A-2. qlEnable command example

qlPortDisable

The following figure shows the qlPortDisable command, which sets a port on a switch with a Fabric Operating System license to fabric mode.

```
admin> qlPortDisable 6
Setting port to Fabric mode,
Committing configuration...done.
De-activate looplet 6
```

Figure A-3. qlPortDisable command example

qlPortEnable

The following figure shows the qlPortEnable command, which sets a port on a switch with the Fabric Operating System license to QuickLoop mode.

```
admin> qlPortEnable 6
Setting port to QuickLoop mode,
Committing configuration...done.
Activate looplet 6
```

Figure A-4. qlPortEnable command example

qlPartner

The following figure shows the qlPartner command, which prints and sets the QuickLoop partner. For a dual-switch QuickLoop, both switches must have the Fabric Operating System license installed. Issue the qlPartner command on both switches by including the remote switch's WWN. To set QuickLoop in single-switch mode, include a zero (0) with the command.

```
admin> qlPartner 0
Setting QuickLoop to single-switch mode,
Committing configuration...done.

admin> qlPartner
QuickLoop is in single-switch mode, partner is not specified.

admin> qlPartner "10:00:00:60:69:10:02:0d"
Setting QuickLoop to dual-switch mode,
Committing configuration...done.

admin> qlPartner
QuickLoop is in dual-switch mode, partner is
10:00:00:60:69:10:02:0d.
```

Figure A-5. qlPartner command example

qlHelp

The following figure shows the qlHelp command, which displays a list of QuickLoop commands.

```
admin> qlHelp
qlDisable          Disable QuickLoop mode
qlEnable           Enable QuickLoop mode
qlPortDisable      Set port in non QuickLoop mode
qlPortEnable       Set port in QuickLoop mode
qlPartner          Print/set QuickLoop partner
qlShow             Print QuickLoop info
```

Figure A-6. qlHelp command example

qlShow

The following figure shows the qlShow command, which displays the current QuickLoop configuration. In this example, QuickLoop is in the dual-switch mode. The following table describes the command fields.

NOTE: Although this example shows port 15 as part of the QuickLoop configuration, the port is actually an E_Port cascaded to the remote switch.

```
admin> qlShow
Self:       10:00:00:60:69:10:02:09 domain 1
Peer:       10:00:00:60:69:10:02:0d domain 2
State:      Master
Scope:      dual
AL_PA bitmap:  18000000 00000000 00000000 000000ff
Remote AL_Pas
[021600]:      e2 e4 e8 ef
[021700]:      04
[021900]:      da dc e0 e1
Local AL_Pas
[011900]:      02
Local looplet states
Member: 0   1   2   3   4   5   6   7   8   9   11  12  13  14  15
Online:  -   -   -   -   -   -   -   -   -   9   -   --  --  --  --
Looplet 0:     offline
Looplet 1:     offline
Looplet 2:     offline
Looplet 3:     offline
Looplet 4:     offline
Looplet 5:     offline
Looplet 6:     offline
Looplet 7:     offline
Looplet 8:     offline
Looplet 9:     online
Looplet 11:    offline
Looplet 12:    offline
Looplet 13:    offline
Looplet 14:    offline
Looplet 15:    offline
```

Figure A-7. qlShow command example

Table A-1
qlShow Command Field Descriptions

Field	Description
Self	The local switch with its WWN and domain number
Peer	The remote switch with its WWN and domain number (if QuickLoop is in a dual-switch mode)
State	Indicates if the local switch is the master or nonmaster
Scope	Indicates if the QuickLoop mode is dual or single
AL_PA bitmap	All AL_PAs in the QuickLoop
Remote AL_PAs	The looplets and devices in QuickLoop mode on the remote switch
Local AL_PAs	The looplets and devices in QuickLoop mode on the local switch
Local looplet states	The looplets, member switch ports, online QuickLoop ports, and looplet port status

General Commands

General commands let you control basic switch operations.

agtcfgDefault

The following figure shows the agtcftDefault command, which lets an admin user reset the configuration of the SNMP agent to factory defaults. The following table describes the fields.

```
switch:admin> agtcfgDefault
Committing configuration...done.
agent configuration reset to factory default
sw5:admin> agtcfgShow
Current SNMP Agent Configuration
Customizable MIB-II system variables:
    SysDescr          =  Fibre Channel Switch
    SysLocation       =  End User Premise
    SysContact        =  Field Support
    SwEventTrapLevel  =  0
    AuthTraps         =  0 (OFF)

SNMPv1 community and trap recipient configuration:
   Community 1: Secret COde (rw)
      No trap recipient configured yet
   Community 2: OrigEquipMfr (rw)
      No trap recipient configured yet
   Community 3: private (rw)
      No trap recipient configured yet
   Community 4: public (ro)
      No trap recipient configured yet
   Community 5: common (ro)
      No trap recipient configured yet
   Community 6: FibreChannel (ro)
      No trap recipient configured yet
sw5:admin>
```

Figure A-8. agtcfgDefault command example

Table A-2
agtcfg Field Descriptions

Field	Description
sysDescr	The system description (in MIB-II definition). The default value is set as "Fibre Channel Switch."
sysLocation	The location of the switch (in MIB-II). The default value is set as "End User Premise."
sysContact	The contact information for this system (switch). The default value is set as "Field Support."
swEventTrapLevel	The event trap level in conjunction with an event's severity level. When an event occurs with a severity level at or below the set value, the SNMP trap swEventTrap is sent to configured trap recipients. By default, this value is set at 0, implying that no swEventTrap is sent. Possible values are: ■ 0—None ■ 1—Critical ■ 2—Error ■ 3—Warning ■ 4—Informational ■ 5—Debug
authTraps	The authentication trap authenticationFailure is transmitted to configured trap recipients when the agent receives a protocol message that is not properly authenticated. In the context of SNMPv1 and SNMPv2c, this means that a request contains a community string that is not known to the agent. The default value for this parameter is 0 (disabled).

There are six communities and respective trap recipients supported by the agent. The first three communities are for read-write access (rw) and the last three are for read-only access (ro). The factory default value for the trap recipient of each community is 0.0.0.0. The factory default values for the community strings are:

1. Secret C0de
2. OrigEquipMfr
3. private

4. public
5. common
6. FibreChannel

agtcfgSet

The following figure shows the agtcfgSet command, which is used to set the SNMP agent configuration to a Fibre Channel switch. Table A-2 describes the fields.

NOTE: Any change to the SNMP configuration is not shown until you reboot the switch.

```
admin> agtcfgSet

Customizing MIB-II system variables ...

At each prompt, do one of the followings:
   O <Return> to accept current value,
   O enter the appropriate new value,
   O <Control-D> to skip the rest of configuration, or
   O <Control-C> to cancel any change.

To correct any input mistake:
<Backspace> erases the previous character,
<Control-U> erases the whole line,
sysDescr: [Fibre Channel Switch]
sysLocation: [End User Premise]
sysContact: [Field Support]
authTrapsEnabled (true, t, false, f): [false]

SNMP community and trap recipient configuration:
Community: [Secret C0de]
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community: [OrigEquipMfr]
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community: [private]
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community: [public]
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community: [common]
Trap Recipient's IP address in dot notation: [0.0.0.0]
Community: [FibreChannel]
Trap Recipient's IP address in dot notation: [0.0.0.0]
```

Figure A-9. agtcfgSet command example

agtcfgShow

The following figure shows the agtcfgShow command, which displays SNMP agent configuration. The fields are described in Table A-2.

```
admin> agtcfgShow
Current SNMP Agent Configuration
Customizable MIB-II system variables:
    SysDescr     = Fibre Channel Switch.
    SysLocation  = End User Premise
    SysContact   = Field Support.
    AuthTraps    = 0 (OFF)

SNMPv1 community and trap recipient configuration:
  Community 1: Secret C0de (rw)
    No trap recipient configured yet
  Community 2: OrigEquipMfr (rw)
    No trap recipient configured yet
  Community 3: private (rw)
    No trap recipient configured yet
  Community 4: public (ro)
    No trap recipient configured yet
  Community 5: common (ro)
    No trap recipient configured yet
  Community 6: FibreChannel (ro)
    No trap recipient configured yet
```

Figure A-10. agtcfgShow command example

aliasShow

The following figure shows the aliasShow command, which displays local Alias Server information. If there is no local alias group, a message stating that is displayed. The command fields are described in the following table.

```
admin> aliasShow
The Local Alias Server has 1 entry
Alias ID Creator Token [rb, type, grptype, qlfr] Member List
fffb01  fffffd  [40, 05, 10000060 69000015] {2d0113 2d0813}
```

Figure A-11. aliasShow command example

Table A-3
aliasShow Command Field Descriptions

Field	Description
Alias ID	The multicast address, which has the format of FFFBxx, where xx is an odd number starting at 01 and continuing through 239. This is the name of the multicast group.
Creator	The Fibre Channel address ID of the N_Port that created this alias group
Creator Token	The Alias Token provided to map to the alias group. The token consists of 4 subfields: ■ rb—Routing bits ■ type—Upper level application type ■ grptype—The alias group type ■ qlfr—Alias Qualifier of the group
Member List	A list of member address IDs

configure

The following figures show the configure command, which is used to set some of the switch configuration parameters. This command cannot be executed on an enabled switch. Disable the switch by using the switchDisable command.

The configure command is navigated by entering a series of collapsible top-level menus. Each menu divides the various switch configuration parameters into logical groups, which include fabric parameters, virtual channel parameters, arbitrated loop parameters, and system service parameters. Each top-level menu and its associated submenus consist of a text prompt, a list of acceptable values, and the current value (shown in brackets). The current value is used in the absence of an entered value when a carriage return is the only input entered at the prompt.

```
switch:admin> configure
Configure...
Fabric parameters (yes, y, no, n): [no]
Virtual Channel parameters (yes, y, no, n): [no]
Arbitrated Loop parameters (yes, y, no, n): [no]
System services (yes, y, no, n): [no]
No changes.
```

Figure A-12. Top level menus for the configure command

Entering out-of-range or inappropriate values causes error messages to display and the original entry prompt to redisplay. You can cancel the command at any time by sending an interrupt control character (**Ctrl+C**). You can also complete the command at any time, with the current changes saved, by sending an end-of-file control character (**Ctrl+D**).

```
switch:admin> configure
Configure...
Fabric parameters (yes, y, no, n): [no] yes
Domain: (1..239) [1]
BB credit: (1..16) [16]
R_A_TOV: (4000..120000) [10000]
E_D_TOV: (1000..5000) [2000]
Data field size: (256..2112) [2112]
Non-SCSI Tachyon Mode: (0..1) [0]
Disable Device Probing: (0..1) [0]
Unicast-only Operation: (0..1) [0]
VC Encoded Address Mode: (0..1) [1]
Per-frame Route Priority: (0..1) [0]

Virtual Channel parameters (yes, y, no, n): [no] yes

VC Link Control: (0..1) [0]
VC Class 2: (2..5) [2]
VC Class 3: (2..5) [3]
VC Multicast: (6..7) [7]
VC Priority 2: (2..3) [2]
VC Priority 3: (2..3) [2]
VC Priority 4: (2..3) [2]
VC Priority 5: (2..3) [2]
VC Priority 6: (2..3) [3]
VC Priority 7: (2..3) [3]

Arbitrated Loop parameters (yes, y, no, n): [no] yes

Send FAN frames?: (0..1) [1]

System services (yes, y, no, n): [no] yes

rstatd (on, off): [off] on
rusersd (on, off): [off] on
No changes.
Disable Translative Mode: (0..1) [0]
```

Figure A-13. Top level menus and submenus for the configure command

```
switch:admin> configure
Configure...
Fabric parameters (yes, y, no, n): [no] y
Domain: (1..239) [0] 256
integer must be between 1 and 239 - please re-enter
Domain: (1..239) [0]
BB credit: (1..16) [16] one
Input not acceptable, please re-enter
BB credit: (1..16) [16]
R_A_TOV: (4000..120000) [10000]
E_D_TOV: (1000..5000) [2000] 4900
integer must be a multiple of 1000 - please re-enter
E_D_TOV: (1000..5000) [2000] 5000
Data field size: (256..2112) [2112] ^D
Committing configuration...done.
```

Figure A-14. Configure command with inappropriate inputs

A number of parameters control the overall behavior of the fabric. Some of these values, such as the domain, are normally assigned automatically by the fabric and can be different from one switch to another in the fabric. Other parameters, such as the buffer-to-buffer credit or the time out values, can be changed to suit particular applications or operating environments but must be in agreement among all switches to allow formation of the fabric. The following table defines the settings affecting the fabric that can be changed.

Table A-4
Adjustable Fabric Settings

Field	Type	Default	Range
Domain	Number	1	Varies
BB Credit	Number	16	1 - 16
R_A_TOV	Number	10000	E_D_TOV * 2 to 120000
E_D_TOV	Number	2000	1000 to R_A_TOV / 2
Data Field Size	Number	2112	256 to 2112
Non-SCSI Tachyon Mode	Boolean	0	0 or 1
Disable Device Probing	Boolean	0	0 or 1
VC Encoded Address Mode	Boolean	0	0 or 1
Disable Translative Mode	Boolean	0	0 or 1
Per-frame Route Priority	Boolean	0	0 or 1

The following table lists the configurable fabric parameters.

