M5424 Fibre Channel

SAN I/O Module

Hardware Reference Manual

BROCADE

Brocade Communications Systems, Incorporated

Document History

Title	Publication Number	Summary of Changes	Date
Brocade M5424 SAN I/O Module Hardware Reference Manual	53-1001082-01	New document	September, 2008

Contents

Chapter 3　　　**Operating the SAN I/O Module**

Appendix A　　　**SAN I/O Module specifications**

Index

About this document

This document is a hardware reference manual written for SAN administrators using Blade Servers that support the Brocade M5424 Fibre Channel SAN I/O Module. It provides information on installing, configuring, and maintaining of the Brocade M5424 SAN I/O Module.

NOTE
Throughout this document, the Brocade M5424 SAN I/O Module is referred to as the SAN I/O Module.

How this document is organized

This document is organized to help you find information that you need as quickly as possible. The document contains the following components:

- Chapter 1, "Introducing the SAN I/O Module," describes the SAN I/O Module and explains its basic concepts and features. This chapter also provides instructions for unpacking the SAN I/O Module from its shipping container, references to the appropriate publication for installing the module into the Blade Server Enclosure, and Fibre Channel port cabling guidelines.

- Chapter 2, "Configuring the SAN I/O Module" describes how to change the SAN I/O Module's IP address, connect the module to the Ethernet network and fabric, change between Access Gateway and Fabric OS Native modes, activate Ports on Demand (POD), and connect to the SAN I/O Module using Web Tools.

- Chapter 3, "Operating the SAN I/O Module," provides details about operating and replacing a M5424 Module.

- Appendix A, "SAN I/O Module specifications," is a product specification reference.

Supported hardware and software

This document includes information specific to the Brocade M5424 SAN I/O Module using Brocade Fabric OS. For more information about the Fabric OS supported by this product, refer to the related publications on the Brocade Family Documentation CD-ROM shipped with the SAN I/O Module.

What's new in this document

This is a new document. For further information, see the *Brocade release notes* for the Fabric OS released with this product.

Document conventions

This section describes text formatting conventions and important notice formats used in this document.

Text formatting

The narrative-text formatting conventions that are used are as follows:

bold text	Identifies command names Identifies the names of user-manipulated GUI elements Identifies keywords and operands Identifies text to enter at the GUI or CLI
italic text	Provides emphasis Identifies variables Identifies paths and Internet addresses Identifies document titles
`code` text	Identifies CLI output Identifies command syntax examples

For readability, command names in the narrative portions of this guide are presented in mixed lettercase: for example, switchShow. In actual examples, command lettercase is often all lowercase. Otherwise, this manual specifically notes those cases in which a command is case sensitive.

Command syntax conventions

Command syntax in this manual follows these conventions:

command	Commands are printed in bold.
--**option, option**	Command options are printed in bold.
-**argument,** arg	Arguments.
[ ]	Optional element.
variable	Variables are printed in italics. In the help pages, values are <u>underlined</u> or enclosed in angled brackets < >.
...	Repeat the previous element, for example "member[;member...]"
value	Fixed values following arguments are printed in plain font. For example, --**show** WWN
|	Boolean. Elements are exclusive. Example: --**show** -**mode** egress | ingress

Notes, attention, caution, and danger

The following notices appear in this document.

NOTE
A note provides a tip, emphasizes important information, or provides a reference to related information.

ATTENTION
An attention alerts you to potential damage to hardware, firmware, software or data.

CAUTION

A caution alerts you to potential injury to personnel.

DANGER

A danger alerts you to potential lethal injury to personnel.

For definitions of SAN-specific terms, visit the Storage Networking Industry Association online dictionary at *http://www.snia.org/education/dictionary*.

Notice to the reader

This document may contain references to the trademarks of the following corporations. These trademarks are the properties of their respective companies and corporations.

These references are made for informational purposes only.

Corporation	Referenced Trademarks and Products
Dell, Inc.	PowerEdge
Microsoft Corporation	Windows, Windows 2000, Windows 2003, Windows XP
Sun Microsystems, Inc.	Solaris
Red Hat Inc.	Red Hat Enterprise Linux (RHEL)
Novell, Inc	SUSE Linux Enterprise Server (SLES)

Additional information

This section lists additional Brocade and industry-specific documentation that you might find helpful.

Brocade resources

The following related documentation is provided on the Brocade Family Documentation and Brocade M5424 Documentation CD-ROMs packaged with the SAN I/O Module and on the Brocade Web site.

NOTE
For access to the Brocade web site, go to *http://www.brocade.com* and click **Brocade Connect** to register at no cost for a user ID and password.

Fabric OS
- *Fabric OS Administrator's Guide*
- *Fabric OS Command Reference Manual*
- *Fabric OS MIB Reference Manual*
- *Fabric OS System Error Message Reference Manual*
- *Access Gateway Administrator's Guide*
- *SAN TECH NOTE - Preparing to Install the Brocade Access Gateway*

Fabric OS Optional Features
- *Web Tools Administrator's Guide*
- *Fabric Watch Administrator's Guide*

Brocade M5424 Fibre Channel SAN I/O Module
- Brocade M5424 Fibre Channel SAN I/O Module *Hardware Reference Manual* (this document).
- *Brocade M5424 QuickStart Guide.*
- Brocade release notes for Fabric OS version supported by the Brocade Brocade M5424 SAN I/O Module.

For practical discussions about SAN design, implementation, and maintenance, you can obtain *Building SANs with Brocade Fabric Switches* through:

> *http://www.amazon.com*

For additional Brocade documentation, visit the Brocade SAN Info Center and click the Resource Library location:

> http://www.brocade.com

Release notes are available on the Brocade Connect Web site and are also bundled with the Fabric OS firmware.

Optional brocade features

Optional Brocade features include:

Advanced Performance Monitoring

Enables more effective end-to-end SAN performance analysis to enhance performance tuning, increase productivity, optimize resource utilization, and reduce costs.

Fabric Watch

Continuously monitors SAN fabrics for potential faults based on thresholds set for a variety of SAN fabric elements and events—automatically alerting administrators to potential problems before they become costly failures.

ISL Trunking

Optimizes the performance and availability of SAN fabrics while simplifying ISL management. For example, two 4 Gbps Brocade switches can automatically group up to eight ISLs into a single logical "trunk," with a total throughput of up to 32 Gbps.

Enhanced Group Management

The Enhanced Group Management (EGM) license enables switches, directors, and DCX backbone platforms to be managed as a group. Group management tasks can include:

- Replicating security settings for a group of switches.
- Downloading firmware to a group of switches.
- Uploading configuration from a group of switches.
- Managing and editing multiple PCDM configurations.
- Scheduling periodic backup to server database.

Adaptive Networking

A suite of tools and capabilities that optimize behavior in the SAN. Even under the worst congestion conditions, Adaptive Networking features can maximize the fabric behavior and provide necessary bandwidth for high-priority, mission-critical applications and connections.

Secure Fabric OS

Provides policy-based access control of local and remote management channels, including Fabric Manager, Web Tools, and standard SNMP applications.

Ports on Demand

Allows you to obtain additional ports via license key upgrade.

Fabric Manager

A fabric monitor and management application that provides a central point of control for multiple switches and fabrics. You can use Fabric Manager to configure multiple switches simultaneously from one location, view the status of multiple devices, and perform SAN-level maintenance without having to access each switch in your fabric or SAN.

Other industry resources

For additional resource information, visit the Technical Committee T11 Web site. This Web site provides interface standards for high-performance and mass storage applications for Fibre Channel, storage management, as well as other applications:

http://www.t11.org

For information about the Fibre Channel industry, visit the Fibre Channel Industry Association Web site:

http://www.fibrechannel.org

Getting technical help

Contact your SAN I/O Module support supplier for hardware, firmware, and software support, including product repairs and part ordering. To expedite your call, have the following information available:

1. General Information

   - Technical Support contract number, if applicable
   - SAN I/O Module model
   - SAN I/O Module operating system version
   - Error numbers and messages received
   - **supportSave** command output
   - Detailed description of the problem and specific questions
   - Description of any troubleshooting steps already performed and results
   - Serial console and Telnet session logs
   - syslog message logs

2. SAN I/O Module Serial Number

   The SAN I/O Module serial number and corresponding bar code are provided on the serial number label attached to the module. Following is an example of a serial number and barcode:

   FT00X0054E9

   ▮▏▎▍▌▐▏▎▍▌▐▏▎▍▌▐▏▎

3. World Wide Name (WWN). Use the CLI **wwn** or **switchShow** commands to display the WWN.

4. Software licenses. Use the CLI **licenseIdShow** command to display the list of licenses and corresponding license IDs available on the unit.

Document feedback

Because quality is our first concern at Brocade, we have made every effort to ensure the accuracy and completeness of this document. However, if you find an error or an omission, or you think that a topic needs further development, we want to hear from you. Forward your feedback to:

documentation@brocade.com

Provide the title and version number and as much detail as possible about your comment, including the topic heading and page number and your suggestions for improvement.

Introducing the SAN I/O Module

The M5424 Fibre Channel SAN I/O Module is a 24-port Fibre Channel module with 8 external ports and 16 internal ports that installs in a Dell PowerEdge M1000e Blade Server Enclosure. Although the product may ship with a specific number of ports enabled, it can upgraded to 24 ports through Ports on Demand (POD) licensing. These ports support link speeds up to 8 Gbps.

