



SilkWorm 4016

Hardware Reference Manual

Supporting Fabric OS v5.0.4

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Document History

The following table lists all versions of the *SilkWorm 4016 Hardware Reference Manual*.

| Document Title | Publication Number | Summary of Changes | Publication Date |
|--|--------------------|--------------------|------------------|
| <i>SilkWorm 4016 Hardware Reference Manual</i> | 53-1000175-01 | New document. | January 2006 |

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About This Document

This document is a hardware reference manual, written for SAN administrators who are using any blade server that supports the Brocade SilkWorm 4016. It provides the information needed to understand the installation, configuration, and maintenance of the Brocade SilkWorm 4016 switch module. This document is specific to Brocade Fabric OS version 5.0.4 and the specified switch.

“About This Document” contains the following sections:

- [“How This Document Is Organized”](#) on page v
- [“Supported Hardware and Software”](#) on page vi
- [“What’s New in This Document”](#) on page vi
- [“Document Conventions”](#) on page vi
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How This Document Is Organized

This document is organized to help you find the particular information that you want as quickly and easily as possible. It provides specific information about the SilkWorm 4016.

As a hardware reference, this document begins with a brief overview of the SilkWorm 4016 before proceeding to details of the switch.

The document contains the following components:

- [Chapter 1, “Introducing the SilkWorm 4016,”](#) provides the basic concepts and a description of the switch.
- [Chapter 2, “Installing the Brocade SilkWorm 4016,”](#) explains the process used to insert the switch into a PowerEdge 1855.
- [Chapter 3, “Configuring the Brocade SilkWorm 4016”](#) describes how to connect to the switch and change the IP address.
- [Chapter 4, “Operating the Brocade SilkWorm 4016,”](#) provides more detail about configuring and replacing a SilkWorm 4016.
- [Appendix A, “Brocade SilkWorm 4016 Specifications,”](#) is a product specification reference.

Supported Hardware and Software

This document has been created to include information specific to the SilkWorm 4016 switch module running Brocade Fabric OS version 5.0.4. This switch was designed specifically to work with a blade server chassis.

This document does not support all 5.x Fabric OS versions: it is specific to the Fabric OS v5.0.4. To obtain information about a different Fabric OS version, refer to the documentation specific to your Fabric OS.

What's New in This Document

This is a new document. For further information, see the *Brocade Fabric OS v5.0.4 release notes*.

Document Conventions

This section describes text formatting conventions and important notices formats.

Text Formatting

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

| | |
|--------------------|---|
| bold text | Identifies command names Identifies GUI elements Identifies keywords and operands Identifies text to enter at the GUI or CLI |
| <i>italic text</i> | Provides emphasis Identifies variables Identifies paths and Internet addresses Identifies document titles |
| code text | Identifies CLI output Identifies syntax examples |

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

Notes, Cautions, and Warnings

The following notices appear in this document.



Note

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



Caution

A caution alerts you to potential damage to hardware, firmware, software, or data.



Warning

A warning alerts you to potential danger to personnel.

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

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 Documentation CD-ROM and on the Brocade Web site, through Brocade Connect.



Note

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*

Fabric OS Optional Features

- *Web Tools Administrator's Guide*
- *Fabric Watch Administrator's Guide*
- *Secure Fabric OS Administrator's Guide*

SilkWorm 4016

- *SilkWorm 4016 Hardware Reference Manual* (this document)
- *SilkWorm 4016 QuickStart Guide*
- *Brocade Fabric OS v5.0.4 release notes*

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.

Extended Fabrics

Supports the reliable, high-speed connectivity of SilkWorm switches over dark fiber or Dense Wave Division Multiplexing (DWDM) equipment at distances up to 500 kilometers to enhance business continuance operations.

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. Two 4 Gbit/sec SilkWorm switches can automatically group up to eight ISLs into a single logical “trunk” with a total throughput of up to 32 Gbit/sec.

Advanced Zoning

Automatically groups SAN fabric-connected devices into logical zones that restrict access to “member” devices in the zone. Advanced Zoning uses hardware enforcement at both the port and WWN level to provide more robust data protection.

Secure Fabric OS

Provides a comprehensive security solution to help protect mission-critical data. Key features include centralized policy-based security management, management data encryption, and authentication to create a fabric-wide trusted environment with control over all levels of fabric access and communication.