Table A-5
Fabric Parameters

Field	Description
Domain	The domain number identifies the switch in a fabric and can be any value between 1 and 239. Normally, this value is automatically assigned by the fabric.
BB Credit	The buffer-to-buffer (BB) credit represents the number of buffers, in a range from 1 to 16, available to the host. For a complete description of this value, refer to the industry specification Fibre Channel Physical and Signaling Interface (FC-PH).
R_A_TOV	The Resource Allocation Time Out Value (R_A_TOV) is displayed in milliseconds. This variable works with the variable E_D_TOV to determine the switch's actions when presented with an error condition. Allocated circuit resources with detected errors are not released until the time out value has expired. If the condition is resolved prior to the time out, the internal time out clock resets and waits for the next error condition.
E_D_TOV	The Error Detect Time Out Value (E_D_TOV) is displayed in milliseconds. This timer flags a potential error condition when an expected response is not received (an acknowledgment or reply in response to packet receipt, for example) within the set time limit. If the time for an expected response exceeds the set value, then an error condition is met.
Data Field Size	The Data Field Size specifies the largest possible value, in bytes, for the size of a type 1 (data) frame. The switch advertises this value to other switches in the fabric during construction of the fabric as well as to other devices when they connect to the fabric. Setting this to a value smaller than 2112 can result in decreased performance.

continued

Table A-5
Fabric Parameters *continued*

Field	Description
Non-SCSI Tachyon Mode	When set, multiple sequences from different sources are interleaved to Tachyon-based controllers at sequence boundaries rather than at frame boundaries, resulting in better performance from Tachyon-based controllers. Set this mode when there are no Tachyon-based SCSI host adapters connected to the fabric.
Disable Device Probing	When device probing is disabled, devices that do not register themselves with the Name Server will not be present in the Name Server data base. Set this mode only if the switch's N_Port discovery process (PLOGI, PRLI, INQUIRY) causes some attached device to fail.
VC Encoded Address Mode	When this mode is set, frame source and destination addresses use an address format compatible with first-generation switches. Set this mode only if the fabric includes such switches. In this mode, the maximum number of switches in a fabric is limited to 32.
Disable Translative Mode	This setting is only relevant if the VC Encoded Address Mode is also set. When set, this setting maintains explicit address compatibility with first-generation switches. However, enabling this feature also disables translative or phantom addressing. Set this mode only if hardware or software systems that explicitly rely on a specific frame address format are attached to the fabric.
Per-frame Route Priority	In addition to the eight virtual channels used in frame routing priority, support is also available for per-frame based prioritization. When set, the virtual channel ID will be used in conjunction with a frame header to form the final virtual channel ID.

The switch can be tuned for a specific application by configuring the parameters for the switch's eight virtual channels. The first two virtual channels are reserved for the switch's internal functions and are not user-configurable. The default virtual channel settings have already been optimized for switch performance. Changing the default values, if properly selected, can improve switch performance somewhat, but can also severely degrade switch performance. Do not change these settings without fully understanding the effects of those changes.

Table A-6
Virtual Channel Parameters

Field	Description	Default
VC Link Control	This changes the virtual channel used for N_Port-generated, Class 2 link control frames (ACKs, P_BSYs, and P_RJTs). 0—Forces N_Port-generated link control frames to be sent back using a Class 2 data virtual channel 1—Forces N_Port-generated link control frames to be sent back using a virtual channel normally reserved for fabric-internal traffic	0
VC Class 2	Sets the virtual channel used for class 2 frame traffic. Can be set to virtual channel 2, 3, 4, or 5.	2
VC Class 3	Sets the virtual channel used for class 3 frame traffic. Can be set to virtual channel 2, 3, 4, or 5.	3
VC Multicast	Sets the virtual channel used for multicast frame traffic. Verify that the multicast channel has the frame class priority set to the frame class of the expected traffic.	7
VC Priority 2-7	The numbers displayed show the priorities assigned to each of the switch's virtual channels. Allowed values are 2 or 3, indicating that the channel gives priority to either Class 2 or Class 3 frame traffic, respectively.	2 or 3

Table A-7
Arbitrated Loop Parameters and System Services

Field	Description	Default
Send FAN frames?	Fabric Address Notification (FAN) frames are sent by the fabric to notify public loop devices about their node ID and address. 0—No, do not send Fabric Address Notification frames. 1—Yes, send Fabric Address Notification frames.	1
Always send RSCN?	Following the completion of loop initialization, a remote state change notification (RSCN) is issued only when FL_Ports detect the presence of new devices or the absence of preexisting devices. When this feature is set, an RSCN will always be issued following the completion of loop initialization, regardless of the presence or absence of new or preexisting devices.	0
Do Not Allow AL_PA 0x00?	Prevents the FL_Port from using AL_PA 0x00. Set this parameter to 1 to force the FL_Port to go to the next available AL_PA upon initialization.	0
rstatd	Dynamically enables or disables a server that returns information via remote procedure calls (RPC) about system operation information. The protocol provides for a wide-range of system statistics; however, only the Ethernet interface statistics and system up time are supported. The retrieval of this information is supported by a number of operating systems that support RPC. On most UNIX-based systems (HP-UX, Irix, Linux, Solaris, and so on) the commands to retrieve the information are rup and rsysinfo. Refer to your local system documentation for the appropriate usage of the rup, rsysinfo, or equivalent commands.	Off
rusersd	Dynamically enables or disables a server that returns information via remote procedure calls (RPC) about the user logged in to the system. The information returned includes: the user login name, the system name, the login protocol or type, login time, idle time, and remote login location (if applicable). The retrieval of this information is supported by a number of operating systems that support RPC. On most UNIX-based systems (HP-UX, Irix, Linux, Solaris, and so on) the command to retrieve the information is rusers. Refer to your local system documentation for the appropriate usage of the rusers or equivalent command.	Off

configDefault

The following figure shows the configDefault command, which resets some of the switch configuration values to their factory default values. This command also configures the switch to boot from its internal firmware if it has been previously configured to boot from the network. This command cannot be executed on an enabled switch; you must first disable the switch using the switchDisable command.

```
switch:admin> configDefault
Committing configuration...done.
```

Figure A-15. configDefault command example

Because the switch caches some configuration parameters, reboot the switch immediately following the execution of the configDefault command, otherwise unexpected behavior can result. With the exception of the following, all configuration parameters are reset to their default values:

- World Wide Name
- Ethernet MAC address
- Ethernet IP address and subnetmask
- IP gateway address
- SNMP configuration
- Zoning configuration
- License keys
- System name

configShow

The configShow command displays the current settings of many of the switch's configurable parameters. The following figure shows the operation of the command. The output of the command is divided into two sections: the first displays the switch's boot settings and the second displays other configuration parameters, most of which are set from the configure command.

```
switch:admin> configShow
Ethernet address: 0:60:69:0:60:10
Nvram data: fei(0,0)host:/usr/switch/firmware e=192.168.1.2
g=192.168.1.254
u=user tn=switch
Type <CR> to continue, Q<CR> to stop:
diag.postDisable:
1fabric.domain: 1
fabric.ops.BBCredit: 16
fabric.ops.E_D_TOV:2000
fabric.ops.R_A_TOV:10000
fabric.ops.dataFieldSize:2112
fabric.ops.mode.fcpProbeDisable:0
fabric.ops.mode.isolate:0
fabric.ops.mode.tachyonCompat: 0
fabric.ops.mode.unicastOnly: 0
fabric.ops.mode.useCsCtl:0
fabric.ops.mode.vcEncode:0
fabric.ops.vc.class.2: 2
fabric.ops.vc.class.3: 3
fabric.ops.vc.config: 0xc0
fabric.ops.vc.linkCtrl: 0
fabric.ops.vc.multicast:7
fc4.fclp.address:0.0.0.0
fc4.fclp.mask: 0.0.0.0
fcAL.fanFrameDisable: 0
fcAL.useAltBBCredit: 0
lcdContrast: 128
licenseKey:none
rpc.rstatd:0
rpc.rusersd:0
```

Figure A-16. configShow command example

date

The following figure shows the date command, which displays the system date and time. To set the date and time:

1. Type the date command followed by the date in the format "mmddHHMMyy" where:
   - mm is the month
   - dd is the day
   - HH is the hour
   - MM is the minutes
   - yy is the year.

     The system is year 2000 compliant, where 00 through 69 equals 20xx and 70 through 99 equals 19xx.
2. Press **Enter** to set the date and time.

```
admin> date
Mon Jul  7 08:48:01 1997
value = 25 = 0x19
admin> date "060811241998"
Mon Jun 8 11:24:00 1998
```

Figure A-17. date command example

errDisplayFilter

The errDisplayFilter command specifies the minimum error level to be reported on the Compaq StorageWorks SAN Switch 16 only. Error level values are from 1 to 5. Errors of severity lower than 4 are available for display in the error log.

```
switch:admin> errDisplayFilter
```

Figure A-18. errDisplayFilter command example

errDump

The following figure shows the errDump command, which prints the contents of the error log with no page breaks.

```
switch:admin> errDump

Error 02
--------
0x103dc470 (tSilkworm): Apr 9 10:41:06
Error SENSOR-FAILED, 3, sensor 7 (Fan 2) is below minimum

Error 01
--------
0x103dc470 (tSilkworm): Apr 9 10:40:51
Error DIAG-TIMEOUT, 1,
Port 2 receive timeout.
```

Figure A-19. errDump command example

errShow

The following figure shows the errShow command, which displays all detected errors. The error log stores the last 30 error types sensed by the switch. The log shows:

- Error number (01 to 30)
- Date and time the first occurrence of each error type was sensed
- Total number of occurrences of each error type (up to 999)
- Error type
- Error level for each error type:
  - 0–Panic (When this level is reached, the switch automatically reboots and the display no longer shows the error.)
  - 1–Critical
  - 2–Error
  - 3–Warning
  - 4–Debug

```
admin> errShow

Error 02
--------
0x103dc470 (tSilkworm): Apr  9 10:41:06
   Error SENSOR-FAILED, 3, sensor 7 (Fan 2) is below
minimum

Type <CR> to continue, Q<CR> to stop:

Error 01
--------
0x103dc470 (tSilkworm): Apr  9 10:40:51
   Error DIAG-TIMEOUT, 1,
  Port 2 receive timeout.

Type <CR> to continue, Q<CR> to stop:
```

Figure A-20. errShow command example

fabricShow

The following figure shows the fabricShow command, which displays a list of switches and multicast alias groups in a fabric. If the switch supporting the Telnet connection does not have a Fabric Operating System license, this command only indicates that switch. The following table describes the fields.

```
admin> fabricShow
Switch ID  Worldwide Name              Enet IP Addr    FC IP Addr  Name
-----------------------------------------------------------------------
0: fffc40  10:00:00:60:69:00:10:63  192.168.1.1     0.0.0.0      "sw1"
1: fffc41  10:00:00:60:69:00:0a:12  192.168.1.2     0.0.0.0      "sw2"
2: fffc42  10:00:00:60:69:00:01:b4  192.168.1.3     0.0.0.0     >"sw3"
```

Figure A-21. fabricShow command example

Table A-8
fabricShow Command Field Descriptions

Fabric Element	Description
switch n	Each line shows: ■ The switch's domain ID (0 - 31) ■ The switch's embedded port ID ■ The switch's World Wide Name ■ The switch's Ethernet and FC IP addresses ■ The switch's name (a ">" indicates the principle switch in the fabric)
multicast alias group	Each line shows: ■ The alias group number (0-30) ■ The alias group ID ■ The alias token Alias groups are only created on demand by requests to the alias server. Typically no groups are listed.

fanShow

The following figure shows the fanShow command, which displays the current status of the switch's fans. The format of the display varies according to the switch model and number of fans present. The status of each fan is shown as:

- OK—Fan is functioning correctly.
- Absent—Fan is not present.
- Below minimum—Fan is present but not rotating or rotating too slowly.

```
admin> fanShow
Fan 1 is OK, speed is 8460 RPM
Fan 2 is OK, speed is 8220 RPM
Fan 3 is OK, speed is 8340 RPM
Fan 4 is OK, speed is 8850 RPM
```

Figure A-22. fanShow command example

fastboot

The following figure shows the fastboot command, which is a warm reboot that bypasses POST and takes about one minute to reboot the switch. The switch can be in any operational state (enabled or disabled) before rebooting.

```
admin> fastboot

Rebooting...
```

Figure A-23. fastboot command example

firmwareDownload

The firmwareDownload 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.

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 NT, a daemon to support an RSH is required. Firmware is downloaded through an RCP command running on top of TCP between the switch and the host.