NOTE
You can also install 4 Gbps SFPs in the SAN I/O Module. All SFPs must be Brocade-branded.

Fabric OS Native and Access Gateway modes

The SAN I/O Module can function in either Fabric OS Native mode or Brocade Access Gateway mode.

- The SAN I/O Module is shipped in Fabric OS Native mode by default.
- Access Gateway simplifies SAN deployment by using NPIV. NPIV provides Fibre Channel switch functions that improve SAN I/O Module scalability, manageability, and interoperability. For more information on Access Gateway, refer to the following:
  - For a list of SAN I/O Module F_Ports mapped to N_Ports in the SAN I/O Module as shipped from the factory, refer to "Access Gateway Mode default port mapping" on page 25.
  - For general information and details on using Access Gateway, refer to the *Brocade Access Gateway Administrator's Guide.*
  - Since Access Gateway relies on NPIV technology for its connection to the edge fabric you may have to prepare the edge fabric before connecting it to Access Gateway. Please refer to the *SAN TECH NOTE – Preparing to Install the Brocade Access Gateway* for specific instructions.

NOTE
Access Gateway cannot be connected directly into an array; it requires a fabric to support NPIV.

Features available on the SAN I/O Module depend on whether the module is configured in Access Gateway or Fabric OS Native mode.

Fabric OS Native mode

The SAN I/O Module has the following features when operating in Fabric OS Native mode:

- Up to 8 external autosensing (2, 4 and 8 Gbps) Fibre Channel ports. These universal and self-configuring ports are capable of becoming one of the following port types:
  - F_Port (fabric enabled)
  - FL_Port (fabric loop enabled)
  - E_Port (expansion port)

These ports are capable of Brocade ISL Trunking with appropriate licensing.

- Up to 16 internal backplane F_Ports. Each port can automatically negotiate its speed at either 4 Gbps or 8 Gbps to match the speed of attached devices.

- Dynamic ports on demand, which allows ports to be activated as needed based on available licenses.

- Frame filtering that augments the hardware zoning capabilities of the Brocade ASIC, which implements hardware zoning at the port level of the SAN I/O Module.

- Brocade ASIC expanded capabilities, including World Wide Name (WWN) and device-level zoning.

- Hardware zoning implemented by firmware-accessible table per output port.

- Extensive diagnostics and monitoring capabilities.

- Unicast and broadcast data traffic support.

- Up to eight Brocade-branded small form-factor pluggable (SFP) optical transceivers.

  Although the product ships with a specific number of transceivers, you can add additional transceivers by purchasing a Ports on Demand (POD) license.

NOTE
You can also install 4 Gbps SFPs in the SAN I/O Module, however all SFPs must be Brocade-branded.

- One serial console port on the front panel.

- One green and amber light-emitting diode (LED) above each port to indicate port status.

  If dark, the port is unlicensed.

- The following system LEDs:
  - One green power LED to indicate module power-on.
  - One green/amber LED to indicate module status.
  - One blue, identify module and flash blue to locate module.

See "Interpreting LED activity" on page 22 for details about the SAN I/O Module LEDs.

Access Gateway mode

- Up to 8 autosensing (2, 4, and 8 Gbps) Fibre Channel ports. These are universal and self-configuring ports capable of becoming the following types:
  - F_Port (fabric enabled)
  - N_Port (fabric enabled)

- Up to 16 internal backplane F_Ports. Each port can automatically negotiate its speed at either 4 Gbps or 8 Gbps to match the speed of attached devices

- Dynamic ports on demand, which allows any port to be activated as needed based on available licenses.

- Up to eight Brocade-branded small-form-factor pluggable (SFP) optical transceivers.

  The SAN I/O module ships with a specific number of 8 Gbps SFPs. If you purchase a POD license, you will receive additional SFPs.

NOTE
You can also install 4 Gbps SFPs in the SAN I/O Module, however all SFPs must be Brocade-branded.

- One serial console port on the front panel (RJ45 connector).
- One green/amber LED to indicate status for each port.

  If dark, the port is unlicensed.

- The following system light-emitting diodes (LEDs):
  - One green power LED to indicate module power-on.
  - One green/amber LED to indicate module status.
  - One blue, identify module and flash blue to locate module.

See "Interpreting LED activity" on page 22 for details about the SAN I/O Module LEDs.

Ports on Demand (POD)

The SAN I/O Module ships with a specific number of active ports. You can allocate a POD license to activate additional ports. The SAN I/O Module supports two licensing methods: static and dynamic (module default).

- For Dynamic POD, 12 licenses are available for the first 12 active ports. Ports 17 and 18 are licensed at the factory. The remaining 10 licenses are assigned to active ports as required. Once licenses are issued, they can be moved from one port to another, making port licensing more flexible.
- For static POD, Table 1 shows the base internal and external ports that are licensed, as well as the additional 12 ports that can be activated with a POD license. For details about activating and deactivating additional ports when you have POD licensing, refer to "Activating Ports on Demand (POD)" on page 17.

TABLE 1　　　Ports available

Port Licensing	External Ports	Internal Ports
Base	17, 18, 19, and 20	1, 2, 3, 4, 5, 6, 7, and 8
POD	0, 21, 22, and 23	9, 10, 11, 12, 13, 14, 15, and 16

Hardware Description

This section describes the physical SAN I/O Module as shipped from the factory. For specifications, such as installed memory, weight and physical dimensions, facility requirements, architectural specifications, and regulatory compliance, refer to Appendix A, "SAN I/O Module specifications"

Port side

Externally accessible ports and LEDs are on the port side of the SAN I/O Module. The port side faces out when the SAN I/O Module is inserted into the I/O bay of the Blade Server enclosure. Figure 1 details the port side. For a complete description of the locations and interpretations of these LEDs, see "Interpreting LED activity" on page 22.

Access the I/O module handle at the front of the port side of the SAN I/O Module. By lifting the handle's release latch, you can open the handle to remove and insert the unit from the Blade Server Enclosure.

FIGURE 1 Port side view
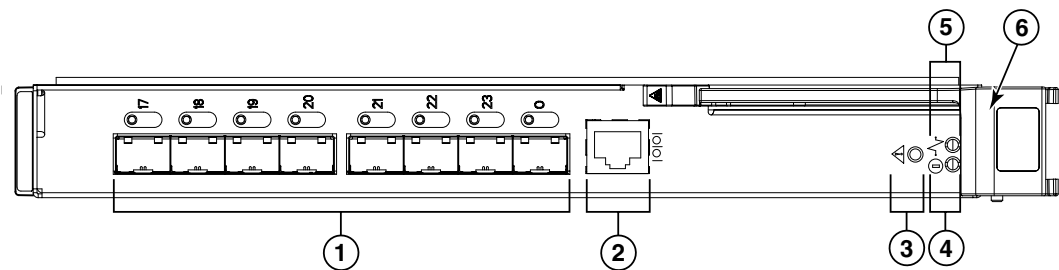
1. Ports with port status and port speed LEDs

2. RJ45 console port

3. SAN I/O Module status LED

4. Power status LED

5. Server management LED

6. SAN I/O Module handle

The nonport (SAN I/O Module status) LEDs, shown as item 3 of Figure 1, display SAN I/O Module-level information as shown in Figure 2.

FIGURE 2 Other status LEDs
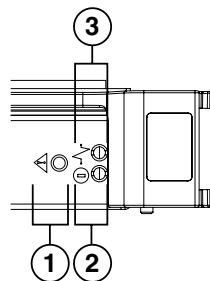
1   SAN I/O Module status LED

2   Power status LED

3   Server Management LED

Nonport side

The nonport side of the SAN I/O Module (shown in Figure 3) is seated into the enclosure. You do not need to line up the SAN I/O Module as it will seat correctly when the insertion arm is closed.

When the SAN I/O Module is inserted, the backplane connectors activate a connection port, allowing the SAN I/O Module to be configured in the Blade Server Enclosure.

FIGURE 3   **Nonport side, viewed from top**
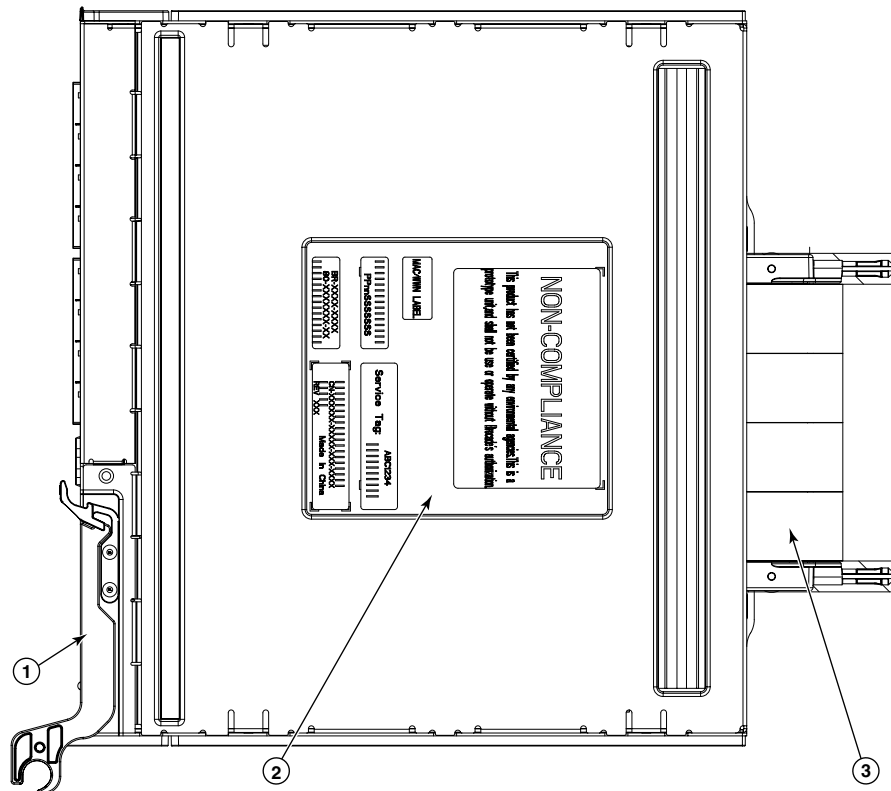
1. I/O module handle. Lifting the handle's release latch opens the handle to install and remove the module from the Blade Server Enclosure.