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

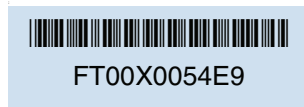
Contact your switch support supplier for hardware, firmware, and software support, including product repairs and part ordering. To expedite your call, have the following information available:

1. General Information

- Technical Support contract number, if applicable
- Switch model
- Switch 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. Switch Serial Number

The switch serial number and corresponding bar code are provided on the serial number label, as shown here:



The serial number label is located as follows:

- *SilkWorm 3014 switches*: Top of chassis, under the insertion arm.
- *SilkWorm 3016, 4012, and 4016 switches*: Side of switch module.
- *SilkWorm 200E, 3200, and 3800 switches*: nonport side of chassis.
- *SilkWorm 3250, 3850, 3900, 4100, 4900, and 7500 switches*: Bottom of chassis.
- *SilkWorm 24000, and 48000 directors*: Inside the front of the chassis, on the wall to the left of the ports.
- *SilkWorm Multiprotocol Router Model AP7420*: On the bottom of the chassis and on the back of the chassis.

3. World Wide Name (WWN)

- *SilkWorm 200E, 3014, 3016, 3250, 3800, 3850, 3900, 4012, 4016, 4100, 4900, 7500 switches and SilkWorm 24000, and 48000 directors*: Provide the license ID. Use the **licenseIdShow** command to display the license ID.
- *SilkWorm Multiprotocol Router Model AP7420*: Provide the switch WWN. Use the **switchShow** command to display the switch WWN.
- *All other SilkWorm switches*: Provide the switch WWN. Use the **wwn** command to display the switch WWN.

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 SilkWorm 4016

The SilkWorm 4016 is a 12-port Fibre Channel switch module (upgradable to 16 ports) that supports link speeds up to 4Gbit/sec. It includes the Brocade Fabric Operating System (Fabric OS) and is compatible with the entire SilkWorm product family.

This chapter provides the following information:

- “SilkWorm 4016 Features” on page 1-1
- “Switch Characteristics” on page 1-3
- “ISL Trunking Groups” on page 1-7
- “Brocade Optional Features” on page 1-7

SilkWorm 4016 Features

The SilkWorm 4016 provides the following features:

- Up to six external autosensing (1, 2, and 4 Gbit/sec) Fibre Channel ports:
 - Universal and self-configuring ports capable of becoming:
 - F_Port (fabric enabled)
 - FL_Port (fabric loop enabled)
 - E_Port (expansion port)
 - Brocade ISL Trunking of external ports with trunking license
- Up to ten copper backplane F_ports capable of automatic negotiation to the highest common speed of all devices connected to port, up to 4 Gbit/sec
- Frame filtering that augments the hardware zoning capabilities of the Brocade ASIC, which implements hardware zoning at the port level of the switch
- Brocade ASIC expanded capabilities, including World Wide Name (WWN) and device-level zoning
- Hardware zoning, implemented by means of a firmware-accessible table per output port
- Extensive diagnostics and monitoring capabilities
- Unicast and broadcast data traffic support
- Up to six SWL small form-factor pluggable (SFP) optical transceivers
- One console port through the backplane connectors to the ; refer to the documentation for connection details

- One 10/100 Mbit/sec autosensing Ethernet port with an RJ-45 connector with manual override for speed, and full/half duplex operation
- The following light-emitting diodes (LEDs) for each external port:
 - One green/amber LED to indicate status for each port
 - One green/amber LED to indicate link speed for each port
- 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 green LED to indicate status

See “[Interpreting LED Activity](#)” on page 4-4 for details about the SilkWorm 4016 switch module LEDs.

Each SilkWorm 4016 switch contains:

- One PowerPC 405GP processor with a clock speed of 200 MHz
- One real-time clock with 10-year battery
- Five digital thermometers

Switch Characteristics

This chapter describe the physical characteristics of the SilkWorm 4016.

Weight and Physical Dimensions

Table 1-1 lists the weight and physical dimensions of the SilkWorm 4016.

Table 1-1 Switch Specifications

| | SilkWorm 4016 |
|---------------|-------------------------|
| Height | 1.27 in (32.2 mm) |
| Width | 5.13 in (130 mm) |
| Depth | 10 in (254 mm) |
| Weight | 2.32 lb — without media |

Memory

The memory installed in the SilkWorm 4016 is shown in Table 1-2.