A Compaq StorageWorks SAN Switch comes with preloaded firmware. In most cases there is no need to update the firmware on a new Compaq StorageWorks SAN Switch. The firmware version can be determined by using the front panel of a SAN Switch 16 or by using a Telnet command.

To upgrade the firmware of a Compaq StorageWorks SAN Switch, the latest version of the Compaq StorageWorks SAN Switch CD is needed. Use one of the following three procedures (NT Intel, NT Alpha, or Tru64 Unix).

Host with NT Intel

To load the Compaq StorageWorks SAN Firmware from a Compaq PC running Windows NT Intel:

1. Copy the files *RSHD.EXE* and *CAT.EXE* to the root directory for your system. These files are found in:
   D:\DSGGA\Firmware\NTIntel\Rshd.exe
   D:\DSGGA\Firmware\NTIntel\Cat.exe
   D:\DSGGA\Firmware\NTIntel\V2.03a

   where D:\ is the drive letter for the CD and V2.03a 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. Place the cursor over the Start button, press the left mouse button, and hold it down to select Run.

4. Let go of the left mouse button and type `TELNET`.

5. Select Connect.

6. From the menu, select Remote System.

7. In the box labeled Host Name, type the IP address of the Compaq StorageWorks SAN Switch.

8. Connect to the switch and log in as admin.

9. At the prompt, type:

   ```
   firmwareDownload "192.168.60.200", "administrator" , "V2.03a"
   ```

   where 192.168.60.200 is the IP address of your host computer, V2.03a is the current firmware version, and administrator is the account you are using to run *RSHD.EXE*. *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>
   ```

10. Click the RSHD window and select Exit for the File menu.

11. Select the Telnet window and enter `reboot`. The switch reboots and copies the firmware into RAM.

Host with NT Alpha

To load the Compaq StorageWorks SAN Firmware from an Alpha NT machine:

1. Copy the files *RSHD.EXE* and *CAT.EXE* to the root directory for your system. These files can be found in:
   D:\DSGGA\Firmware\NTAlpha\Rshd.exe
   D:\DSGGA\Firmware\NTAlpha\Cat.exe
   D:\DSGGA\firmware\NTAlpha\V2.03a

   where D:\ is the drive letter for the CD and V2.03a is the latest version of firmware.

2. Double-click *RSHD.EXE*.

3. Run Telnet to connect to the switch and login as admin.

4. At the prompt, type:

   ```
   firmwareDownload "192.168.60.200", "administrator" , "V2.03a"
   ```

   where 192.168.60.200 is the IP address of your host computer, V2.03a is the current firmware version, and administrator is the account you are using to run *RSHD.EXE*. *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>
   ```

5. Click the RSHD window and select Exit for the File menu.

6. Select the Telnet window and enter reboot. The switch reboots and copies the firmware into RAM.

Host with Tru64 (Unix)

To load the firmwarefrom a host running Compaq Tru64 (UNIX):

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

   mount -t cdfs -r /dev/rz5c /mnt

   where 5 is the unit number of your CD drive.

2. Change to the CD directory by entering:

   cd mnt

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

   cp DSGGA/Firmware/v2.03a/mary/tmp/v2.03a

   where mary is the user name on the Compaq Tru64 host and v2.03a is the current firmware version. The Compaq StorageWorks SAN Switch uses the remote shell capabilities of Unix to log in to the Compaq Tru64 host and copy the firmware image. The user (mary) and the switch's IP address must be in the .rhosts file on the Compaq Tru64 host to allow login without a password.

4. Telnet to the switch by entering:

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

5. To download the firmware from the host to the switch's flash memory, enter the following command line at the Telnet prompt:

   firmwareDownload "16.140.32.60", "mary", "/tmp/v2.03a"

   where 16.140.32.60 is the IP address of the host with the firmware image, mary is the user to RSH, and /tmp/v2.03a is the firmware image to be loaded into the Compaq StorageWorks SAN 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.

h

The following figure shows the h command, which displays the shell history of the previous 20 commands. The older commands are replaced by new commands. The shell history is similar to the Unix Korn shell history facility with a built-in line editor that allows previously typed commands to be edited.

NOTE: The shell history is reset by a reboot.

```
admin=> h
   11   date
   12   dateShow
   13   switchName
   14   date "0117130198"
   15   nsShow
   16   fabricShow
   17   portDisable 5
   18   portEnable 5
   19   portLogShow 100
   20   h
   21   portShow 5
   22   portStatsShow 5
   23   ipAddrShow
   24   diagShow
   25   switchDisable
   26   switchShow
   27   portLoopbackTest
   28   portShow 5
   29   diagShow
   30   switchEnable
```

Figure A-24. h command example

help

The following figure shows the help command, which displays a list of commands in alphabetical order. The command syntax to display detailed information about individual commands is help <command>.

NOTE: The help display changes depending on the login user level. Only commands that are available to the current user are displayed. This example shows the admin level commands. Commands for optionally licensed products only display if the appropriate license key is installed.

```
switch:admin> help
agtcfgDefault           reset SNMP agent to factory defaults
agtcfgSet               Set SNMP agent configuration
agtcfgShow              Print SNMP agent configuration
aliasShow               Print Alias Server information
configure               Set switch config parameters
configShow              Print switch config parameters
configDefault           Reset config to factory default
date                    Print/set the system date and time
errDisplayFilter        Set min error level to be reported
errDump                 Print error log (no page breaks)
errShow                 Print error log
fabricShow              Print fabric membership info
fanShow                 Print fan status
firmwareDownload        Download firmware into switch
h                       Print shell history
l                       Print task summary
ifShow                  Print network interface information
ipAddrSet               Set ethernet and FC IP addresses
ipAddrShow              Print ethernet and FC IP addresses
login                   Login as a new user
logout                  Logout from remote session
nsAllShow               Print global Name Server information
nsShow                  Print local Name Server information
passwd                  Set usernames and passwords
portDisable             Disable a specified port
portEnable              Enable a specified port
portErrShow             Displays error summary for all ports
portLogClear            Clear port activity log
portLogDump             Print port log (no page breaks)
portLogShow             Print port activity log
portPerfShow            Print port throughput numbers
portShow                Print state of specified port
portStatsShow           Print hardware statistics
psShow                  Print power supply status
syslogdIp               Print/set syslog daemon IP address
switchDisable           Disable this switch
switchEnable            Enable this switch
switchName              Print/set this switch's name
switchShow              Print switch and port status
tempShow                Print temperature readings
uptime                  Print switch's operational time
version                 Print firmware version
diagHelp                Print diagnostic help info
licenseHelp             Print licensing help info
```

Figure A-25. help command example

i

The following figure shows the i command, which displays a currently running task summary. The following table describes the command fields.

```
admin>i

NAME       ENTRY          TID      PRI  STATUS     PC       SP       ERRNO  DELAY
------     -------        ------   ---  --------   ------   --------  ------  ----
tExcTask   excTask        103f7eb0 0      PEND     1014f718 103f8200 3d0001 0
tLogTask   _logTask       103f5f30 0      PEND     1014f718 103f6280 0      0
tShell     _shellTask     103c6e40 1      READY    101367c0 103c70b0 c0002  0
tRlogind   _rlogind       103ee0f0 2      PEND     101331e0 103ee7e0 0      0
tTelnetd   _telnetd       103ec160 2      PEND     101331e0 103ec5d0 0      0
tTelnetOutT _telnetOutTa  103711b0 2      READY    101331e0 103717b0 0      0
tTelnetInTa _telnetInTas  1036d330 2      READY    101330e4 1036d9b0 0      0
tTimers    _timerTask     103fbd80 10     PEND     1014f718 103fc100 0      0
tNetTask   _netTask       103f0370 50     READY    10134280 103f0740 0      0
tSwitch    _switchTask    103e9500 80     PEND+T   1014f718 103e9900 3d0004 36
tPBmenu    _menuTask      103d7c20 90     PEND     1014f718 103d7fe0 0      0
tReceive   _portRxTask    103d4450 100    PEND     1014f718 103d47d0 0      0
tTransmit  _portTxTask    103d2eb0 100    PEND     1014f718 103d3230 0      0
tFabric    _fabricTask    103b9530 100    PEND     1014f718 103b98f0 3d0004 0
tFspf      _fspfTask      103b7340 100    PEND     1014f718 103b76c0 0      0
tFcph      _fcphTask      103bde50 120    PEND+T   1014f718 103be1d0 3d0004 31
tZone      _cfgTask       10374ef0 130    PEND     1014f718 10375270 0      0
tFcp       _fcpTask       103bbd00 150    PEND+T   1014f718 103bc080 3d0004 773
tSnmpd     101394b0       103b3500 150    PEND     101331e0 103b4250 5b0002 0
tHttpD     _STARTUP_Web   103b1e70 150    PEND     101331e0 103b2330 0      0
tNSd       _ns_svr        103aca10 150    PEND     1014f718 103acda0 0      0
tASd       _as_svr        103812d0 150    PEND     1014f718 10381650 0      0
```

Figure A-26. i command example

Table A-9
i Command Field Descriptions

Field	Description
Name	Task name
Entry	Task entry point ID
TID	Task ID
PRI	Task priority with VxWorks
Status	■ READY—Task is not waiting for any resource other than the processor. ■ PEND—Task is blocked due to the unavailability of some resource. ■ DELAY—Task is asleep for some duration. ■ SUSPEND—Task is unavailable for execution, but not delayed or pended. ■ DELAY+S—Task is delayed and suspended. ■ PEND+S—Task is pended and suspended. ■ PEND+T—Task is pended with a timeout. ■ PEND+S+T—Task is pended with a timeout and suspended. ■ DEAD—Task no longer exists.
PC	Program counter
SP	Stack pointer
ERRNO	Last error number generated by this task
Delay	For pending tasks, the amount of time a task has been waiting to execute

ifShow

The following figure shows the ifShow command, which displays network interface information. The display includes three sections organized by interface:

- ei—Ethernet 10/100BaseT port
- lo—loopback interface
- fc—Fibre Channel (This section is omitted if IP over Fibre Channel is not configured.)

```
admin> ifShow
ei (unit number 0):
   Flags: (0x63) UP BROADCAST ARP RUNNING
   Internet address: 192.168.64.146
   Broadcast address: 192.168.64.255
   Netmask 0xffffff00 Subnetmask 0xffffff00
   Ethernet address is 00:60:69:00:04:64
   Metric is 0
   Maximum Transfer Unit size is 1500
   2089 packets received; 156 packets sent
   0 input errors; 0 output errors
   3 collisions
lo (unit number 0):
   Flags: (0x69) UP LOOPBACK ARP RUNNING
   Internet address: 127.0.0.1
   Netmask 0xff000000 Subnetmask 0xff000000
   Metric is 0
   Maximum Transfer Unit size is 4096
   0 packets received; 0 packets sent
   0 input errors; 0 output errors
   0 collisions
```

Figure A-27. ifShow command example

ipAddrSet

The following figure shows the ipAddrSet command, which sets the switch's Ethernet IP address, Ethernet subnetmask, Fibre Channel IP address, Fibre Channel subnetmask, and gateway address. The following table describes the command fields.

```
admin> ipAddrSet
Ethernet IP Address [192.158.1.14]:
Ethernet Subnetmask [255.255.255.0]:
Fibre Channel IP Address [none]:
Fibre Channel Subnetmask [none]:
Gateway Address [192.158.1.1]:
```

Figure A-28. ipAddrSet command example

Table A-10
ipAddrSet Command Field Descriptions

Field	Description
Ethernet IP Address	The default IP address on a new switch is a temporary number. Enter a valid IP address.
Ethernet Subnetmask	The Ethernet subnetmask value. The default subnet mask value is none. See your network administrator for the appropriate subnet mask value.
Fibre Channel IP Address	The Fibre Channel IP address for the switch. Enter a valid IP address.
Fibre Channel Subnetmask	The Fibre Channel subnetmask for the switch. The default is none.
Gateway Address	The gateway address. The default gateway address on a new switch is none. Enter a valid gateway address if required.

ipAddrShow

The following figure shows the ipAddrShow command, which displays the switch's IP addresses. The fields are described in the following table.

```
admin> ipAddrShow
Ethernet IP Address: 192.158.1.14
Ethernet Subnetmask: 255.255.255.0
Fibre Channel IP Address: none
Fibre Channel Subnetmask: none
Gateway Address: 192.158.1.1
```

Figure A-29. ipAddrShow command example

login

The following figure shows the login command, which logs in a user from a remote host. If a user is already logged in, the command logs out the user and lets a new user log in.

```
switch:user> login
login:admin
Password:
switch:admin>
```

Figure A-30. login command example

logout

The following figure shows the logout command, which logs a user out from a remote session.

```
admin> logout
Connection closed.
```

Figure A-31. logout command example

nsAllShow

The following figure shows the nsAllShow command, which displays a list of port IDs connected to the fabric. The nsAllShow command optionally takes an integer parameter, the value of the FC-PH type. For example, nsAllShow 8 shows all SCSI-FCP nodes. If the parameter is not provided, then Nx_Ports displays. This command only returns relevant data for switches that have a Fabric Operating System license.

```
admin> nsAllShow
2 Nx_Ports in the Fabric {
   614001 614301
}
value = 0 = 0x0

admin> nsAllShow 8
2 FCP Ports {
   6042ef 6045e8
}
```

Figure A-32. nsAllShow command example

nsShow

The following figure shows the nsShow command, which displays the local name server information, including information about devices connected to the switch and cached information about devices connected to other switches in the fabric. The nsAllShow command shows information about all switches.