2. Product label including serial number.

3. Connectors

Labeling

Figures 3 shows the labels appearing on the SAN I/O Module. A second serial label is located beneath the insertion arm on the enclosure (visible only when the arm is extended).

To extend the insertion arm, gently squeeze the release tab and pull outward.

SFPs

NOTE
You must install Brocade-branded SFPs in the SAN I/O Module.

The SAN I/O Module was designed to work with small form-factor pluggable (SFP) optical modules. The SAN I/O Module ships with a specific number of 8 Gbps Brocade-branded SFPs. If you purchase a POD license, you will receive additional SFPs.

NOTE
You can also install 4 Gbps SFPs in the SAN I/O module, All SFPs must be Brocade-branded.

SFPs provide optical connections to external devices for both SWL and LWL connections. Replace SFPs with a new pluggable unit rather than replacing the SAN I/O Module. Refer to the manufacturer's instructions when installing SFPs.

"Removing and replacing the SAN I/O Module" on page 23 provides details about removing SFPs from the SAN I/O Module.

For a complete list of SFPs and other interoperable hardware, visit the Brocade Connect Web site at: *http://www.brocadeconnect.com* and follow the links to the latest compatibility information.

ISL trunking groups

If your SAN I/O Module has a Brocade ISL Trunking license, external ports can form trunking groups of ISLs between adjacent switches. Ports that can be used within the same trunking group are color-coded on the SAN I/O Module's port side for easy identification.

All external ports (0, 17-23) can be formed into a single 8-port trunk if the attached switch supports an 8-port trunk. The ports can also form 2-port, 3-port, 4-port trunks, or.a 5-port or7-port trunk. For details about Brocade ISL Trunking, see the *Brocade Fabric OS Procedures Guide*.

NOTE
Only the external ports are available for trunking.

Optional features

The SAN I/O Module supports the following optional software, which is activated with the purchase of the corresponding license key. Applicable options depend on whether the SAN I/O Module operates in Switch or Access Gateway mode.

Fabric OS Native Mode

- Enhanced Group Management[1]
- Adaptive Networking
- ISL Trunking
- Advanced Performance Monitoring

- Fabric Watch
- Fabric Manager
- Port on Demand (POD) licensing
- Support for Brocade Fabric Access API and API Scripting Toolkit

1.   included with the SAN I/O Module

Access Gateway Mode

- Fabric/Switch License
- Brocade AG (N_Port) Trunking

For detailed information on any of these features, refer to the *Brocade Fabric OS Administrator's Guide*.

Unpacking and installing the SAN I/O Module

If the SAN I/O Module is installed in the Blade Server Enclosure as shipped to you, skip this section. This section applies when installing a new module in an empty bay or replacing an existing SAN I/O Module.

NOTE
The SAN I/O Module is designed to work only in I/O bays B1/B2 and C1/C2 of the Dell M1000e Blade Server Enclosure. Make sure to comply with installation requirements in the Blade Server Enclosure *Hardware Owner's Manual*.

Perform the following steps to remove the SAN I/O Module from its shipping package.

1. Open the shipping box and inspect the contents, making sure that nothing is missing or damaged.

   Do not insert a damaged SAN I/O Module into the Blade Server Enclosure. If the SAN I/O Module appears to be damaged, contact your sales representative before proceeding.

2. Remove the cardboard accessory tray from on top of the SAN I/O Module.

   This tray contains the documentation, regulatory statements, product information guide, and Documentation CD.

3. Remove the SAN I/O Module from the box.

   The protective foam ends will slide out with the SAN I/O Module.

4. Remove the foam ends from the SAN I/O Module.

5. Be sure that you have taken the necessary precautions for electrostatic sensitivity; then break the seal warning.

6. Slide the SAN I/O Module out of the antistatic sleeve and inspect it carefully for any obvious defects or shipping damage.

7. For complete instructions to install the SAN I/O Module into the Blade Server Enclosure, refer to the section on installing an I/O module in the Blade Server Enclosure *Hardware Owner's Manual*.

Cabling guidelines

After modifying the SAN I/O Module's IP address and domain name (if SAN I/O Module is in Fabric OS Native mode), we recommend that you cable all external ports to fabric connections before bringing the SAN I/O Module online. Refer to Chapter 2, "Configuring the SAN I/O Module," for steps on modifying the IP address.

Begin by cabling ports 17, 18, 19, 20, 21, 22, 23, and 0. Ports 17 and 18 are licensed at the factory as part of Dynamic Ports On Demand (DPOD). By cabling these ports first, you will not need to move licenses to other ports you may have cabled.

Configuring the SAN I/O Module

Use procedures in this chapter to configure the SAN I/O Module to operate on a network and fabric. Also use steps to change the Module's operating mode (Fabric OS Native and Access Gateway modes), activate Ports on Demand (POD), and connect to the SAN I/O Module using Web Tools.

NOTE
Although the SAN I/O Module is configured at the factory for Fabric OS Native mode, you can enable it for Access Gateway mode. For more information, refer to *"Fabric OS Native and Access Gateway modes"* on page 1.

This chapter provides configuration procedures that use SAN I/O Module Command Line Interface (CLI) and the Web Tools application. For details refer to the *Web Tools Administrator's Guide*, *Access Gateway Administrator's Guide,* and *Fabric OS Command Reference Manual*. If the same operation can be performed using the Blade Server Enclosure's Chassis Management Controller (CMC) application, use that application instead.

Items required

The following items are required for configuring and connecting the SAN I/O Module for use in a network and fabric:

- The SAN I/O Module installed in a Blade Server Enclosure. For instructions, refer to the steps on installing an I/O module in the *Hardware Owner's Manual* for the Blade Server Enclosure.

- If required, management workstation (computer) that has a terminal emulator (such as HyperTerminal) or a keyboard, video, and mouse (KVM) device. Note that this is only required if not changing the SAN I/O Module IP address through the Blade Server Enclosure GUI or CLI management programs.

- An unused IP address and corresponding subnet mask and gateway address unless DHCP is used.

- If required, a serial cable to connect to the SAN I/O Module serial console port. Note that this is only required if not changing the SAN I/O Module IP address through the Blade Server Enclosure GUI or CLI management programs.

- SFP transceivers and compatible fibre cables, as required.

- Access to an FTP server for backing up the SAN I/O Module configuration.

- Access to these publications:
  - Blade Server Enclosure *Hardware Owner's Manual*
  - Blade Server Enclosure *Configuration Guide*
  - *Fabric OS Command Reference Manual*
  - *SAN TECH NOTE – Preparing to Install the Brocade Access Gateway*
  - *Access Gateway Administrator's Guide*
  - *Web Tools Administrator's Guide*

Modify the SAN I/O Module IP address

By default, the IP address for the SAN I/O Module is configured as 10.77.77.77 with a default Ethernet subnetmask of 255.255.255.0.

Reset the IP address using three methods. If the IP values are set using either of these methods, the IP values are stored on the SAN I/O Module.

- SAN I/O Module Command Line Interface (CLI).
- Blade Server Enclosure CMC CLI.
- Blade Server Enclosure CMC graphical user interface (GUI).

ATTENTION
Do not connect the SAN I/O Module to the internal network until the IP address is correctly set for your Ethernet network requirements.

NOTE
It is recommended that you set the IP address using the Blade Server Enclosure CMC GUI application because this enables centralized management of the SAN I/O Module.

Using the SAN I/O Module CLI to set the IP address

Use the following tasks to change the IP address on the SAN I/O Module using the Module's CLI.

Task 1: Establish a terminal session with the SAN I/O Module

Use these steps to establish a terminal emulation session between the SAN I/O Module and a Blade Server Enclosure management workstation used for managing the I/O Module. Once this session is established, you can log into the Module and use its CLI commands to manage the module.

1. Connect a serial cable between the serial console port on the SAN I/O Module and a Blade Server Enclosure management workstation that can establish a terminal emulation session with the SAN I/O Module. For instructions, refer to *Configuration Guide* for your Blade Server enclosure.

2. Disable any serial communication programs that are running on the workstation.

3. Using a terminal emulator application (such as HyperTerminal on a PC or TERM in a LINUX or UNIX environment), establish a terminal session to the SAN I/O Module from the management workstation. You will use this connection if you want to reset the module's IP address using CLI commands and perform other configuration tasks.