Table 1-2 Memory Specifications

| Memory Type | Value |
|-------------------------|--|
| PowerPC 440GP processor | 200 MHz |
| SDRAM | 256 Mbytes - for system memory at 64 bits wide with 8 ECC bits |
| Boot flash | 4 MB |
| Compact flash | 256 MB |
| SEEPROM | 256 Kbit |

Additional Port Activation

Table 1-3 shows the base (included) ports as well as the additional 4 ports that can be activated by installing an optional 4-port Ports-on-Demand (POD) license. For details about activating POD licensing, see “Activating Ports on Demand (POD)” on page 3-6

Table 1-3 Ports available

| Port Licensing | External Ports | Internal Ports |
|----------------|----------------|----------------|
| Base | 10 through 13 | 0 through 7 |
| POD | 14, 15 | 8, 9 |

Port Side

Externally accessible ports and LEDs are on the port side of the switch. The port side faces out when the switch is inserted into a . [Figure 1-1](#) details the switch's port side. For a complete description of the locations and interpretations of these LEDs, see [“Interpreting LED Activity”](#) on page 4-4.

The insertion arm is located just above the port side of the SilkWorm 4016 and ends with a plastic handle, accessible at the front of the port side of the switch. This arm is used to remove and insert the unit as described in [“Inserting a SilkWorm 4016 into the Chassis”](#) on page 2-2.

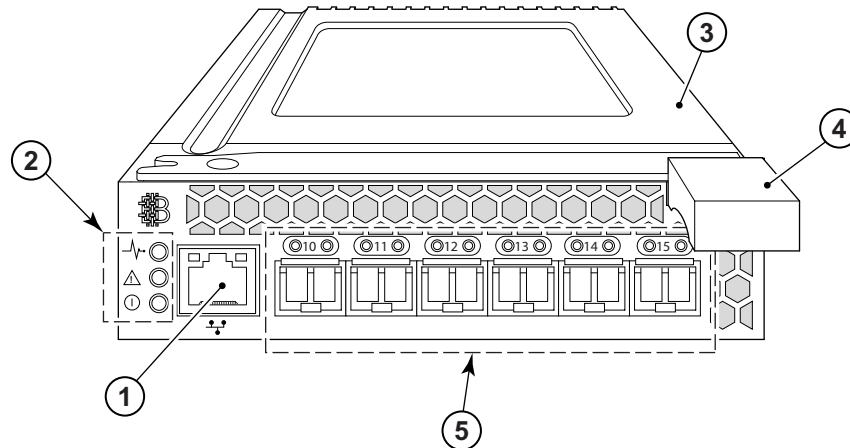


Figure 1-1 Port Side of the SilkWorm 4016

- 1 Ethernet port
- 2 Power and status LEDs
- 3 Top of SilkWorm 4016
- 4 Insertion arm latch
- 5 Autosensing ports

The nonport (switch status) LEDs, shown as item 2 of [Figure 1-1](#), display switch-level information as shown in [Figure 1-2](#).

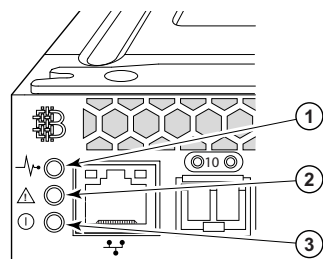


Figure 1-2 Nonport LEDs

- 1 Module controller status
- 2 Switch status
- 3 Power and module status

Nonport Side

The nonport side of the SilkWorm 4016 (shown in [Figure 1-3](#)) is seated into the . You do not need to do anything special to line up the SilkWorm 4016: it will seat correctly when the insertion arm is closed.

When the switch is inserted the backplane connectors activate a connection port, allowing the access and control of the SilkWorm 4016 via the .

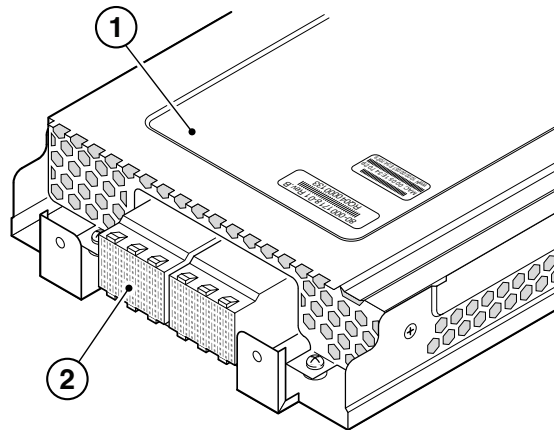


Figure 1-3 Nonport Side, Viewed from Top

- 1 Top of switch
- 2 Connection ports

Labeling

[Figures 1-4](#) and [1-5](#) show the labels appearing on the SilkWorm 4016. A second serial label is located beneath the insertion arm on the chassis, visible only when the arm is extended.