The message “There is no entry in the Local Name Server” displays if there is no information about the local switch. If information about the local switch is available, the number of name service entries displays.

```
admin> nsShow
The Local Name Server has 2 entries {
Type  Pid      CO      PortName      NodeName                  TTL(sec)
NL    614001; 3;00:00:00:00:00:00:00:00;00:00:00:00:00:00:00:00; na
NL    614301; 3;00:00:00:00:00:00:00:00;00:00:00:00:00:00:00:00; na
}
```

Figure A-33. nsShow command example

Table A-11
nsShow Command Field Descriptions

Field	Description
Type	The port type with one of the following values: ■ N—Indicates that this is an N_Port. ■ NL—Indicates that is is an NL_Port.
Pid	The address ID of the port in hexadecimal format
COS	The class of service supported by the port
PortName	The port WWN
NodeName	The node WWN associated with the port
TTL	The time-to-live value of the entry. This field is typically set to not applicable (na) for a local enty. An entry can be a cached version of a remote port, that is, not directly connect to this switch. In that case, the value equals the number of seconds before the cached entry expires and is deleted from the local database. A cached entry is marked with an asterisk (*).

passwd

The following figure shows the passwd command, which sets usernames and passwords.

```
admin> passwd

username 1 [admin]:
"admin" password:
username 2 [user]:
"user" password:
username 3 [other]:
"other" password:
```

Figure A-34. passwd command example

The command syntax is passwd ["user name"]. The optional parameter <username> is a valid user name enclosed by quote marks.

NOTE: If the current password is incorrect, the command exits without saving any changes. If the number of attempts to connect is exceeded, the command either steps to the next user or exits without saving any changes.

Special Inputs

The passwd command accepts the following inputs at the Telnet prompt.

- **Enter**—Accepts the default value (if applicable) and moves to the next prompt.
- **Ctrl+C**—Aborts the passwd command immediately and ignores all changes made.
- **Ctrl+D**—Terminates the passwd command and writes all changes to flash memory when entered alone at a prompt without any preceding input.

Examples

The following is a list of the passwd command's input and output examples. Only passwords at the current level and below can be changed.

1. Invalid user name.

```
admin> passwd "nobody"
passwd: nobody is not a valid user name.
```

2. Invalid command usage.

```
admin> passwd ""
Usage: passwd [username]
```

3. Permission denied.

```
admin> passwd "root"
passwd: Permission denied.
```

4. Change the user name.

```
admin> passwd "admin"
New username [admin]: maint
Old password:
passwd: Password unchanged.

Updating flash...done.
```

5. Change the user name and password.

```
maint> passwd "maint"
New username [maint]: admin
Old password:
New password:
Re-enter new password:
Updating flash...done.
```

6. Skip through the prompts without changes.

```
admin> passwd
New username [admin]:
Old password:
passwd: Password unchanged.
New username [user]:
Old password:
passwd: Password unchanged.
New username [other]:
Old password:
passwd: Password unchanged.
```

7. Surpass failure limit, then cancel the command.

```
admin> passwd
New username [admin]:
Old password:
New password:
Re-enter new password:
passwd: Passwords do not match; try again.
New password:
Re-enter new password:
passwd: Passwords do not match; try again.
New password:
Re-enter new password:
passwd: Number of failure attempts exceeded.
New username [user]: ^C
```

8. Change the user name and then finish with **Ctrl+D**.

```
admin> passwd
New username [admin]: maint
Old password: ^D
Updating flash...done.
maint>
```

portDisable

The following figure shows the portDisable command, which disables a specified port. Devices attached to a disabled port cannot communicate with the fabric. The command syntax is portDisable <port #>.

```
admin> portDisable 2
```

Figure A-35. portDisable command example

NOTE: Unlike inserting a GBIC module into an interface card, portDisable and portEnable do not generate SNMP traps.

portEnable

The following figure shows the portEnable command, which enables a specified port. The first example shows an L-Port, and the second example shows an F-Port. The command syntax is portEnable <port #>.

```
admin> portEnable 2
```

Figure A-36. portEnable command example

portErrShow

The following figure shows the portErrShow command, which displays an error summary for all ports. One output line displays per port, and shows error counters in ones, thousands (the number is followed by “k”), or millions (the number is followed by “m”). This example shows an eight-port switch, where port 6 has a high number of errors. The command fields are described in the following table.

```
switch:admin> portErrShow
  frames      enc  crc  too  too  bad  enc  disc  link  loss  loss  frjt  fbsy
    tx    rx  in   err  shrt long eof  out  c3    fail  sync  sig
 --------------------------------------------------------------------------------
0: 0     0    0    0    0    0    0    0    0     0     0     1     0     0
1: 2.5m  38   0    0    0    0    0    2    0     0     1     1     0     0
2: 0     0    0    0    0    0    0    0    0     0     0     1     0     0
3: 95k   15k  0    0    0    0    0    3    0     0     1     0     0     0
4: 0     0    0    0    0    0    0    0    0     0     0     1     0     0
5: 0     0    0    0    0    0    0    0    0     0     0     1     0     0
6: 61k   48   2    15   0    0    0    3k   0     0     2     0     0     0
7: 0     0    0    0    0    0    0    0    0     0     0     1     0     0
```

Figure A-37. portErrShow command example

Table A-12
portErrShow Command Field Descriptions

Field	Description
frames tx	Frames transmitted
frames rx	Frames received
enc in	Encoding errors inside of frames
crc err	Frames with CRC errors
too shrt	Frames shorter than minimum
too long	Frames longer than maximum
bad eof	Frames with bad end-of-frame delimiters
enc out	Encoding error outside of frames
disc c3	Class 3 frames discarded
link fail	Link failures (LF1 or LF2 states)
loss sync	Loss of synchronization
loss sig	Loss of signal
frjt	Frames rejected with F_RJT
fbsy	Frames busied with F_BSY

Note: Non-zero values in the portErrShow command fields do not indicate a bad switch. It is normal to have errors when connecting cables and powering up devices that are connected to the switch.

portLogClear

The following figure shows the portLogClear command, which clears the data from the port log. The command syntax is portLogClear.

```
admin> portLogClear
```

Figure A-38. portLogClear command example

portLogDump

The following figure shows the portLogDump command, which displays the port log without page breaks. The portLogDump and portLogShow commands are the same except for how much information the port log displays without intervention.

```
admin> portLogDump
time                    task     event    port  cmd      args
------                  ------   ------   ----- -----    ------
May 18 21:35:21.000 tSwitch  create                     tTimers
May 18 21:35:22.383 tSwitch  create                     tPBmenu
May 18 21:35:22.383 tSwitch  create                     tReceive
May 18 21:35:22.383 tSwitch  create                     tTransmit
May 18 21:35:22.383 tSwitch  start                      100
May 18 21:35:22.633 tSwitch  pstate   4     OL1
May 18 21:35:22.633 tSwitch  pstate   5     OL1
May 18 21:35:22.633 tSwitch  pstate   6     OL1
May 18 21:35:22.633 tSwitch  pstate   7     OL1
May 18 21:35:38.066 tSwitch  Tx3      3     2112     02ffffd,00ffffd,4723bcbc
May 18 21:35:38.083 tReceive Rx3      3     2112     02ffffd,00ffffd,4723bcbc
May 18 21:35:38.083 tSwitch  ioctl    3     80       a,0
May 18 21:35:38.083 tSwitch  Tx3      5     2112     02ffffd,00ffffd,4723bcbc
May 18 21:35:38.083 tReceive Rx3      5     2112     02ffffd,00ffffd,4723bcbc
May 18 21:35:38.083 tSwitch  ioctl    5     80       a,0
May 18 21:35:38.083 tSwitch  Tx3      7     2112     02ffffd,00ffffd,4723bcbc
May 18 21:35:38.099 tReceive Rx3      7     2112     02ffffd,00ffffd,4723bcbc
May 18 21:35:38.099 tSwitch  ioctl    7     80       a,0
May 18 21:35:41.049 tSwitch  disable  0             2
May 18 21:35:41.083 tSwitch  pstate   2     OL1
May 18 21:35:41.583 tSwitch  start                      0
May 18 21:35:41.599 tSwitch  pstate   0     LF2
May 18 21:35:41.599 tSwitch  pstate   2     OL1
May 18 21:35:41.599 tSwitch  pstate   3     LF2
May 18 21:35:54.216 tSwitch  enable   16            0
May 18 21:35:55.266 tSwitch  errlog   3     FANS-1_FAILED
```

Figure A-39. portLogDump command example

portLogShow

The following figure shows the portLogShow command, which displays the switch's port activity. Entries consist of fabric login (link service request to a fabric F_Port 22fffffe), port login (link service request to the management server 22ffffa), and an inquiry request (unsolicited command to the management server 06ffffa). The entries are like the initial handshake between an F_Port and the Host Bus Adapter. The following table describes the command fields.

```
admin> portLogShow
time                  task       event  port  cmd   args
-----                 -----      -----  ----  -----  -----
Jun 15 16:00:21.899   tReceive   pstate  2    OL2
Jun 15 16:00:21.899   tReceive   pstate  2    LR3
Jun 15 16:00:21.899   tReceive   pstate  2    AC
Jun 15 16:00:21.899   interrupt  scn     2    2
Jun 15 16:00:21.899   interrupt  scn     2    1
Jun 15 16:00:21.899   tFspf      ioctl   2    ab    ffffff,16
Jun 15 16:00:21.899   tFspf      ioctl   16   ab    ffffff,2
Jun 15 16:00:21.899   tReceive   Rx3     2    116   22fffffe, 00000000, 04000000
Jun 15 16:00:21.899   tReceive   ioctl   2    a2    210213,2
Jun 15 16:00:21.899   tReceive   scn     2    6
Jun 15 16:00:21.899   tFspf      ioctl   2    ac    0,0
Jun 15 16:00:21.899   tFspf      ioctl   2    aa    ffffff,16
Jun 15 16:00:21.899   tFspf      ioctl   16   aa    ffffff,2
Jun 15 16:00:21.899   tFspf      ioctl   2    ad    0,0
Jun 15 16:00:21.899   tFspf      Tx3     2    116   23210213, 00fffffe, 02000000
Jun 15 16:00:21.899   tReceive   Rx3     2    116   22fffffa, 00210213, 03000000
Jun 15 16:00:21.899   tSwitch    Tx3     2    116   23210213, 00fffffa, 02000000
Jun 15 16:00:21.899   tFcp       Tx3     2    116   22210213, 00fffc41, 03000000
Jun 15 16:00:21.899   tReceive   Rx3     2    32    06fffffa, 00210213, 00000000
Jun 15 16:00:21.899   tFcp       Tx3     2    36    01210213, 00fffffa, 0d000302
Jun 15 16:00:21.899   tFcp       Tx3     2    24    07210213, 00fffffa, 00000000
```

Figure A-40. portLogShow command example

Table A-13
portLogShow Command Field Descriptions

Field	Description
Time	The event's date and time in milliseconds.
Task	The task name that logged the event, or "interrupt" if the event was recorded from interrupt level code.
Event	The possible switch events include: ■ start—The switch starts running. ■ disable—A port is disabled. ■ enable—A port is enabled. ■ ioctl—A port I/O control is executed. ■ Tx—A frame is transmitted using class x. ■ Rx—A frame is received using class x. ■ scn—A state change notification is posted. ■ pstate—A port changes physical state. ■ ctin—A CT-based request is received (name server request). ■ ctout—A CT-based response is transmitted (name server request).
Port	Either the port number of the affected port or the last byte of a well-known address (for example, fc for the well-known Name Server address).