For Windows 95, 98, 2000, XP or NT

     a. Click **Start** and select **Programs -> Accessories -> Communications**.

     b. Select **Hyperterminal** and enter a name for the connection.

     c. From the Hyperterminal window, click the **Connect** drop-down menu and select an available COM port.

     d. Click **OK**.

e. From the **COM Port Properties** window, select the following configuration values:

- `Bits per second: 9600`
- `Databits: 8`
- `Parity: None`
- `Stop bits: 1`
- `Flow Control: None`

For LINUX or UNIX

a. Enter the following at the command prompt:

`tip /dev/ttyb -9600`

b. When the terminal application stops reporting information, press **Enter** to display the login prompt.

c. Log in using the default administrative account:

`Login: admin`

`Password: password`

d. When prompted either change the administrative password, or press **Ctrl-C** to bypass.

Task 2: Changing the IP address

1. Verify that the SAN I/O Module has completed POST. When POST is complete, the port status and SAN I/O Module power and status LEDs return to a standard healthy state.

2. Enter the CLI **ipAddrSet** command.

Follow on-screen instructions and supply the correct information, as shown in the following example.

```
switch:admin> ipaddrset
Ethernet IP Address [10.77.77.77]:10.32.53.47
Ethernet Subnetmask [255.255.255.0]:255.255.240.0
Fibre Channel IP Addresss [none]:
Fibre Channel Subnetmask [none]:
Gateway IP Address [0.0.0.0]:10.32.48.1
DHCP [Off]:
IP address is being changed...Done.
```

3. Enter **ipAddrShow** at the prompt to verify that the address was correctly set.

Using the CMC CLI to set the IP address

Use the following steps to connect modify the SAN I/O Module IP address through the CMC CLI.

1. Establish a Telnet session to the CMC CLI.

2. At the command prompt, type **connect switch-x** where *x* is the bay where the SAN I/O Module is installed. For example, **switch-x** can be:

- **Switch-3** for SAN I/O Module installed in bay B1.
- **Switch-4** for SAN I/O Module installed in bay B2.
- **Switch-5** for SAN I/O Module installed in bay C1.

- **Switch-6** for SAN I/O module installed in bay C2.

3. At the login prompt, enter the user name as **admin** and password as **password**.

4. Use the appropriate CLI commands to change the IP address of the selected SAN I/O module. Refer to your Blade Server Enclosure CLI documentation.

Using the CMC GUI to set the IP address

To change the IP address, use the following steps:

1. Open the CMC application's **Setup** tab.

2. Enter the new information in the **IP Address**, **Subnet Mask**, and **Gateway** fields as appropriate and click **Apply**.

3. To enable DHCP, select **DHCP Enabled** and click **Apply**.

FIGURE 4   CMC Setup tab
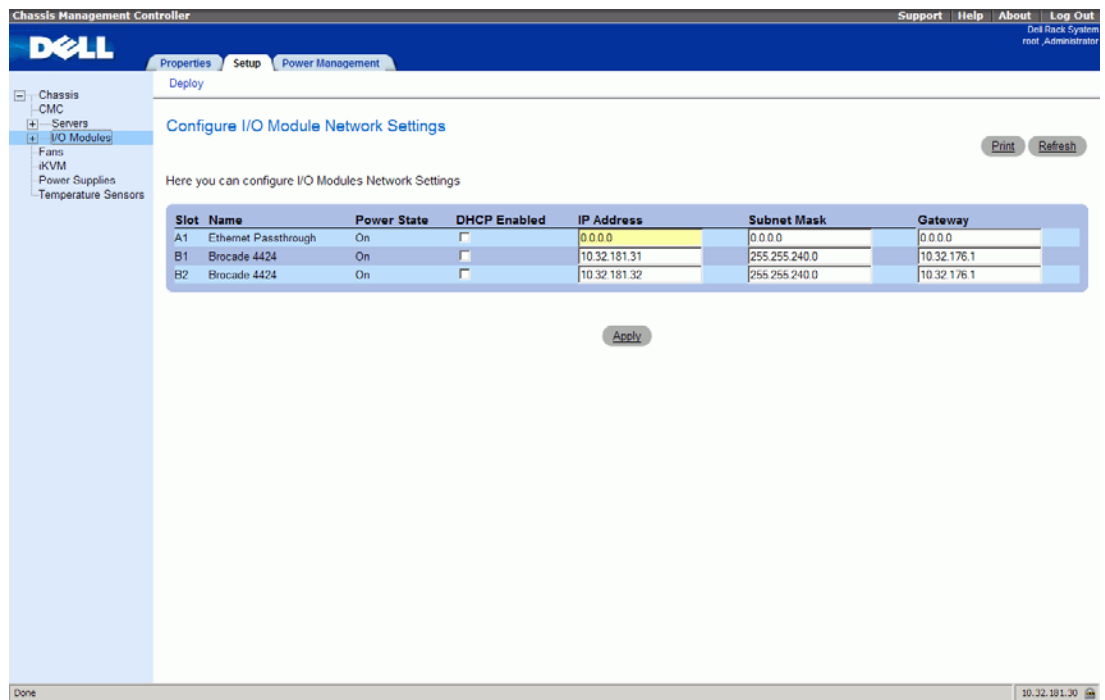
NOTE

Refer to the documentation for the CMC GUI application for additional detail.

Connecting the SAN I/O Module to the Ethernet network

Once you have successfully set the appropriate IP address of the SAN I/O Module, you can establish an Ethernet connection through the Chassis Management Controller (CMC) to a remote management workstation for any additional configuration. The management workstation must be on the same Ethernet subnet as the CMC.

NOTE
Ensure that the SAN I/O Module is not being modified from any other connection until configuration is complete.

Connecting the SAN I/O Module to the fabric

NOTE
Refer to "Cabling guidelines" on page 8 before beginning the following procedure.

Before beginning the following steps, determine whether the SAN I/O Module is in Brocade Access Gateway or Fabric OS Native mode. This affects the configuration process. Using the SAN I/O Module CLI, enter the **ag --modeShow** command to determine the current operating mode.

1. If the SAN I/O Module is in Fabric OS Native mode, continue with step 2 and step 3. If the Module is in Access Gateway mode, go on to step 4.

2. Log onto the SAN I/O Module through a Telnet connection, using the admin account.

3. Modify the domain ID if required using SAN I/O Module CLI commands.

   The default domain ID is 1. If the SAN I/O Module is not powered on until after it is connected to the fabric and the default domain ID is already in use, the domain ID for the new SAN I/O Module is automatically reset to a unique value. If the SAN I/O Module is connected to the fabric after it has been powered on and the default domain ID is already in use, the fabric segments.

   To find the domain IDs that are currently in use, run the **fabricShow** command on another SAN I/O Module or switch in the fabric. Identify an unused domain ID:

   a. Disable the SAN I/O Module being configured using the **switchDisable** command.

   b. Enter the **configure** command at the root prompt.

      The command prompts display sequentially. Enter a new value at the Domain prompt or press **Enter** to accept the default value. The SAN I/O Module now has a unique domain ID and can join the fabric. Following is an example of command output.

      ```
      Fabric parameters (yes, y, no, n): [no] y

      Data field size: (256..2112) [2112]
      Sequence Level Switching: (0..1) [0]
      Disable Device Probing: (0..1) [0]
      Suppress Class F Traffic: (0..1) [0]
      Switch PID Format: (1..2) [1]Configure...

      Domain: (1..239) [1] 155
      R_A_TOV: (4000..120000) [10000]
      E_D_TOV: (1000..5000) [2000]
      WAN_TOV: (0..30000) [0]
      ```

```
MAX_HOPS: (7..19) [7]

Per-frame Route Priority: (0..1) [0]
Long Distance Fabric: (0..1) [0]
BB credit: (1..27) [16]

Insistent Domain ID Mode (yes, y, no, n): [no]
Virtual Channel parameters (yes, y, no, n): [no]
F-Port login parameters (yes, y, no, n): [no]
Zoning Operation parameters (yes, y, no, n): [no]
RSCN Transmission Mode (yes, y, no, n): [no]
Arbitrated Loop parameters (yes, y, no, n): [no]
System services (yes, y, no, n): [no]
Portlog events enable (yes, y, no, n): [no]
ssl attributes (yes, y, no, n): [no]
http attributes (yes, y, no, n): [no]
snmp attributes (yes, y, no, n): [no]
rpcd attributes (yes, y, no, n): [no]
cfgload attributes (yes, y, no, n): [no]
webtools attributes (yes, y, no, n): [no]
System  (yes, y, no, n): [no]

    WARNING: The domain ID will be changed. The port level zoning may be
affected
```

c.   Re-enable the SAN I/O Module by entering the **switchEnable** command.

NOTE
It could take a short time (typically a few seconds, but sometimes up to 20 seconds) for the newly added SAN I/O Module to appear in the fabric display with its newly assigned domain ID.

---

4.   If you need to install SFP transceivers, install them in the external Fibre Channel ports as required.

a.   Remove the dust plugs from the ports to be used.

b.   If necessary, remove the end caps from the SFP.

c.   Orient the transceiver correctly and insert it into a port until it is firmly seated and the latching mechanism clicks.

For instructions specific to the type of transceiver, refer to the transceiver manufacturer's documentation.

d.   Repeat substeps a, b, and c for the remaining ports, as required.

NOTE
Use only brocade branded SFPs on the external optical ports of this module.

---

5.   Connect the cables to the transceivers.

The transceivers are keyed to ensure correct orientation. If a transceiver does not install easily, ensure that it is correctly oriented and that the end caps have been removed. The cables used in trunking groups must meet specific requirements. For a list of these requirements, see the *Fabric OS Administrator's Guide*.