To extend the insertion arm, gently squeeze the plastic tab (top-to-bottom) and pull outward.

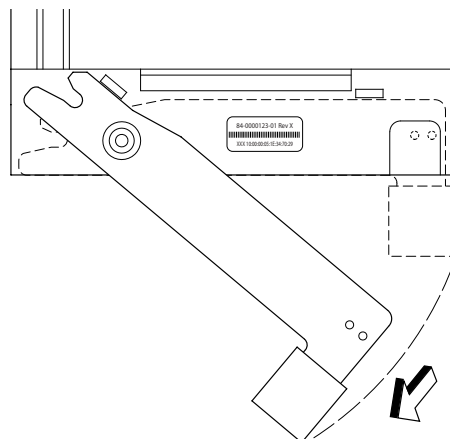
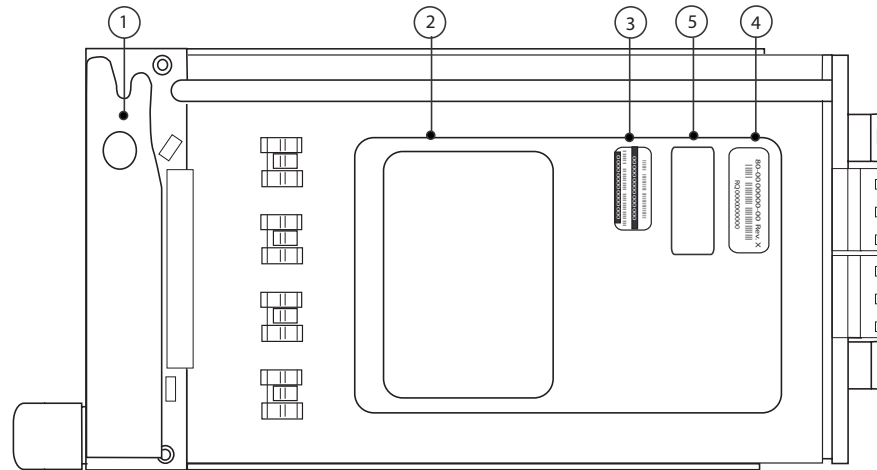


Figure 1-4 Insertion Arm Label**Figure 1-5** Detail, Labeling

- 1 Supplier serial label (under insertion arm)
- 2 Compliance label
- 3 Service tag
- 4 PPID label
- 5 Service tag and PPID label

SFPs

The SilkWorm 4016 was designed to work with small form-factor pluggable (SFP) optical modules and ships with up to six SWL SFPs. SFPs provide optical connections to external devices for both SWL and LWL connections. SFPs are replaced using a new pluggable unit rather than having to replace the switch. Refer to the manufacturer's instructions when installing SFPs.

“[Removing and Replacing the SilkWorm 4016](#)” on page 4-5 provides details about removing SFPs from the SilkWorm 4016.

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

ISL Trunking Groups

Brocade ISL Trunking is optional software that allows you to create trunking groups of ISLs between adjacent switches.

If your SilkWorm 4016 switch has a Brocade ISL Trunking license, the external ports can be used as a trunking group. Ports that can be used within the same trunking group are color-coded on the switch's port side for easy identification.

Trunking groups can be groups of two, three, or all four ports. [Table 1-4](#) lists the trunking group possibilities for the SilkWorm 4016. These groups correspond with external port groups.

Table 1-4 ISL Trunking Group Options

| # Active Ports | External Port # | Trunking groups |
|-----------------------------|------------------------|---|
| External: 4 Internal: 8 | 10, 11, 12, 13 | 10+11, 10+12, 10+13, 10+11+12, 10+11+13, 10+12+13, 11+12+13, 10+11+12+13 (any 2, 3, or 4 ports can be trunked together) |
| External: 6 Internal: 10 | 10, 11, 12, 13, 14, 15 | 10+11, 10+12, 10+13, 10+11+12, 10+11+13, 10+12+13, 11+12+13, 10+11+12+13, 14+15 (any 2, 3, or 4 ports from the 10 to 13 group of ports and one two port trunk with 14+15 2-port trunk) |



Note

Only the external ports are available for trunking.