continued

Table A-13
portLogShow Command Field Descriptions *continued*

Field	Description
cmd	The cmd field represents different values depending on the task and event. The following definitions are included: ■ For ioctl events, cmd is the I/O control command code. ■ For Tx and Rx events, cmd is the payload size. ■ For scn events, cmd is the new state. ■ For pstate events, cmd is the new physical state. ■ For ctin events, cmd consists of two 2-byte subfields. ■ For ctout events, cmd consists of two 2-byte subfields.
pstate	For pstate events, the cmd field entries in upper case are Fibre Channel ANSI Standard (PC-PH) as follows: ■ AC—Active State ■ LR1—Link Reset: LR Transmit State ■ LR2—Link Reset: LR Receive State ■ LR3—Link Reset: LRR Receive State ■ LF1—Link Failure: NOS Transmit State ■ LF2—Link Failure: NOS Receive State ■ OL1—Offline: OLS Transmit State ■ OL2—Offline: OLS Receive State ■ OL3—Offline: Wait for OLS State

continued

Table A-13
portLogShow Command Field Descriptions *continued*

Field	Description
ioctl	For ioctl events, the cmd field entries in lower case are switch-specific as follows: ■ a1—Port is an E_Port ■ a2—Port is an F_Port ■ a3—Port is segmented ■ a4—Domain name is known ■ a5—Port enable ■ a6—Port disable ■ a7—Link reset ■ a8—Add unicast route ■ a9—Delete unicast route ■ aa—Add multicast route ■ ab—Delete multicast route ■ ac—Unicast routing table done ■ ad—Multicast routing table done ■ ae—Add a phantom device ■ af—Remove a phantom device For a ctin event, the first subfield indicates whether “argument 1” and “argument 2” would be valid: ■ 0000—no argument 1 and 2 ■ 0001—argument 1 is valid ■ 0003—arguments 1 and 2 are valid For ctout event, the cmd field consists of two 2-byte subfields, similar to ctin. The second subfield should contain a CT command code indicating an accept or reject: ■ 8001—reject ■ 8002—accept

continued

Table A-13
portLogShow Command Field Descriptions *continued*

Field	Description
args	The args field represents different values depending on the task and event. The following definitions are included: ■ For ioctl events, the I/O controls arguments. ■ For Tx and Rx events, the first two header words and the first payload word. ■ For ctin events, the args field generally represents the first and second words of the CT payload where they are valid. When there is an IPv4 address involved, this field shows the value of the IPv4 address, which is neither the first nor second word of the CT payload. ■ For ctout events, if the event is associated with an accept, then the args field generally represents the first and second words of the CT payload. When there is an IPv4 address involved, this field shows the value of the IPv4 address, which is neither the first nor second word of the CT payload. ■ If the event is associated with a rejection, the args field contains the reason for the reject and an explanation code.
loopscn	For loopscn events: ■ OLP—Offline (disconnected or nonparticipating) ■ LIP—LIP sent (if the next argument is 8xxx) or received (if the next argument contains the lower two bytes of the LIP Primitive Sequence received), port entered OPEN-INIT state. ■ LIM—FL_Port is elected as LIM. ■ BMP—AL_PA bitmap is collected by the FL_Port. ■ ERR—An error occurred during the loopinit process, such as a loss of sync. ■ OLD—Port entered OLD_PORT state. ■ TMO—Loopinit timed out.

portPerfShow

The following figure shows the portPerfShow command, which displays the throughput for all ports. The output is terminated by pressing **Enter** or **Ctrl+C**. The throughput number represents the number of bytes received plus the number of bytes transmitted and displays as bytes per second (B/s). Throughput numbers are shown either as B/s, kilobytes per second, or megabytes per second. This information is used to monitor port performance. One line per second is printed summarizing the traffic on all ports.

```
admin> portPerfShow
0  1  2  3  4  5  6  7  8  9  10 11 12 13 14 15
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
```

Figure A-41. portPerfShow command example

portShow

The following figure shows the portShow command, which displays a summary of all ports. The fields are described in the following table. The command syntax is portShow <port #>.

```
admin> portShow 2
portFlags: 0x20021          PRESENT L_PORT LED
portType:  2.2
portState: 2       Offline
portPhys:  4       No_Light
portScn:   0
portRegs:  0xa0008000
portData:  0x103ce320
portId:    614200
portWwn:  20:02:00:60:69:00:04:64

Interrupts:    0          Link_failure:  0          Frjt:     0
Unknown:       0          Loss_of_sync:  0          Fbsy:     0
Lli:           0          Loss_of_sig:   0
Proc_rqrd:     0          Protocol_err:  0
Timed_out:     0          Invalid_word:  0
Rx_flushed:    0          Invalid_crc:   0
Tx_unavail:    0          Delim_err:     0
Free_buffer:   0          Address_err:   0
Overrun:       0          Lr_in:         0
Suspended:     0          Lr_out:        0
Parity_err:    0          Ols_in:        0
                          Ols_out:       0
```

Figure A-42. portShow command example

Table A-14
portShow Command Field Descriptions

Type	Field	Description
Port Definition	portFlags	The bitmap port status
	portType	The port type (G_port or FL_Port)
	portState	The port SNMP state; values include Online or Offline
	portPhys	The port physical state
	portScn	The port LED state
	portRegs	Pointer of hardware register
	portData	Pointer to driver private data
	portId	The port address ID
	portWwn	The port World Wide Name
Interrupt Statistics	Interrupts	Total number of interrupts
	Unknown	Number of unknown interrupts
	Lli	Number of low level interface (LLI) interrupts
	Proc_rqrd	Number of interrupts with processing (CPU) required
	Timed_out	Number of timed out interrupts
	Rx_flushed	Number of flushed transmissions
	Tx_unavail	Number of interrupted transmissions
	Free_buffer	Number of buffer interrupts
	Overrun	Number of buffer overruns
	Suspended	Number of suspended interrupts
	Parity_err	Number of parity errors

continued

Table A-14
portShow Command Field Descriptions *continued*

Type	Field	Description
Error Statistics	Link_failure	Number of link failures
	Loss_of_sync	Loss of synchronization
	Loss_of_sig	Loss of signal (no light)
	Protocol_err	Protocol error
	Invalid_word	Invalid word (encoding errors inside of frames)
	Invalid_crc	Invalid CRC in a frame
	Delim_err	Delimeter error (order set)
	Address_err	Address ID error (S_ID D_ID)
	Lr_in	Link reset in (primitive sequence), does not apply to FL_Port
	Lr_out	Link reset out (primitive sequence), does not apply to FL_Port
	Ols_in	Offline resent in (primitive sequence), does not apply to FL_Port
	Ols_out	Offline resent in (primitive sequence), does not apply to FL_Port
	Frjt	Number of frames rejected
	Fbsy	Number of frames busy

portStatsShow

The following figure shows the portStatsShow command. When used with a port number, this command gives a static view of port status. For example, to update the command and check if an error count is increasing, reissue the portStatsShow command to capture another snapshot. The command syntax is portStatsShow <port #>.

```
switch:admin> portStatsShow 2
stat_wtx        1379589     4-byte words transmitted
stat_wrx        473913      4-byte words received
stat_ftx        114957      Frames transmitted
stat_frx        40          Frames received
stat_c2_frx     0           Class 2 frames received
stat_c3_frx     34          Class 3 frames received
stat_lc_rx      3           Link control frames received
stat_mc_rx      0           Multicast frames received
stat_mc_to      0           Multicast timeouts
stat_mc_tx      0           Multicast frames transmitted
tim_rdy_pri     599970      Time R_RDY high priority
tim_txcrd_z     0           Time BB_credit zero
er_enc_in       0           Encoding errors inside of frames
er_crc          0           Frames with CRC errors
er_trunc        0           Frames shorter than minimum
er_toolong      0           Frames longer than maximum
er_bad_eof      0           Frames with bad end-of-frame
er_enc_out      74670       Encoding error outside of frames
er_disc_c3      0           Class 3 frames discarded
open            0           loop_open
transfer        0           loop_transfer
opened          0           FL_Port opened
starve_stop     0           tenancies stopped due to starvation
fl_tenancy      0           number of times FL has the tenancy
nl_tenancy      0           number of times NL has the tenancy
frame_nozone    0           frames rejected due to zone protection
```

Figure A-43. portStatsShow command example

Table A-15
portStatsShow Command Field Descriptions

Field	Description
stat_wtx	Number of 4-byte words transmitted from the port.
stat_wrx	Number of 4-byte words received by the port.
stat_ftx	Number of frames transmitted from the port.
stat_frx	Number of frames received by the port.
stat_c2_frx	Number of Class 2 frames received.
stat_c3_frx	Number of Class 3 frames received.
stat_lc_rx	Number of link control frames received.
stat_mc_rx	Number of multicast frames received.
stat_mc_to	Number of timeouts reported for multicast frames. A single frame could cause this counter to increment if it timed out for each multiple destination.
stat_mc_tx	Number of multicast frames transmitted.
tim_rdy_pri	Amount of time (measured in proprietary ticks) that R_RDY transmission has higher priority than frame transmission.
tim_txcrd_z	Time that this port cannot transmit frames due to a transmit buffer-to-buffer credit of zero.
er_enc_in	Received data: The number of 8b/10b encoding errors that have occurred inside frame boundaries. This counter is generally a nonzero value, although occasional errors can occur on a normal link and give a zero result. (Minimum compliance with the link bit error rate specification on a link continuously receiving frames would cause approximately one error every 20 minutes.)
er_crc	Received frames: The number of CRC errors detected.
er_trunc	Received frames: The number of frames that were shorter than the minimum Fibre Channel frame size (such as a header with no payload).
er_toolong	Received frames: The number of frames that were longer than the maximum Fibre Channel frame size (such as a header with a 2,112-byte payload).
er_bad_eof	The number of frames received with a badly formed end-of-frame.

continued

Table A-15
portStatsShow Command Field Descriptions *continued*

Field	Description
er_enc_out	Receive link: The number of 8b/10b encoding errors recorded outside frame boundaries. This number can become nonzero during link initialization but indicates a problem if it increments faster than the allowed link-bit error rate (approximately once every 20 minutes).
er_disc_c3	Receive link: The number of Class 3 frames discarded. Class 3 frames can be discarded due to timeouts or invalid/unreachable destinations. This quantity could increment at times during normal operation but might be used for diagnosing problems in some situations.
open	Loop_open: the number of times FL_Port entered the OPEN state.
transfer	Loop_transfer: the number of times FL_Port entered the TRANSFER state.
opened	FL_Port opened: the number of times FL_Port entered the OPENED state.
starve_stop	Loop tenancies stopped due to starvation.
fl_tenancy	Number of times FL_Port has the loop tenancy.
nl_tenancy	Number of times NL_Port has the loop tenency.
frame_nozone	Number of frames rejected due to zone protection.

psShow

The following figure shows the psShow command, which displays power supply status information. The format of the display varies according to the switch model and number of power supplies present. Possible values are:

- OK—The power supply is present and functioning correctly.
- Absent—The power supply is not present.
- Faulty—The power supply is present but faulty (no power cable, power switch turned off, fuse blown, or other internal error).

After the status line, power supply information displays including manufacture date, part number, serial number, and other information.

```
switch:admin> psShow
Power Supply 1 is OK
9835,DH000000208,60-0000734-01, A,00001, E108302A,01, 803350
Power Supply 2 is OK
9839,DH000000253,60-0000734-01, A,00001, E108302A,01, 803522
```

Figure A-44. psShow command example

reboot

The following figure shows the reboot command, which reboots the switch to the stored configuration in flash memory. The reboot lasts about 1½ minutes. The switch can be in any operational state (enabled or disabled) before rebooting.

```
admin> reboot
Rebooting...
```

Figure A-45. reboot command example

syslogdIp

The following figure shows the syslogdIp command, which sets or displays the switch's system log daemon IP address. The command syntax is syslogdIp <"ip address">.

```
admin> syslogdIp

syslog daemon's address: 0.0.0.0
```

Figure A-46. syslogdIp command example

switchDisable

The following figure shows the switchDisable command, which is used for diagnostic tests, maintenance functions, or replacement of a faulty switch. You can observe this process by watching the front panel LEDs change color from green to amber as each port inactivates.

```
admin> switchDisable
```

Figure A-47. switchDisable command example

switchEnable

The switchEnable command enables the switch and provides fabric information. You need to enable the switch after maintenance and diagnostic tests. In the following figure, the switch is enabled with a domain ID of 1. After the fabric is reconfigured, this switch is the principal address manager, capable of assigning domain IDs to other switches in the same fabric. You can observe this process by watching the front panel LEDs change color from green to amber as each port activates.

```
admin> switchEnable
value = 0 = 0x0
10  9  8  7  6  5  4  3  2  1
fabric: Principal switch
fabric: Domain 1
```

Figure A-48. switchEnable command example

NOTE: When a switch is powered on, it is automatically enabled.

switchName

The following figure shows the switchName command, which displays or sets the switch's name. If a new name is specified and enclosed in quotes, the command sets the switch to that name. The command syntax is switchName <"name-of-switch">. If no new name is included, the command displays the switch's default name.

```
admin> switchName "sw3"

sw3
```

Figure A-49. switchName command example

Certain restrictions apply to the length and format of the switch name. Specifically, the name of the switch:

- Cannot exceed 19 characters in length
- Cannot contain characters other than upper or lower case letters (a-z), the numbers 0-9, or the underscore character (_)
- Must start with an upper or lower case letter (a-z)

NOTE: Switch names should be unique in a cascaded environment.