ATTENTION
A cable should not be bent to a radius less than 5.08 cm (2 inches) under full tensile load and 3.048 cm (1.2 inches) with no tensile load.

Tie wraps are not recommended for optical cables because they are easily overtightened.

    a.   Orient a cable connector so that the key (the ridge on one side of connector) aligns with the slot in the transceiver.

    b.   Insert the cable into the transceiver until the latching mechanism clicks. For instructions specific to cable type, refer to the cable manufacturer's documentation.

    c.   Repeat for the remaining transceivers as required.

6.   Check the LEDs to verify that all components are functional.

For information about LED patterns, see the "Interpreting LED activity" on page 22.

7.   Verify the correct operation of the SAN I/O Module by typing the **switchShow** command from the workstation.

This command provides information about SAN I/O Module and port status.

8.   Verify the correct operation of the SAN I/O Module in the fabric by typing the **fabricShow** CLI command from the workstation.

9.   Back up the SAN I/O Module configuration to an FTP server by typing the **configUpload** command and following the prompts.

This command uploads the SAN I/O Module configuration to the server, making it available for downloading to a replacement SAN I/O Module if necessary. Brocade recommends backing up the configuration on a regular basis to ensure that a complete configuration is available for downloading to a replacement SAN I/O Module.

For specific instructions about how to back up the configuration, see the *Fabric OS Administrator's Guide*. The **switchShow**, **fabricShow**, and **configUpload** commands are described in detail in the *Fabric OS Command Reference Manual.*

Changing from Fabric OS Native to Access Gateway mode

The SAN I/O Module ships from the factory in Fabric OS Native mode. Converting to Access Gateway mode allows you to use the module as a device management tool that transparently connects hosts to the fabric.

Configure your SAN I/O Module to run in Access Gateway mode using the following instructions. You can log into the SAN I/O Module and enable Access Gateway mode using either Web Tools or the SAN I/O Module command line interface (CLI).

Notes

- Determine if the SAN I/O Module is running in Fabric OS Native mode by entering the **switchShow** CLI command to display the current switch configuration. If running in Fabric OS Native mode, the switchMode parameter should display **Native**.

- Enabling Access Gateway mode is a disruptive process because the switch is disabled and rebooted.Once you enable the SAN I/O Module in Access Gateway mode, only a limited subset of Fabric OS commands are available and all fabric-related service requests are forwarded to the fabric switches. See the *Access Gateway Administrator's Guide* for more information.

- When you enable Access Gateway mode some fabric information is erased, such as the zone and security databases. To recover the information save the switch configuration before enabling Access Gateway mode.

Web Tools

Complete the following steps to enable Access Gateway mode using Web Tools.

1. From the management console, open a Web browser.

2. Enter the IP address of the SAN I/O Module into the Address field of the Web browser.

   See the *Web Tools Administrator's Guide* for more information on using Web Tools.

3. Log into Web Tools using the default administrative account.

   Login: admin

   Password: password

4. From the Fabric Tree, select the SAN I/O Module.

   The selected SAN I/O Module appears in the Switch View.

5. Click the **Switch Admin** button in the WebTools Manage taskbox.

   The Switch Administration window opens.

NOTE
You should save the configuration file if you are converting an SAN I/O Module to Access Gateway mode. To save your current configuration, click the **Show Advanced Mode** button in the top right-hand corner of the Switch Administration window. Select the **Configure** tab, then select the **Upload/Download** tab. Enter the relevant information to upload the configuration file.

---

6. From the Switch Status section, click **Disable**.

7. From the Access Gateway Mode section, click **Enable**.

8. Click **Apply**.

9. When prompted, click **Yes** to restart the SAN I/O Module in Access Gateway mode.

   The current Web Tools session closes; relaunch Web Tools after the SAN I/O Module reboots.

Command Line Interface

Complete the following steps to enable Access Gateway mode using the CLI.

1. Log in using the default administrative account.

   ```
   Login: admin
   Password: password
   ```

2. Enter the following command to disable SAN I/O Module.

   ```
   switchDisable
   ```

3. Enter the following command to save the current configuration on the SAN I/O Module.

    This command is optional and is only required if you are converting an existing SAN I/O Module to Access Gateway mode.

    ```
    configUpload Save
    ```

4. Enter the following command to enable Access Gateway mode:

    ag --modeEnable

    The SAN I/O Module automatically reboots and comes back online in Access Gateway mode using a factory default F_Port to N_Port mapping. You can enter the **ag --modeShow** command to ensure that the module is in Access Gateway mode. See the *Access Gateway Administrator's Guide* for more detailed configuration information.

    You can also enter the **ag --mapshow** command to display the F_Port to N_Port mapping. Enter **ag --help** command to display a list of all Access Gateway actions.

Changing from Access Gateway mode to Fabric Switch mode

If your SAN I/O Module is currently configured in Access Gateway mode, you can enable the module for Fabric OS Native mode by disabling Access Gateway mode. When you do this, the module automatically reboots in Fabric OS Native mode.

Determine if the SAN I/O Module is running in Access Gateway mode by entering the **switchShow** CLI command to display the current switch configuration. If running in Fabric OS Native mode, the switchMode parameter should display **Access Gateway Mode**.

For complete instructions on disabling Access Gateway mode using the CLI and joining the switch to the fabric, refer to the "Disabling Access Gateway Mode" section in the *Access Gateway Administrator's Guide*.

NOTE
Disabling Access Gateway mode is disruptive because the switch is disabled and rebooted. Always back up the current configuration before enabling or disabling Access Gateway mode. Enabling Access Gateway mode clears the security and zone databases. Disabling Access Gateway mode clears the F_Port to N_Port mapping.

Activating Ports on Demand (POD)

Ports on Demand (POD) licensing allows you to enable up to 24 ports from the initial 12 ports. Add optional POD licenses using either Brocade Web Tools or a Telnet connection; do not use the Blade Server Enclosure CMC software.

Ports on Demand is ready to be unlocked in the SAN I/O Module firmware. A POD license might be supplied with SAN I/O Module software, or you can purchase the license separately from your SAN I/O Module vendor, who will provide you with a key to unlock it.

Once you have installed the license keys, you must enable the ports. You can do so without disrupting SAN I/O Module operation, or alternatively, you can disable and re-enable the SAN I/O Module to activate all ports.

If you remove a POD License, ports that were enabled by that license are disabled.

Activating ports with a POD license

You can activate ports with a POD license while the SAN I/O Module is connected to existing SANs or before connecting to an existing SAN.

For SAN I/O Modules already connected to existing storage networks:

1. Add the POD license using Web Tools or CLI.

2. Enable each newly licensed port using Web Tools or CLI.

NOTE
This method is non-disruptive to existing servers and storage connecting to SAN I/O Module.

For new SAN I/O Module installations, perform the following *before* connecting to an existing SAN.

ATTENTION
Do not use this method if the SAN I/O Module is operating in an existing SAN because traffic will be disrupted.

1. Disable the SAN I/O Module.

   NOTE
   If Secure Fabric OS (Secure FOS) is enabled, you cannot use Telnet or SSH to disable the module. For details about using Web Tools, refer to the *Web Tools Administrator's Guide*. For details about the CLI, see the *Fabric OS Command Reference Manual*.

2. Add the POD license using Web Tools or the CLI.

3. Enable the SAN I/O Module using Web Tools or CLI. When the SAN I/O Module is enabled, the newly-added POD ports are also enabled.

Connecting to the SAN I/O Module Using Web Tools

Complete the following steps to connect to the SAN I/O Module using Web Tools.

1. On the management console, open a Web browser such as Internet Explorer.

   The Web browser must be connected to the same network as the SAN I/O Module.

2. Enter the IP address of the SAN I/O Module in the address field and press **Enter**.

For more information about using Web Tools, see the *Web Tools Administrator's Guide*.

Operating the SAN I/O Module

This chapter describes the operation and interoperability of the SAN I/O Module.

Interoperability

The SAN I/O Module supports interoperability for the following functions:

- link initialization
- principal SAN I/O Module selection
- routing (FSPF)
- Simple Name Service
- state change notification

- soft WWN zoning
- SNMP facilities
- translative mode (private target support on fabrics)
- trunking (between two Brocade switches)
- Advanced Performance Monitoring

Port negotiation

The SAN I/O Module has been designed to be highly interoperable. Eight Gbps ports support 2, 4, and 8 Gbps transmit and receive rates with autonegotiation. You can also install 4 Gbps SFPs, which allow 1 Gbps, 2 Gbps, and 4 Gbps transmit and receive rates with autonegotiation. The actual data signaling rate used on a port is automatically sensed and set to the rate supported by the device or devices attached to the port.

NOTE
You must install Brocade-branded SFPs in the SAN I/O Module.

If the SAN I/O Module is connected to a device, but is unable to negotiate the signaling rate, the operator can manually set the speed of each port through the management interfaces.

The SAN I/O Module is compliant with current Fibre Channel standards, including most current-generation switch N_Ports, NL_Ports, and E_Ports as well as host adapters, Redundant Array of Independent Disks (RAID) storage devices, hubs, Fibre-SCSI bridge devices, and older switch families.

Operating system support

Brocade Fabric OS has no specific host OS dependencies. The Fabric OS in the switches allows for any Fibre Channel-compliant device to attach to switches as long as it conforms to the standards for device login, name service, and related Fibre Channel features. The operating systems listed in Table 2 are for the host machine running Brocade management applications outside the Fabric OS, such as Fabric Manager and Enterprise Fabric Connectivity Manager (EFCM). For the latest information on operating system support for these applications, refer to the latest released versions of Fabric Manager and EFCM documentation.