switchShow

The following figure shows the switchShow command, which displays the switch and port status. The fields are described in the following table.

```
admin> switchShow
switchName:     open146
switchType:     3.1
switchState:    Online
switchRole:     Principal
switchDomain:   1
switchId:       fffc41
switchWwn:      10:00:00:60:69:00:04:64
port  0: sw    Online       L-Port  1 private, 1 phantom
port  1: --    No_Module    L-Port
port  2: sw    No_Light     L-Port
port  3: sw    Online       L-Port  1 private, 1 phantom
port  4: --    No_Module
port  5: sw    Online       E-Port  10:00:00:60:69:00:00:12 "sw1"(upstream)
port  6: sw    No_Light
port  7: sw    No_Light
port  8: sw    No_Light
port  9: sw    Online       E-Port  10:00:00:60:69:00:01:b4 "sw3"(downstream)
port 10: sw    No_Light
port 11: sw    No_Light
port 12: sw    No_Light
port 13: sw    No_Light
port 14: sw    No_Light
port 15: sw    No_Light
```

Figure A-50. switchShow command example

Table A-16
switchShow Command Field Descriptions

Field	Description
switchName	The switch name
switchType	The switch model and motherboard revision level
switchState	The state of this switch: online, offline, testing, or faulty.
switchRole	There are three possibilities for switchRole: ■ Master: The principal switch, as defined in FC-SW. ■ Slave: The switch is enabled and not the principal switch. ■ Disabled: The switch is disabled.
switchDomain	The domain ID of this switch can range from 0 to 31. The lowest domain numbered switch in a fabric will become the master.
switchID	The domain ID of this switch's embedded port is hex fffc00 to fffc7f.
switchWwn	The World Wide Name (WWN) of this switch, which is a unique identifier for each switch assigned by the manufacturer. A numbering scheme administered globally ensures that the WWN is unique for each switch.
Port Number	One line per port is printed after the switch summary. Each line shows the port number (0 to 15), the GBIC type, the port state, and a comment field.
GBIC type	The GBIC type follows the port number. The three GBIC types include: ■ -- no GBIC present ■ sw shortwave GBIC ■ lw longwave GBIC

continued

Table A-16
switchShow Command Field Descriptions *continued*

Field	Description
Port state	The port state follows the GBIC type. The possible port states include: ■ No_Card—No card is present in this switch slot. ■ No_Module—No GBIC module is in this port. ■ No_Light—The module is not receiving light. ■ No_Sync—The module is receiving light but it is out of sync. ■ In_Sync—The module is receiving light and it is in sync. ■ Laser_Flt—The module is signaling a laser fault (defective GBIC). ■ Port_Flt—The port has been marked faulty (defective GBIC, cable, or device). ■ Diag_Flt—The port failed diagnostics (defective G_Port or FL_Port card or motherboard). ■ Online—The port is up and running. ■ Lock_Ref—The port is locking to the reference signal.
Comment field	The comment field follows the port state. The possible comments include: ■ Disabled—The port is disabled. ■ Loopback—The port is in loopback mode. ■ E_Port—The WWN and switch name of the other switch is shown, and the use of this ISL is shown. ■ F_Port—The WWN of the N_Port is shown. ■ G_Port—The port is online but is not yet an E_Port or F_Port. ■ L_Port—The port is connected to an arbitrated loop.

tempShow

The following figure shows the tempShow command, which shows the switch's temperature as measured by five sensors on the motherboard.

```
admin> tempShow
 29  29  31  27  32 Centigrade
 84  84  87  80  89 Fahrenheit
```

Figure A-51. tempShow command example

uptime

The following figure shows the uptime command, which displays the amount of time the switch has been in operation, the amount of time since the switch was first powered up, the date and time of the last reboot, and the reason for the last reboot.

For up and powered-on times less than 60 seconds, the time displays in seconds. For times greater than 60 seconds, the time displays in minutes.

```
switch:admin> uptime
Up for:3 days, 18:35
Powered for: 30 days, 16:05
Last up at: Mon Jan 11 16:17:29 1999
Reason:Reboot
```

Figure A-52. uptime command example

version

The following figure shows the version command. The fields are described in the following table.

```
admin> version
VxWorks version: 5.3.1
Firmware version: v2.0
Made on: Mon Nov 16 18:15:26 PST 1998
Flash: Mon Dec 28 15:34:05 PST 1998
BootProm: Thu Oct 1 13:34:29 PDT 1998
```

Figure A-53. version command example

Table A-17
version Command Field Descriptions

Field	Description
VxWorks version	VxWorks operating environment version used on the processor
Firmware version	Switch firmware version
Made on	Switch firmware release date and time
Flash	Build date of the firmware stored in flash memory
BootProm	Build date of the firmware stored in the boot prom

diagHelp

The following figure shows the diagHelp command, which displays the diagnostic help commands available for troubleshooting switch problems.

```
switch:admin> diagHelp

ramTest                 System DRAM diagnostic
portRegTest             Port register diagnostic
centralMemoryTest       Central memory diagnostic
cmiTest                 CMI bus connection diagnostic
camTest                 Quickloop CAM diagnostic
portLoopbackTest        Port internal loopback diagnostic
sramRetentionTest       SRAM Data Retention diagnostic
cmemRetentionTest       Central Mem Data Retention diagostic
crossPortTest           Cross-connected port diagnostic
spinSilk                Cross-connected line-speed exerciser
diagClearError          Clear diag error on specified port
diagDisablePost         Disable Power-On-Self-Test
diagEnablePost          Enable Power-On-Self-Test
setGbicMode             Enable tests only on ports with GBICs
supportShow             Print the switch info for debugging
diagShow                Print diagnostic status information
```

Figure A-54. diagHelp command example

licenseHelp

The following figure shows the licenseHelp command, which displays the commands used to administer license keys. Each switch can save one license key for each optionally licensed product. License keys are unique for every switch.

```
switch:admin> licenseHelp

licenseAdd      Add a license key to this switch
licenseRemove   Remove a license key from this switch
licenseShow     Show current license key
```

Figure A-55. licenseHelp command example

routeHelp

The following figure shows the routeHelp command, which displays the routing help commands. Routing commands do not return relevant data unless the switch has a Fabric Operating System license.

```
admin> routeHelp

bcastShow       Print broadcast tree information
fspfShow        Print FSPF global information
interfaceShow   Print FSPF interface information
dlsReset        Turn off dynamic load sharing
dlsSet          Turn on the dynamic load sharing
iodReset        Truns off the in-order delivery optio
iodSet          Turns on the in-order delivery option
LSDbShow        Print Link State Database entry
mcastShow       Print multicast tree information
nbrStateShow    Print neighbor's summary information
topologyShow    Print paths to domains
uRouteConfig    Configure static unicast route
uRouteRemove    Remove static unicast route
URouteShow      Print port's unicast routing info
```

Figure A-56. routeHelp command example

Diagnostic Commands

Diagnostic commands enable you to monitor, test, and evaluate the switch.

ramTest

The following figure shows the ramTest command, which checks processor RAM memory. This test validates proper memory function.

```
switch:admin> ramTest

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

Figure A-57. ramTest command example

portRegTest

The following figure 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 validates that all registers are accessible. 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 A-58. portRegTest command example

centralMemoryTest

The following figure shows the centralMemoryTest command, which checks the central memory in each Application Specific Integrated Circuit (ASIC). This test assures 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).

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 A-59. centralMemoryTest command example

cmiTest

The following figure 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. 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 A-60. cmiTest command example

camTest

The following figure shows the camTest command, which verifies that the SID translation required by QuickLoop and implemented using content addressable memories (CAMs) is functioning correctly. 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 A-61. camTest command example

portLoopbackTest

The following figure 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 nFrames. 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 nFrames parameter, the loopback test runs continuously until you press **Enter**.

```
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.
      lm4:    4654  frTx     4654  frRx       0  LLI_errs.
      lm5:    4654  frTx     4654  frRx       0  LLI_errs.
      lm6:    4654  frTx     4654  frRx       0  LLI_errs.
      lm7:    4654  frTx     4654  frRx       0  LLI_errs.

Central Memory OK
Total Diag Frames Tx: 38032
Total Diag Frames Rx: 39232

Diags: (Q)uit, (C)ontinue, (S)tats, (L)og: q
 aborted
```

Figure A-62. portLoopbackTest 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. The following table describes the loopback error message fields.

Table A-18
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.

continued

Table A-18
portLoopbackTest Command Field Descriptions *continued*

Field	Description
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.

sramRetentionTest

The following figure 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. 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 A-63. sramRetentionTest command example

cmemRetentionTest

The following figure 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 some amount of delay since the write. 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 A-64. cmemRetentionTest command example

crossPortTest

The following figure 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 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  UNKNOWN      PRESENT ACTIVE G_PORT
```

Figure A-65. crossPortTest command example

Cross Port Test 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 cable 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 doublecheck 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 present 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
- Ports connected to themselves (single port connections)

The command syntax is

```
crossPortTest <nFrames>, <0 or 1>
```

where <nFrames> 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 <nFrames> parameter, the test runs until you press **Enter**.

spinSilk

The following figures show the spinSilk 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 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
```

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 nMillions
```

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

```
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.
```

Figure A-66. spinSilk command example 1

```
port 8 Rx/Tx 1 of 2 million frames.
port 9 Rx/Tx 1 of 2 million frames.
port 10 Rx/Tx 1 of 2 million frames.
port 11 Rx/Tx 1 of 2 million frames.
port 12 Rx/Tx 1 of 2 million frames.
port 13 Rx/Tx 1 of 2 million frames.
port 14 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.
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 A-67. spinSilk command example 1 (continued)

```
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 A-68. spinSilk command example 2

diagClearError

The following figure shows the diagClearError command, which clears diagnostic errors detected on a specified port. Issuing this command does not clear the error log. The command syntax is diagClearError <port #>. Without the <port #> parameter, all errors are cleared.

```
switch:admin> diagClearError
```

Figure A-69. diagClearError command example

diagDisablePost

The following figure 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 A-70. diagDisablePost command example

diagEnablePost

The following figure 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 A-71. diagEnablePost command example

diagShow

The following figure shows the diagShow command, which summarizes the diagnostics results, including POST results, since the switch was last booted. The following table describes the fields.

The diagShow command can be looped. For example, diagShow 4 executes diagShow every four seconds until you stop it by pressing **Enter**. 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     0  LLI_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 A-72. diagShow command example

Table A-19
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.

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.

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

Figure A-73. setGbicMode 1 command example

To disable GBIC mode, execute the setGbicMode 0 command.

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

Figure A-74. setGbicMode 0 command example

supportShow

The supportShow command prints switch information for debugging purposes. The command 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
- configShow
- faultShow
- traceShow
- portLogDump

The following figure shows the supportShow command. The command syntax is:

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

The following table describes the supportShow command fields.

```
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 A-75. supportShow command example

Table A-20
supportShow Field 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).
nLog	Number of lines of portLogDump to print: ■ 0 means dump all lines (default) ■ N means dump the last N lines ■ <0 means skip portLogDump

Routing Commands

Routing commands let you view switch routing information. Routing commands only return relevant data for switches that have the Fabric Operating System license installed.

bcastShow

The following figure shows the bcastShow command, which displays broadcast tree information and all ports that are currently transmitting and receiving broadcast frames. The fields are described in the following table.

The bcastShow command helps you understand routes the broadcast frames take through the fabric. A bit set indicates that the corresponding port belongs to a specific set. For instance, the bitmap value 0x00010003 means that port 0, port 1, and port 16 (the embedded port) are members of the set.

```
admin> bcastShow
Group   Member Ports        Member ISL Ports   Static ISL Ports
--------------------------------------------------------------------
31      0x00010003          0x00000000         0x00000000
```

Figure A-76. bcastShow command example

Table A-21
bcastShow Bitmap Field Descriptions

Bitmap Field	Description
Group	The multicast group
Member Ports	All ports currently transmitting or receiving broadcast frames
Member ISL Ports	Ports that belong to the interswitch broadcast distribution tree, as selected by the dynamic broadcast path selection protocol. Broadcast frames use these ports to reach all of the fabric switches and to enter into the switch. Some of the E_Ports on a switch cannot be part of this set since the broadcast paths must constitute a tree.
Static ISL Ports	Ports that belong to the interswitch broadcast distribution tree, as configured through the shell. This field is normally 0x00000000.

fspfShow

The following figure shows the fspfShow command, which displays Fibre Channel Shortest Path First (FSPF) information. The fields are described in the following table.

```
switch:admin> fspfShow

version          = 2
domainID         = 1
isl_ports        = 0x00000000
minLSArrival     = 3
minLSInterval    = 5
LsoriginCount    = 0
startTime        = 18656
fspfQ            = 0x10fa44e0
fabP             = 0x10fa4d60
agingTID         = 0x10f7e4c0
agingTo          = 10000
lsrDlyTID        = 0x10f6e4f0
lsrDelayTo       = 5000
lsrDelayCount    = 0
ddb_sem          = 0x10fa44b0

fabP:
event_sch = 0x0
lsrRefreshCnt = 0
```

Figure A-77. fspfShow command example

Table A-22
fspfShow Command Field Descriptions

Field	Description
version	The version of the FSPF protocol.
domainID	The local switch's domain ID.
isl_ports	A bitmap field that shows all local switch E_Ports.
startTime	The time the FSPF started, in milliseconds from boot.
other	Internal FSPF variables.

interfaceShow

The following figure shows the interfaceShow command, which displays FSPF interface information. This includes static information about the port (for example, variables allocated when a port is down) and "neighbor" information (variables associated with the remote switch connected to the port). An FSPF interface corresponds to an E_Port. The fields are described in the following table.

The command syntax is interfaceShow <port#>. With no parameters, the command result shows the information for all switch interfaces.

```
switch:admin> interfaceShow
idbP            = 0x10f7e560
Interface 10 data structure:
nghbP           = 0x0
ifNo            = 0
cost            = 1000
delay           = 1
lastScn         = 5
lastScnTime     = Mar 20 16:09:49.199
upCount         = 0
lastUpTime      = Mar 20 16:09:49.199
downCount       = 2
lastDownTime    = Mar 20 16:09:46.516
downReason      = 2
iState          = DOWN

Type <CR> to continue, Q<CR> to stop:
```

Figure A-78. interfaceShow command example

```
Neighbor 10 data structure:
state           = NB_ST_FULL
nghbCap         = 0x0
nghbId          = 239
idbNo           = 10
remPort         = 10
nflags          = 0x3
initCount       = 1
&dbRetransList  = 0x10e83530
&lsrRetransList = 0x10e83540
&lsrAckList     = 0x10e83550
inactTID        = 0x10e83200
helloTID        = 0x10e834c0
dbRtxTID        = 0x10e833d0
lsrRtxTID       = 0x10e82cb0
inactTo         = 80000
helloTo         = 20000
rXmitTo         = 5000
nCmdAcc         = 132
nInvCmd         = 0
nHloIn          = 122
nInvHlo         = 0
nLsuIn          = 5
nLsaIn          = 5
attHloOut       = 123
nHloOut         = 123
attLsuOut       = 5
nLsuOut         = 5
attLsaOut       = 5
nLsaOut         = 5
```

Figure A-79. interfaceShow command example (continued)

Table A-23
interfaceShow Command Field Descriptions

Field	Description
idbP	The port number
nghbP	The neighbor (adjacent) switch's port
ifNo	The port number, which should be identical to the value specified in the command line

continued

Table A-23
interfaceShow Command Field Descriptions *continued*

Field	Description
cost	The cost of sending a frame over the ISL connected to this port. The value 1000 indicates a 1 Gbps link.
delay	The conventional delay incurred by a frame transmitted on this ISL. The delay is required by the FSPF protocol and is a fixed value.
lastScn	The last State Change Notification received on this interface.
lastScnTime	The time the last SCN was received.
upCount	The number of times this interface initialized (the transition number from an offline to E_Port state)
lastUpTime	The last time this interface came up.
downCount	The number of times this interface went down.
lastDownTime	The last time this interface went down.
downReason	The reason (SCN) for the interface going down.
iState	The current interface state, which must be up in order for the ISL to forward frames to the adjacent switch
state	The current neighbor state. The state value must be NB_ST_FULL for the ISL to forward frames to the adjacent switch. Other values can be transitory; however, if a value is retained for more than 10 seconds, contact technical support.
nghbCap	Neighbor capabilities have a value of 0.
nghbId	The neighbor (adjacent) switch's domain ID
idbNo	The port number
remPort	The port number on the remote switch connected to this port
inactTo	The inactivity time out (in milliseconds). When this timeout expires, the adjacency with the neighbor switch expires. When this happens, new paths are computed to all possible destination switches in the fabric.
helloTo	The Hello timeout. When this timeout expires, a Hello frame is sent to the neighbor switch through this port.
rXmitTo	The retransmit timeout, which is used to transmit topology information to the neighbor switch. If an acknowledgment is not received within rXmitTo, the frame is retransmitted.

continued

Table A-23
interfaceShow Command Field Descriptions *continued*

Field	Description
nCmdAcc	The number of commands accepted from the neighbor switch, which include Hellos, Link State Updates, and Link State Acknowledges
nInvCmd	The number of invalid commands received from the neighbor switch. These are commands with a version higher than the one running on the local switch. The current version is 1 and there is no version 0.
nHIoIn	The number of Hello frames received from the neighbor switch
nInvHIo	The number of invalid Hello frames received from the neighbor switch. These are Hello frames with invalid parameters.
nLsuIn	The number of Link State Updates received from the neighbor switch
nLsaIn	The number of Link State Acknowledges received from the neighbor switch
attHIoOut	The number of attempted transmissions of Hello frames to the neighbor switch
nHIoOut	The number of Hello frames actually transmitted to the neighbor switch
attLsuOut	The number of attempted transmissions of Link State Updates to the neighbor switch
nLsuOut	The number of Link State Updates actually transmitted to the neighbor switch
attLsaOut	The number of attempted transmissions of Link State Acknowledgments to the neighbor switch
nLsaOut	The number of Link State Acknowledgments actually transmitted to the neighbor switch
other	The other fields represent internal FSPF variables.

dlsReset

The following figure shows the dlsReset command, which turns off the dynamic load sharing option. The dlsReset command prevents load sharing when a fabric change occurs if otherwise working ports could be affected. Load sharing will only occur when a switch reboots. Only use this command if devices connected to the fabric cannot properly handle occasional routing changes. Optimal load sharing is rarely achieved with this setting.

```
switch:admin> dlsReset
```

Figure A-80. dlsReset command example

dlsSet

The following figure shows the dlsSet command, which allows load sharing when a fabric change occurs. Routing is done on a per source port basis. All traffic coming in from a port that is directed to the same remote domain is routed through the same output E_Port. To optimize fabric utilization, traffic is shared among all paths when there are multiple equivalent paths to a remote switch. If dynamic load sharing is enabled, the optimal load sharing is recomputed every time a change in the fabric occurs. By default, the load sharing option is on.

When dynamic load sharing is set, routing changes can affect working ports and applications, especially if the in-order delivery option is set.

```
switch:admin> dlsSet
```

Figure A-81. dlsSet command example

iodReset

The following figure shows the iodReset command, which turns off the in-order delivery option. This command allows out-of-order delivery of frames during fabric topology changes. After you execute the iodReset command, the switch allows fast rerouting after a fabric topology change. Use the configShow command to view the status of the iodReset command. If the route.delay.Reroute parameter is equal to 0, the in-order delivery option is off.

```
switch:admin> iodReset
```

Figure A-82. iodReset command example

iodSet

The following figure shows the iodSet command, which ensures that frames will not be delivered out-of-order, even during fabric topology changes. In a stable fabric, frames are always delivered in order, even when the traffic between switches is shared among multiple paths. Use the configShow command to view the status of the iodSet command. If the route.delay.Reroute parameter is equal to 1, the in-order delivery option is on.

Use this command with care because it will cause a delay in the establishment of a new path when a topology change occurs. Only use this command if there are devices connected to the fabric that do not tolerate occasional out-of-order delivery of frames. By default, the in-order delivery option is on.

```
switch:admin> iodSet
```

Figure A-83. iodSet command example

LSDbShow

The following figure shows the LSDbShow command, which displays domain Link State Database entries. The fields are described in the following table. The database record for any fabric switch can be displayed from any switch. The LSDbShow command gives the same information regardless of which switch is used to run the program (unless there is a database update in progress, which occurs every 10 minutes in a stable network).

Every switch keeps a database of topology information associated with itself and the other fabric switches. The topology information for a switch consists of all neighbors that are in NB_ST_FULL state, and the associated port numbers.

This replicated database remains in sync at all times so that every switch in the fabric has the same topology view. The topology database, in turn, is used to compute the path from a switch to all other fabric switches.

With no parameters specified, the command shows all of the Link State Records (LSR) in the database instead of the LSR for domain 1.

```
admin> LSDbShow
Domain=0, Link State Database Entry pointer=0x10393140
lsrP              = 0x1036b650
earlyAccLSRs      = 0
ignoredLSRs       = 0
lastIgnored       = Never
installTime       = 0x96a64 (617060)
lseFlags          = 0xa
uOutIfs           = 0x2000
uPathCost         = 1000
uHopsFromRoot     = 1
mOutIfs           = 0x0
parent            = 0x0
mPathCost         = 0
mHopsFromRoot     = 0

Link State Record:
Link State Record pointer = 0x1036b650
lsAge             = 512
reserved          = 0
type              = 1
options           = 0x0
lsId              = 0
advertiser        = 0
incarn            = 0x800003a0
length            = 60
chksum            = 0x9afe
linkCnt = 2,      flags = 0x0
LinkId = 1, out port = 8, rem port = 13, cost = 1000, costCnt = 0, type = 1
LinkId = 2, out port = 9, rem port =  8, cost = 1000, costCnt = 0, type = 1
```

Figure A-84. LSDbShow command example

Table A-24
LSDbShow Command Field Descriptions

Field	Description
domain	Indicates that domain 1 is the local switch's domain ID
lsrP	Link State Database Entry pointer
earlyAccLSRs	The number of LSRs (Link State Records) accepted within the 5 second window
ignoredLSRs	The number of LSRs ignored because the time was inside the 5 second window
lastIgnored	The time the last LSR was ignored because it was inside the 5 second window
installTime	This is the database entry for domain 1. The keyword installTime is the time when this database record was installed, in milliseconds from boot. Values are in hexadecimal and decimal format.
debug fields	These fields contain internal Fibre Channel Shortest Path First (FSPF) information and are used by customer support for debugging purposes only: lseFlags, uOutIfs, uPathCost, uHopsFromRoot, mOutIfs, parent, mPathCost, and mHopsFromRoot.
lsAge	The record age in seconds since installation time. Records are refreshed throughout the fabric every 30 minutes. This value should never exceed 3600. When lsAge reaches the value 1800, the record is flushed from the fabric if the switch that is described by the LSR is functioning and is connected to the fabric.
reserved	This field is reserved for internal use.
type	Always 1
options	Default 0
lsId	The record's Link State ID is equal to the switch's domain ID, as described by the record.
advertiser	The switch ID of the switch that issued this LSR. Currently set to lsId.
incarn	The incarnation number. When a record is refreshed every 10 minutes, its incarnation number is incremented by 1. If data in the record changes (for example, if an E_Port on a switch goes offline), the switch described by that record issues a new instance and increments the incarnation number by 1.
length	The total record length

continued

Table A-24
LSDbShow Command Field Descriptions *continued*

Field	Description
chksum	The record checksum, which includes all fields except lsAge.
linkCnt	The link count, which is the number of neighbors in NB_ST_FULL state that are adjacent to the switch described by this record. The linkCnt field is followed by a number of lines equal to the link count. Each line contains the following information: ■ linkID—The neighbor switch's domain ID. ■ out port—The ISL port number connecting the neighbor switch. ■ cost—The cost of sending a frame over the ISL connected to this port. The cost is the same value as the cost in the neighbor data structure of the switch described by this record.
linkID	The neighbor switch's domain ID
rem port	The port on the remote switch that the local port (out port) is connected to
costCnt	Always 0
type	Always 1

mcastShow

The following figures show the mcastShow command with and without a parameter (group number). Without parameters, this command shows multicast tree information for all of the multicast groups. With parameters, it shows information about one multicast group only. The following table describes the command fields.

```
admin> mcastShow
Group    Member Ports    Member ISL Ports    Static ISL Ports
-------------------------------------------------------------------------
  0      0x00000084      0x00000084          0x00000000
  1      0x00000084      0x00000084          0x00000000
  2      0x00000084      0x00000084          0x00000000
  3      0x00000084      0x00000084          0x00000000
  4      0x00000084      0x00000084          0x00000000
  5      0x00000084      0x00000084          0x00000000
  6      0x00000084      0x00000084          0x00000000
  7      0x00000084      0x00000084          0x00000000
  8      0x00000084      0x00000084          0x00000000
  9      0x00000084      0x00000084          0x00000000
 10      0x00000084      0x00000084          0x00000000
 11      0x00000084      0x00000084          0x00000000
 12      0x00000084      0x00000084          0x00000000
 13      0x00000084      0x00000084          0x00000000
 14      0x00000084      0x00000084          0x00000000
 15      0x00000084      0x00000084          0x00000000
 16      0x00000084      0x00000084          0x00000000
 17      0x00000084      0x00000084          0x00000000
 18      0x00000084      0x00000084          0x00000000
 19      0x00000084      0x00000084          0x00000000
 20      0x00000084      0x00000084          0x00000000
 21      0x00000084      0x00000084          0x00000000
 22      0x00000084      0x00000084          0x00000000
 23      0x00000084      0x00000084          0x00000000
 24      0x00000084      0x00000084          0x00000000
 25      0x00000084      0x00000084          0x00000000
 26      0x00000084      0x00000084          0x00000000
 27      0x00000084      0x00000084          0x00000000
 28      0x00000084      0x00000084          0x00000000
 29      0x00000084      0x00000084          0x00000000
 30      0x00000084      0x00000084          0x00000000
 31      0x00010087      0x00000084          0x00000000
```

Figure A-85. mcastShow command example 1

```
admin> mcastShow 1
Group    Member Ports    Member ISL Ports    Static ISL Ports
-------------------------------------------------------------------------
  1      0x00000011      0x00000011          0x00000000
```

Figure A-86. mcastShow command example 2

Table A-25
mcastShow Bitmap Field Descriptions

Bitmap Field	Description
Group	The multicast group
Member Ports	All ports currently transmitting or receiving broadcast frames
Member ISL Ports	Ports that belong to the interswitch broadcast distribution tree, as selected by the dynamic broadcast path selection protocol. These are all E_Ports, and this set is a subset of m_port. Broadcast frames use these ports to reach all fabric switches and to enter into the switch. Some of the E_Ports on a switch may not be part of this set since the broadcast paths must constitute a tree.
Static ISL Ports	Ports that belong to the interswitch broadcast distribution tree, as configured through the shell. This field is normally 0x00000000.

nbrStateShow

The following figures show the nbrStateShow command, which displays the neighbor's summary information. You can also see this information by using the interfaceShow command. The nbrStateShow command provides essential information to determine the fabric topology in a concise way. By using this command, you can discover the domain ID of all switches directly connected to the local switch and the port number on the local and remote switches. The command fields are described in the following table.

With no parameters, the nbrStateShow command shows the neighbor's state summary for all of the neighbors instead of the neighbor connected to port 0 only. The command syntax to list all neighbors is nbrStateShow.