TABLE 2   Supported Operating Systems - Fabric Manager

Operating System	Version
Windows 2000	N/A
Windows 2003	N/A
Windows XP	N/A
Solaris	8, 9, 10
Linux Red Hat Enterprise	AS 3.0, AS 4.0

TABLE 3   Supported Operating Systems - EFCM

Operating System	Version
Windows 2000	SP4
Windows 2003	SP1
Windows XP	XP2
Solaris	9, 10
Linux Red Hat	9.0
Linux Red Hat Enterprise	ES 3.0, ES 4.0
SuSe Linux Professional Edition version 9.2	9.2, 9.3

Accessing the SAN I/O Module

The SAN I/O Module is managed as a single element. It has a single IP address and appears as a separate entity to the Telnet protocol and the Simple Network Management Protocol (SNMP).

When SNMP devices send SNMP messages to a management console running SAN management software, the information is stored in a Management Information Base (MIB). The SAN I/O Module Fabric OS 4.4.1 supports the FibreAlliance Fibre Channel Management (FCMGMT) MIBs, allowing the provision of needed information to a SAN administrator.

In addition, the Brocade Fabric Access Layer (API) and the Storage Management Initiative (SMI) provide facilities for the discovery and management of physical and logical elements in a SAN. Using the Fabric Access interface to the Fabric OS, a client application can retrieve information and modify the configuration of Brocade switches in the fabric.

Secure Telnet access is available using Secure Shell (SSH), a network security protocol for secure remote login and other secure network services over an insecure network.

Brocade Web Tools management is available through a secure browser using Secure Sockets Layer (SSL). The SSL security protocol provides data encryption, server authentication, message integrity, and optional client authentication for a TCP/IP connection. Because SSL is built into all major browsers and Web servers, installing a digital certificate enables the SSL capabilities.

Interpreting POST results

The power-on self test (POST) system check is performed each time the SAN I/O Module is powered on, rebooted, or reset.

Example POST Output

```
POST1: Started running Tue Nov  9 20:27:57 GMT 2004
POST1: Test #1 - Running turboramtest
POST1: Test #2 - Running centralmemorytest
POST1: Test #3 - Running cmitest
POST2: Running diagshow
POST1: Script PASSED with exit status of 0 Tue Nov  9 20:28:10 GMT 2004 took
(0:
0:13)
POST2: Started running Tue Nov  9 20:28:12 GMT 2004
POST2: Test #1 - Running camtest
POST2: Test #2 - Running txdpath
POST2: Test #3 - Running spinsilk (SERDES)
POST2: Running diagshow
POST2: Script PASSED with exit status of 0 Tue Nov  9 20:29:11 GMT 2006 took
(0:
0:59)
Initializing Ports ....
Port Initialization Completed
Enabling switch...
```

During POST, the LEDs are activated in various indicator patterns.

Perform the following steps to determine POST completion status.

1. Verify that the LEDs on the SAN I/O Module indicate a healthy SAN I/O Module. LED patterns are described in "Interpreting LED activity," next.

    If one or more LEDs do not display a healthy state, verify that the LEDs are not set to beacon. Use the SAN I/O Module CLI **switchShow** command or Web Tools to verify the LED state. For information about how to turn beaconing on and off, see the *Fabric OS Administrator's Guide* or the *Web Tools Administrator's Guide*.

2. Use the Blade Server Enclosure's Chassis Management Controller (CMC) GUI to verify that the SAN I/O Module is working correctly.

    For details, refer to the *Hardware Owner's Manual* for the Blade Server Enclosure.

3. Review the system log for errors.

    Any errors detected during POST are written to the system log. Access this log through the Module's CLI **errShow** command. For information about this command, see the *Fabric OS Command Reference Manual*. For information about error messages, see the *Fabric OS System Error Message Reference Manual*.

Interpreting LED activity

Each SAN I/O Module uses LEDs to indicate status. These LEDs are shown in Figure 5.

FIGURE 5 LED Locations
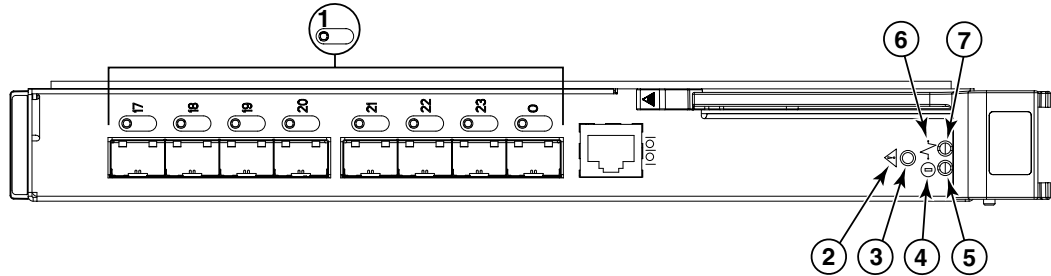
TABLE 4 Key to Figure 5

Location	Indicator	Color	Operation
1	FC (external) port status	green/amber	Note: LED meanings are not valid during boot, diagnostics, or POST. Green: Off (dark): No signal carrier or unlicensed. Steady: Online normal active port but no port activity. Flickering: normal active port (I/O activity). Slow blink: Online but segmented. Fast blink: Internal loopback. Amber Steady: Signal present but not online. Slow blink or flash: Disabled port (less than two second interval). Fast (rapid) blink or flash: Error or fault with port (less than 1/2 second interval).
2 (status icon) and 3 (LED)	module status	green/amber	Off: SAN I/O Module is off or power supplies for the Blade Server or onboard DCC have failed. Green: No errors and all ports are ready for use. Amber: Steady: Boot-up state, port(s) offline, or in reset state. Blinking (green/amber): One or more environmental ranges are exceeded, or error log contains diagnostic error messages. Note: The LED might blink during testing.
4 (icons) and 5 (LED)	module power	green	Off: SAN I/O Module is off or power supplies for the Blade Server Enclosure or onboard DCC have failed. Green: Normal operation and power supply is functioning. properly. Power is supplied by the Blade Server Enclosure.
6 (icon) 7 (LED)	server management	blue/amber	Controlled by the Blade Server Enclosure's CMC. For details, refer to the *Hardware Owner's Manual* for Blade Server Enclosure.

Locating the serial number

Before contacting service support, be sure to obtain the module's serial number. Use one of these methods to locate the number:

- Use the CLI and enter the **ChassisShow** command. The SAN I/O Module serial number is displayed along with other data.

- Locate the serial number on the label attached to the SAN I/O Module. Refer to Figure 3 on page 5 for location.

Removing and replacing the SAN I/O Module

Complete the following steps to remove and replace a failed SAN I/O Module.

NOTE
Before beginning this procedure, ensure that you have a replacement SAN I/O Module or filler panel available because you do not want to leave the slot on the Blade Server Enclosure open for an extended period of time. The slot must be filled with either a replacement SAN I/O Module or a filler panel to maintain proper airflow.

1. Back up the SAN I/O Module configuration to an FTP server by using the Module's **configUpload** CLI command and following the prompts.

   This command uploads the SAN I/O Module configuration to the server, making it available for downloading to a replacement SAN I/O Module if necessary. It is recommended to back up the configuration on a regular basis to ensure that a complete configuration is available for downloading to a replacement SAN I/O Module.

2. Stop all SAN activity requiring the ports used by the SAN I/O Module.

   For details about port management, refer to your Blade Server Enclosure Hardware Owner's Manual. Verify that there is no activity by viewing the SAN I/O Module LEDs. For details about LED activity on the SAN I/O Module, see "Interpreting LED activity" on page 22.

3. Remove all cables from the SFP modules.

4. Remove the SFP modules according to the manufacturer's instructions.

   Figure 6 on page 24 details the generic process for removing an SFP from a port.

FIGURE 6 Removing an SFP from a Port
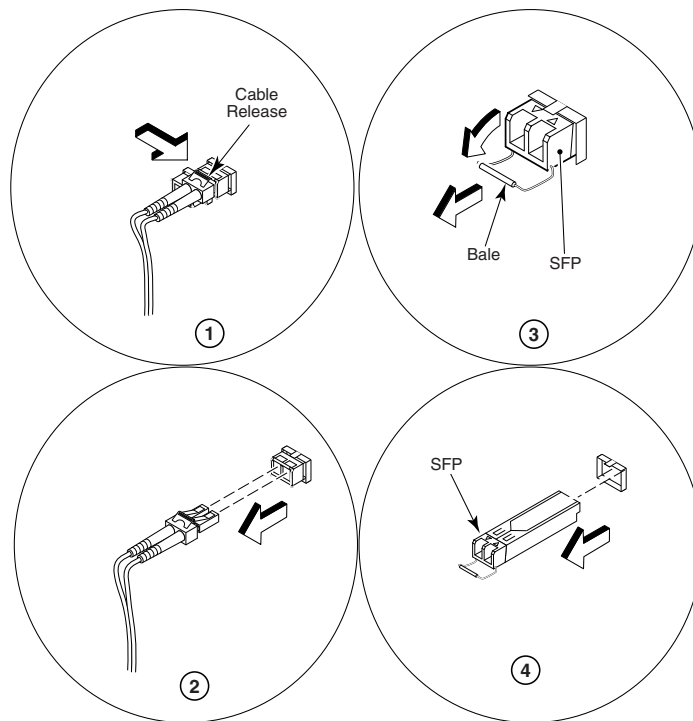
5. Refer to the *Hardware Owner's Manual* for the Blade Server Enclosure to remove and replace the SAN I/O module from the enclosure.

ATTENTION
If you are not replacing the SAN I/O Module, use a filler panel to fill the empty slot to maintain proper air flow. Do not leave the slot empty.

SAN I/O Module specifications

This appendix provides product specifications and regulatory compliance as a handy reference.

Access Gateway Mode default port mapping

The M5424 SAN I/O Module can contain 24 total ports. Of these, F_Ports are ports 1-16 and N_Ports are ports 0 and 17-23.

In Access Gateway mode, the SAN I/O Module F_Ports are mapped to N_Ports. This following lists the factory-default F_Port to N_Port mapping for Access Gateway mode. Since the SAN I/O Module is shipped with Dynamic Ports on Demand (DPOD) enabled, any out of the 24 ports can be enabled. Therefore this mapping applies for 12 active ports or, if POD licensing is enabled, for 24 ports. For more information on changing port mapping and managing ports in Access Gateway Mode, refer to the *Access Gateway Administrator's Guide*.

- 17-20 as N_Port with failover enabled, failback enabled
- 0, 21-23 as N_Port with failover enabled, failback enabled
- 1, 2 mapped to 17
- 3, 4 mapped to 18
- 5, 6 mapped to 19
- 7, 8 mapped to 20
- 9, 10 mapped to 21
- 11, 12 mapped to 22
- 13, 14 mapped to 23
- 15, 16 mapped to 0

Processor and memory specifications

The processor and memory installed in the SAN I/O Module are shown in Table 5.

TABLE 5   Memory Specifications

Memory Type	Value
PowerPC 440EPX processor	667 MHz
SDRAM	512 MB DDR2 - for system memory at 64 bits wide with 8 ECC operating at 166 MHz
Boot flash	4 MB
Compact flash	512 MB

Weight and physical dimensions

Table 6 lists the weight and physical dimensions of the SAN I/O Module.

TABLE 6 SAN I/O Module Specifications

Dimension	Measurements
Height	1.27 in (32.48 mm)
Width	10.74 in (272.75 mm)
Depth	12.09 in (307.24 mm)
Weight	4.65 (2.10 kg) — without media

Facility requirements

The information in Table 7 shows the operating and non-operating limitations of the Brocade M5424 Fibre Channel SAN I/O Module SAN I/O Module.

TABLE 7 Environmental Requirements

Condition	Operating	Non-operating
Temperature	32°F to 104°F (0°C to 40°C)	-4°F to 158°F (-20°C to 70°C)
Humidity	10% to 90%, non-condensing at 84.2°F (29°C)	5% to 95%, non-condensing at 100.4 °F (38°C)
Altitude	Up to 10,000 ft (3,048 m)	35,000 ft (10,668 m)
Shock	20 G for 6 ms	50G with velocity change of 4216 mm/sec squared
Vibration	0.4 G at 5-500 Hz for 60 minutes	0.5 G at 2-200 Hz for 15 minutes
Air flow	86 °F (30°C) Ambient: Approx. 3CFM 104°F (40°C) Ambient: Approx. 9CFM	None required

Electrical

Table 8 lists SAN I/O module electrical specifications.

TABLE 8   Electrical specifications and requirements

Dimension	Measurements
DC input	12 V and 3.3 V from chassis
Power consumption	About 32 W normally and 39 W maximum measured

Architectural specification

The SAN I/O Module meets the specifications shown in Table 9.

TABLE 9   Architecture

Feature	Description
Scalability	Refer to the current *Brocade Scalability Guidelines* publication.
Certified maximum	Refer to the current *Brocade Scalability Guidelines* publication.
Performance	1.063 Gbps line speed, full duplex 2.125 Gbps line speed, full duplex 4.25 Gbps line speed, full duplex 8.50 Gbps line speed, full duplex
Fabric latency (Fabric OS Native mode only)	<1.2 µsec with no contention
Maximum frame size	2112-byte payload
Class of service	Class 2 Class 3 Class F (interswitch frames)
Port types	FL_Port F_Port E_Port N_Port
Fabric services (Fabric OS Native mode only)	Simple Name Server, Registered State Change Notification (RSCN)

Supported HBAs

For a complete list of interoperable hardware, visit the Brocade Connect Web site at:

http://www.brocadeconnect.com

and follow the links to the latest compatibility matrix. From the main page, select **Technical Resource Center**, then **Documentation Library**. Finally, choose **Compatibility and Scalability Information**.

For more information and a list of supported HBAs, refer to your Dell PowerEdge documentation.

Fibre Channel standards compliance

The SAN I/O Module switch meets or exceeds the Fibre Channel standards for compliance, performance, and feature capabilities as defined in the Brocade standards compliance list. This information is available at:

http://www.brocade.com/products/interop/standards_compliance.jsp

Regulatory compliance

This section describes the regulatory compliance requirements for the Brocade M5424 Fibre Channel SAN I/O Module .

FCC warning (US only)

This equipment has been tested and complies with the limits for a Class A computing device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's own expense.

MIC Statement (Republic of Korea)

사용자 안내문 : A 급기기

이 기기는 업무용으로 전자파 적합 등록을 받은 기기
이오니, 판매자 또는 사용자는 이점을 주의하시기
바라며, 만약 잘못 구입하셨을 때에는 구입한 곳에
서 비업무용으로 교환하시기 바랍니다.

VCCI statement (Japan)

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance might arise. When such trouble occurs, the user might be required to take corrective actions.

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

BSMI statement (Republic of Taiwan)

BSMI 通告（僅限於台灣）

大多數的 Dell 電腦系統被 BSMI（經濟部標準檢驗局）劃分為乙類數位裝置。但是，使用某些選件會使有些組態的等級變成甲類。若要確定您的電腦系統適用等級，請檢查所有位於電腦底部或背面板、擴充卡安裝托架，以及擴充卡上的 BSMI 註冊標籤。如果其中有一甲類標籤，即表示您的系統為甲類數位裝置。如果只有 BSMI 的檢驗號碼標籤，則表示您的系統為乙類數位裝置。

一旦確定了系統的 BSMI 等級，請閱讀相關的 BSMI 通告。請注意，BSMI 通告規定凡是未經 Dell Inc. 明確批准的擅自變更或修改，將導致您失去此設備的使用權。

此裝置符合 BSMI（經濟部標準檢驗局）的規定，使用時須符合以下兩項條件：

• 此裝置不會產生有害干擾。

• 此裝置必須能接受所接收到的干擾，包括可能導致無法正常作業的干擾。

甲類

此設備經測試證明符合 BSMI（經濟部標準檢驗局）之甲類數位裝置的限制規定。這些限制的目的是為了在商業環境中使用此設備時，能提供合理的保護以防止有害的干擾。此設備會產生、使用並散發射頻能量；如果未遵照製造廠商的指導手冊來安裝和使用，可能會干擾無線電通訊。請勿在住宅區使用此設備。

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

乙類

此設備經測試證明符合 BSMI（經濟部標準檢驗局）之乙類數位裝置的限制規定。這些限制的目的是為了在住宅區安裝時，能防止有害的干擾，提供合理的保護。此設備會產生、使用並散發射頻能量；如果未遵照製造廠商的指導手冊來安裝和使用，可能會干擾無線電通訊。但是，這並不保證在個別的安裝中不會產生干擾。您可以透過關閉和開啟此設備來判斷它是否會對廣播和電視收訊造成干擾；如果確實如此，我們建議您嘗試以下列一種或多種方法來排除干擾：

• 重新調整天線的接收方向或重新放置接收天線。

• 增加設備與接收器的距離。

• 將設備連接至不同的插座，使設備與接收器連接在不同的電路上。

• 請向經銷商或有經驗的無線電／電視技術人員查詢，以獲得幫助。

CE statement

ATTENTION

This is a Class A product. In a domestic environment, this product might cause radio interference, and the user might be required to take corrective measures.

The standards compliance label on the Switch contains the CE mark which indicates that this system conforms to the provisions of the following European Council directives, laws, and standards:

- Electromagnetic Compatibility (EMC) Directive 89/336/EEC and the Complementary Directives 92/31/EEC and 93/68/EEC
- Low Voltage Directive (LVD) 73/23/EEC and the Complementary Directive 93/68/EEC
- EN50082-2/EN55024:1998 (European Immunity Requirements)
    - EN61000-3-2/JEIDA (European and Japanese Harmonics Spec)
    - EN61000-3-3

Canadian requirements

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations, ICES-003 Class A.

Laser compliance

This equipment contains Class 1 laser products and complies with FDA Radiation Performance Standards, 21 CFR Subchapter I and the international laser safety standard IEC 825-2.

CAUTION

Use only optical transceivers that are qualified by Brocade Communications Systems, Inc. and comply with the FDA Class 1 radiation performance requirements defined in 21 CFR Subchapter I, and with IEC 825-2. Optical products that do not comply with these standards might emit light that is hazardous to the eyes.

Environmental regulation compliance

This section describes the China ROHS environmental regulatory compliance requirements for the SAN I/O Module.

China RoHS

The contents included in this section are per the requirements of the People's Republic of China-Management Methods for Controlling Pollution by Electronic Information products.