```
admin> nbrStateShow

Local Domain ID: 1

Local Port      Domain      Remote Port          State
-------------------------------------------------------------------
    0             2             0            NB_ST_FULL
    1             2             1            NB_ST_FULL
    2             2             2            NB_ST_FULL
    4             5             4            NB_ST_FULL
    5             5             5            NB_ST_FULL
    7             5             6            NB_ST_FULL
```

Figure A-87. nbrStateShow command example 1

The command syntax is nbrStateShow <port #> to list the neighbor on the specified port.

```
admin> nbrStateShow 1

Local Domain ID: 3

Local Port      Domain      Remote Port          State
-----------------------------------------------------------------
   1              2             1              NB_ST_FULL
```

Figure A-88. nbrStateShow command example 2

Table A-26
nbrStateShow Command Field Descriptions

Field	Description
Local Port	Corresponds to idbNo in the neighbor data structure.
Domain	Corresponds to nghbId in the neighbor data structure.
Remote Port	Corresponds to remPort in the neighbor data structure.
State	The neighbor's current state. The state value must be NB_ST_FULL for the ISL to forward frames to the adjacent switch. Other values can be transitory; however, if a value is retained for more than 10 seconds, contact technical support.

topologyShow

The following figures show the topologyShow command, which displays all paths to a domain including:

- Output ports used to route frames to the domain
- The routing cost to reach the domain
- The input ports routed through the output port

The FSPF protocol supports equal cost multipaths, so there could be multiple parallel paths between two switches.

The command syntax is topologyShow to list all domains.

```
admin> topologyShow

Local Domain ID: 1

Domain  Metric    Hops    Out Port    In Ports        Flags    Name
-------------------------------------------------------------------------
   1    2000       2          2      0x00000050      D     "open348"
                   2          1      0x00000020      D
                   2          0      0x00000080      D

Type <CR> to continue, Q<CR> to stop:

   4    3000       3          2      0x00000050      D     "open375"
                   3          1      0x00000020      D
                   3          0      0x00000080      D

Type <CR> to continue, Q<CR> to stop: q
```

Figure A-89. topologyShow command example 1

The command syntax is topologyShow <domain ID> to list a specified domain.

```
admin> topologyShow 1

Local Domain ID: 1

Domain  Metric    Hops    Out Port    In Ports        Flags    Name
-------------------------------------------------------------------------
   1    2000       2          2      0x00000050      D     "open148"
                   2          1      0x00000020      D
                   2          0      0x00000080      D
```

Figure A-90. topologyShow command example 2

Table A-27
topologyShow Command Field Descriptions

Field	Description
Domain	The destination domain
Metric	The total cost to reach the destination domain, or the sum of all link costs traversed by a frame to reach the destination domain. A metric of 1000 indicates the destination domain is one hop away from the local switch, since 1000 is the cost of a 1 Gbps link.
Hops	The number of hops (switches) between the local and remote switches.
Out Port	The out ports used to route frames to the domain.

continued

Table A-27
topologyShow Command Field Descriptions *continued*

Field	Description
In Ports	A bitmap field that indicates what ports are routed through the out port to reach the destination domain.
Flags	Indicates how the switch acquired this path. Possible values are: D—The path was dynamically discovered by the FSPF protocol. S—The path was statically configured through the shell.
Name	The switch name in the domain.

uRouteConfig

Figure A-91 shows the uRouteConfig command, which lets you select the destination traffic's path on a source-port basis. The command syntax is:

uRouteConfig <port>, <domain>, <output port>

After using this command, traffic coming in from the port addressed to a domain is forwarded through the output port. Make sure that the output port is a viable path for reaching the domain. The port can be an E-Port or an F_Port. If it is an E_Port, make sure that no routing loops are created.

If the output is not an E_Port, the route is allocated dynamically to a different path, if one is available, as if this was a regular route. If the output port goes down, the route is treated as a regular route and is allocated to a different path if one is available. When the output port comes back up, the port is rerouted back to the static route.

Load sharing continues, taking into account static routes when counting the number of routes that are allocated to a path, acting only on regular, non-static routes.

If the port has a static route, the flags field in uRouteShow is set to S instead of D. This does not affect the flags field in the topologyShow command. The topologyShow command still shows D unless a static path is configured.

```
switch:admin>uRouteConfig 2,2,4
committing configuration...done.
```

Figure A-91. uRouteConfig command example

uRouteRemove

Figure A-92 shows the uRouteRemove command, which removes the static route configured by the uRouteConfig command.

```
switch:admin>uRouteRemove 2,2
committing configuration...done.
```

Figure A-92. uRouteRemove command example

uRouteShow

Figure A-93 shows the uRouteShow command, which displays the port's unicast routing information (the output port used to forward frames from a port to the domain). Only one output port is used to forward frames from one input port to a destination domain.

The command uRouteShow has three syntax options:

- uRouteShow <port #> <domain ID>—Displays the route for port <port #> to domain <domain ID>
- uRouteShow <port #>—Displays the route for port <port #> to all the active domains in the fabric
- uRouteShow—Displays the route for all the ports on the switch to all the active domains in the fabric

For all three formats, uRouteShow displays the domain ID of the next hop and the port number on the next hop for each route.

```
admin> uRouteShow

Local Domain ID: 1

In Port  Domain  Out Port  Metric   Hops  Flags  Next(Dom,Port)
-------------------------------------------------------------
   0       5        7      1000     1     D        5,6
           6        7      2000     2     D        5,6
           7        7      3000     3     D        5,6
           8        7      4000     4     D        5,6
           9        7      5000     5     D        5,6

1          5        5      1000     1     D        5,5
           6        5      2000     2     D        5,5
           7        5      3000     3     D        5,5
           8        5      4000     4     D        5,5
           9        5      5000     5     D        5,5

2          5        4      1000     1     D        5,4
           6        4      2000     2     D        5,4
           7        4      3000     3     D        5,4
           8        4      4000     4     D        5,4
           9        4      5000     5     D        5,4
```

Figure A-93. uRouteShow command example

Table A-28
uRouteShow Command Field Descriptions

Field	Description
In Port	A bitmap field that indicates what ports are routed through the out port to reach the destination domain
Domain	The destination domain
Out Port	The out ports used to route frames to the domain
Metric	The total cost to reach the destination domain, or the sum of all link costs traversed by a frame to reach the destination domain. A metric of 1000 indicates the destination domain is one hop away from the local switch, since 1000 is the cost of a 1 Gbps link.
Hops	The number of hops (switches) between the local and remote switches

continued

Table A-28
uRouteShow Command Field Descriptions *continued*

Field	Description
Flags	Indicates how the switch acquired this path. Possible values are: D—The path was dynamically discovered by the FSPF protocol. S—The path was statically configured through the shell.
Next (Dom, Port)	The domain ID that the remote switch (out port) is connected to, and the port ID on the remote switch.

License Commands

License commands let you view, add, and remove license keys.

licenseAdd

The following figure shows the licenseAdd command, which adds licenses. Licenses can be checked using the licenseShow command.

```
admin> licenseAdd “342kj4324KJ23423dn”
```

Figure A-94. licenseAdd command example

licenseRemove

The following figure shows the licenseRemove command, which deletes licensed products. The value returned depends on the license keys removed. Check remaining licenses with the licenseShow command.

```
admin> licenseRemove “342kj4324KJ23423dn”
```

Figure A-95. licenseRemove command example

licenseShow

The following figure shows the licenseShow command, which displays the optionally licensed products installed on the SAN Switch. The value returned depends on the license keys installed. If no optional software features have been added, no value is returned.

NOTE: If the switch does not have a Fabric Operating System license installed, the licenseShow command only returns Web Management Tools. QuickLoop functionality is the default state if a Fabric Operating System license is not installed.

```
admin> licenseShow

Webtools

Zoning
```

Figure A-96. licenseShow command example

Glossary

Alias Server

An Alias Server is a fabric software facility that supports multicast group management.

Arbitrated Loop

The Fibre Channel Arbitrated Loop (FC-AL) is a loop where several Fibre Channel nodes arbitrate for access to a shared common medium.

Community

An SNMP community is a relationship between an SNMP agent and a set of SNMP managers that defines authentication, access control, and proxy characteristics.

Credit

Credit is a numeric value applied to a switch. The value represents the maximum number of receive buffers provided by an F_Port or FL_Port to its attached N_Port or NL_Port, respectively, such that the N_Port or NL_Port may transmit frames without over-running the F_Port or NL_Port.

Class 2

In Class 2 service, the fabric and destination N_Port provide connectionless service with notification of delivery or nondelivery between the two N_Ports.

Class 3

Class 3 service provides a connectionless service without notification of delivery between N_Ports. The transmission and routing of Class 3 frames is the same as for Class 2 frames.

Domain ID

The domain number uniquely identifies a switch in a fabric. Normally, the switch automatically assigns the domain ID. The domain ID can be any value between 0 and 31.

E_Port

An E_Port is used as an interswitch expansion port. It connects to the E_Port of another switch to build a larger fabric.

Error Detect Time Out Value

The Error-Detect Time-Out Value (E_D_TOV) is equal to the time the switch waits for an expected response before declaring an error condition.

Fabric

A fabric is a network comprised of high-speed fiber connections resulting from the interconnection of switches and devices. A fabric is an active and intelligent nonshared interconnect scheme for nodes.

FL_Port

An FL_Port is a fabric access port used to connect NL_Ports to the switch in a loop configuration.

F_Port

An F_Port is a fabric access port used to connect an N_Port.

Giga Bit Interface Converter module

A Giga Bit Interface Converter (GBIC) module is a removable serial transceiver designed to provide gigabaud capability for Fibre Channel and other protocols that use the same physical layer.

G_Port

A G_Port is a generic switch port that can operate either as an E_Port or as an F_Port.

Interswitch Link

The Interswitch Link (ISL) is a fiber link between two switches.

Isolated E_Port

An E_Port is isolated when the ISL is online but not operational between switches because of overlapping domain ID or nonidentical parameters such as E_D_TOVs or zone configuration definitions.

Loop

A loop is a configuration of devices connected to the fabric by way of a U_Port interface card that is in FL_Port mode.

Multicast

Multicast is used when multiple copies of data are to be sent to designated multiple destinations.

N_Port

An N_Port is an equipment port connected to the fabric.

NL_Port

An NL_Port is an equipment port connected to the fabric in a loop configuration by way of an FL_Port.

Power-On Self-Test

The Power-On Self-Test (POST) is a series of self-tests that run each time the switch is booted or reset.

Resource Allocation Time Out Value

The Resource Allocation Time Out Value (R_A_TOV) is used to time out operations that depend on the maximum possible time that a frame could be delayed in a fabric and still be delivered.

Simple Network Management Protocol

Simple Network Management Protocol (SNMP) is a TCP/IP protocol that generally uses the User Datagram Protocol (UDP) to exchange messages between a management information base and a management client residing on a network. Since SNMP does not rely on the underlying communication protocols, it can be made available over other protocols, such as UDP/IP.

SNMPv1

The original standard for SNMP is now referred to as SNMPv1.

Tachyon

Tachyon refers to a Fibre Channel controller that focuses on arbritrated loop topologies for cost-effective Fibre Channel mass storage designs. Tachyon family architecture is a complete hardware-based design that delivers on the true performance capabilities of Fibre Channel.

Trap

An SNMP trap is a mechanism for SNMP agents to notify the SNMP management station of significant events.

Unicast

Unicast routing provides one or more optimal paths between any two switches that make up the fabric. This allows for a single copy of data to be sent to designated destinations.

U-Port

A U_Port is a generic switch port that can operate either as an E_Port, F_Port, or FL_Port. A port is defined as a U_Port, for example, when it is not connected or has not yet assumed a specific function in the fabric.

World Wide Name

A World Wide Name (WWN) uniquely identifies a switch on local and global networks.

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