遵守环境法规

中国 **RoHS**

本节中包含的内容都遵守了中华人民共和国《电子信息产品污染控制管理办法》的要求。

Environmental Protection Use Period (EPUP) Disclaimer

In no event do the EPUP logos shown on the product and FRU's alter or expand that warranty that Brocade provides with respect to its products as set forth in the applicable contract between Brocade and its customer. Brocade hereby disclaims all other warranties and representations with respect to the information contained on this CD including the implied warranties of merchantability, fitness for a particular purposes and non-infringement.

The EPUP assumes that the product will be used under normal conditions in accordance with the operating manual of the product.

　　环保使用期限 **(EPUP)** 免责声明：

EPUP　　标志不会出现在产品和　　FRU　　的改装产品中，也不会对　　Brocade 所提供的相关产品保修条款（该保修条款在　　　　　　　　　　Brocade 及其客户间达成的适用合同中列出）进行增补。对于此　　　　　　　　　　　CD 上包含的相关信息，如适销性、针对特定用途的适用性和非侵权性的暗示保证，Brocade 在此郑重声明本公司对于与上述信息相关的所有其他保证和陈述概不负责。EPUP 假设在"产品操作手册"中注明的常规条件下使用该产品。

TS/HS Dual Language Sheet

In accordance with China's Management Measures on the Control of Pollution caused by Electronic Information products (Decree No. 39 by the Ministry of Information Industry), the following information is provided regarding the names and concentration level of Hazardous substances (HS) which may be contained in this product.

China ROHS Hazardous Substances/Toxic Substances (HS/TS) Concentration Chart

Name of the Component	Hazardous/Toxic Substance/Elements					
	Lead (PB)	Mercury (Hg)	Cadium (CD)	Hexavalent Chromium (CR6+)	Polybrominated Biphenyl (PBB)	Polybrominated Diphenyl Ether (PBDE)
Fibre Channel Switch	X	O	O	O	O	O
PCBA cards	X	O	O	O	O	O
SFPs (optical cable connectors)	X	O	O	O	O	O
Sheet Metal	X	O	O	O	O	O
Mechanical brackets and Slides	X	O	O	O	O	O
Software/ Documentation CDs	O	O	O	O	O	O

X indicates that the concentration of such hazardous/toxic substance in all the units of homogeneous material of such component is higher than the SJ/T11363-2006 Requirements for Concentration Limits.

O indicates that no such substances are used or that the concentration is within the aforementioned limits.

<div align="center">

CHINA ROHS有害物质/有毒物质(HS/TS)限量列表

</div>

有毒与有害物质或元素的名称及含量
根据中国的<<电子信息产品污染控制管理办法>>
(信息产业部第39号令)，本公司提供以下有关产品中可能含有的有害物质(HS)的名称及含量水平的
信息。

主要部件名称	有害/有毒物质或元素					
	铅 （PB）	汞 （Hg）	镉 （CD）	六价铬 （CR6+）	多溴联苯 （PBB）	多溴二苯醚 （PBDE）
光纤通道交换机	X	O	O	O	O	O
线路板部件	X	O	O	O	O	O
SFP（光纤接头）	X	O	O	O	O	O
钣金件	X	O	O	O	O	O
机械支架及滑轨	X	O	O	O	O	O
软件/文档光盘	O	O	O	O	O	O

X   表示此类部件内同质材料中的有害/有毒含量高于SJ/T11363-2006的限量要求。
O   表示未使用此类物质或其含量低于上述限量要求。

Regulatory certifications

Table 10 lists the safety and EMC (electromagnetic compatibility) specifications for which the Switch is certified.

TABLE 10   EMC certifications

Country	Safety specification	EMC specification
Argentina	IEC 60950-1:2001 IEC 60825-1:1993+A1+A2	
Australia and New Zealand		EN55022:2006 Class A
Canada	CSA60950-1-03 1st Ed.	CSA 108.8 Class A
China (power supply only)	GB4943-1995	GB9254-1998 GB17625.1
European Union (Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, The Netherlands, and United Kingdom)	EN 60950:92 +A1:93+A2:93+A3:95+A4:96+A11:97 73/23/EEC EN60825-1:1994/A11, -2 TUV (Germany only) IEC 60950+A1+A2+A3+A4+A11 (NEMKO CB Report) (Norway only)	EN55022:2006 Class A EN 55024 (Immunity) EN 61000-4-2 Electrostatic Discharge EN 61000-4-3 Radiated Fields EN 61000-4-4 Electrical Fast Transients EN 61000-4-5 Surge Voltage EN 61000-4-6 Conducted Emissions EN 61000-4-8 Magnetic Fields EN 61000-4-11 Voltage Dips and Interruptions EN 61000-3-2 Limits for Harmonic Current Emissions EN 61000-3-3 Flicker
International	IEC 60950+A1+A2+A3+A4+A11	EN55022 Class A
Japan	IEC 60950+A1+A2+A3+A4+A11	EN55022 Class A EN 61000-3-2 Harmonics (JEIDA Limits)

TABLE 10   EMC certifications (Continued)

Country	Safety specification	EMC specification
Republic of Korea		KN24 KN22
Russia	GOST R IEC 60950-2002	GOST R 51318.22-99 (Class A) GOST R 51318.24-99 GOST R 51317.3.2-99 GOST R 51317.3.3-99
Taiwan (power supply only)		CNS13438
United States	UL 60950-1 1st Ed.	EN55022 Class A FCC Part 15, Subpart B (CFR title 47), Class A

Index

A

access gateway mode, *1*
    changing from fabric OS native mode, *15*
    default port mapping, *25*
activating POD ports, *18*
ag --help command, *17*
ag --mapshow command, *17*
ag --modeEnable command, *17*
air flow, *26*
architectural specifications, *27*

B

beacon, *21*
boot flash, *25*
Brocade applications supported, *7*
Brocade ISL Trunking, *6*
BSMI statement (Chinese), *29*

C

cabling guidelines, *8*
Canadian requirements, *30*
China RoHS, *31*
commands
    ag --help, *17*
    ag --mapshow, *17*
    ag --modeEnable, *17*
    configUpload, *15, 17*
    configure, *13*
    connect, *11*
    connect switch-x, *11*
    errShow, *21*
    fabricShow, *15*
    ipAddrSet, *11*
    switchDisable, *13, 16*
    switchShow, *15, 21*
compact flash, *25*
compatibility matrix, *6*

D

dimensions, *26*
dynamic ports on demand, *2*

E

E_Ports, *1*
errShow command, *21*

F

F_Ports, *1*
Fabric OS, *viii, 20*
Fabric OS native mode, *1*
fabric OS native mode
    available features, *1*
    changing from access gateway mode, *17*
Fabric Watch, *7*
fabricShow command, *15*
facility requirements, *26*
FCC warning (US only), *28*
features, *7*
Fibre Channel standards compliance, *28*
FL_Ports, *1*
flash, *25*

H

host OS, *20*
humidity, *26*

configUpload command, *15, 17*
configure command, *13*
connect command, *11*
connect switch-x command, *11*
console port, *2, 3*

I

insertion arm, *5*
Internet Explorer, *18*
interoperability, *19*
interpreting
    LED activity, *22*
    POST results, *21*
IP address
    modify using CMC CLI, *11*
    modify using CMC GUI, *12*
    modify using module CLI, *10*
    modifying default, *10*
ipAddrSet command, *11*
ISL, *6*
    trunking, *2, 6*
    trunking groups, *6*

K

kernel, *25*
kernel flash, *25*

L

labeling, *5*
laser compliance, *30*
LED, *2, 21, 22*
LED activity
    interpreting, *22*
license key, *17*
LWL, *6*

M

management tool, *21*
memory, *25*
MIC statement (Republic of Korea), *28*
module status, *2*

N

nonport side of SAN I/O Module, *5*

O

operating requirements, *26*
operating system support, *20*
optional features, *7*
    access gateway mode, *7*
    fabric OS native mode, *7*
OS, *viii*

P

performance monitoring, *7*
port management, *23*
port negotiation, *19*
port side of the SAN I/O Module, *4*
ports
    activating POD ports, *18*
    base ports for POD, *3*
    POD, *17*
    serial console, *2*
ports on demand (POD), *3*
    activating, *17*
    activating ports, *18*
    base ports, *3*
    licensing, *7, 18*
POST, *1, 21*
    results, *21*
processor, *25*
protective foam, *7*

R

regulatory certifications, *33*
regulatory compliance, *28*
removing and replacing, *23*
RJ-45 connector, *2, 3*

S

SAN I/O Module
  accessing, *20*
  cabling guidelines, *8*
  characteristics, *4*
  connecting to Ethernet, *13*
  connecting to fabric, *13*
  hardware description, *4*
  physical dimensions and weight, *26*
  removing and replacing, *23*
  serial number, *23*
  specifications, *25*
  status, *22*
  unpacking and installing, *7*
SDRAM, *25*
SEEPROM, *25*
serial cable, *10*
serial console port, *2, 3*
serial number, *23*
SFPs, *2, 6*
shipping package, *7*
shock, *26*
specifications, *26*
supported HBAs, *27*
supported SFP, *6*
switchDisable command, *13, 16*
switchShow command, *15, 21*
SWL, *6*

T

temperature, *26*
terminal session with I/O module, *10*
trunking, *6*

U

unpacking the SAN I/O Module, *7*

V

VCCI statement, *28*
vibration, *26*

W

web browser, *18*
Web Tools, *7, 18*
  using to connect SAN I/O Module, *18*
weight, *26*

Z

zoning, *2, 7, 20*