The external ports can be used to form 2-port trunks, 3-port trunks, or a 4-port trunk. Trunking groups are color-coded on the port side of the chassis for easy identification.

For details about Brocade ISL Trunking, see the *Brocade Fabric OS Administrator's Guide*.

Brocade Optional Features

The SilkWorm 4016 supports the following optional Brocade software, which is activated with the purchase of the corresponding license key:

- Brocade Advanced Web Tools¹
- Brocade Advanced Zoning¹
- Brocade ISL Trunking
- Brocade Advanced Performance Monitoring
- Brocade Fabric Watch
- Brocade Secure Fabric OS
- Port on Demand (POD) licensing
- Support for Brocade Fabric Access API and API Scripting Toolkit

1. included with the SilkWorm 4016

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

Installing the Brocade SilkWorm 4016

This chapter provides the following information:

- “Unpacking the SilkWorm 4016” on page 2-1
- “Preparing the Blade Server for the SilkWorm 4016” on page 2-2
- “Inserting a SilkWorm 4016 into the Chassis” on page 2-2

Unpacking the SilkWorm 4016

To remove the SilkWorm 4016 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 switch into the PowerEdge chassis. If the SilkWorm 4016 appears to be damaged, contact your sales representative before proceeding.
2. Remove the cardboard accessory tray that sits on top of the SilkWorm 4016.
This tray contains the documentation, regulatory statements, product information guide, and Documentation CD.
3. Remove the switch from the box.
The protective foam ends will slide out with the switch.
4. Remove the foam ends from the switch.
5. Be sure that you have taken the necessary precautions for electrostatic sensitivity; then, break the seal warning.
6. Slide the SilkWorm 4016 out of the antistatic sleeve and inspect it carefully for any obvious defects or shipping damage.

Preparing the Blade Server for the SilkWorm 4016

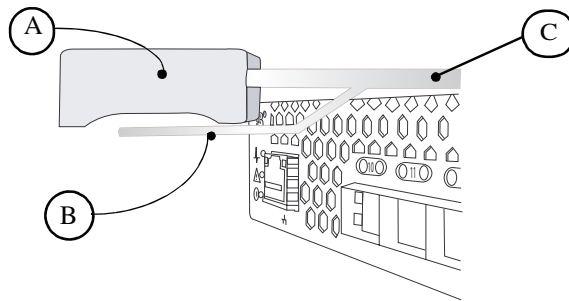
Before you insert the SilkWorm 4016 into the blade server chassis, make sure that the following conditions are met:

- The blade server chassis is powered up.
- The I/O bay into which the SilkWorm 4016 will be inserted is empty and ready to receive the switch. The SilkWorm 4016 should only be inserted into the specific chassis I/O bay indicated.
- All power requirements specific to the blade server chassis are met. Refer to the manufacturer's documentation for details.
- If you are replacing an existing switch, the new one should be inserted within one minute of removal.

Inserting a SilkWorm 4016 into the Chassis

To insert the SilkWorm 4016 into a blade server chassis:

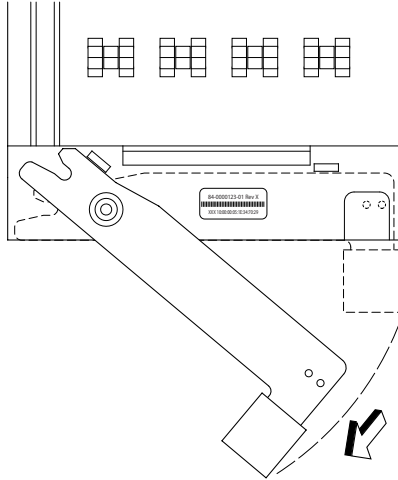
1. Unpack the SilkWorm 4016 from its shipping box, as described in “Unpacking the SilkWorm 4016” on page 2-1.
2. Verify that the chassis I/O bay into which the SilkWorm 4016 is being inserted is empty. *Do not insert the SilkWorm 4016 into any other chassis I/O bay.*
3. Gripping the top and bottom of the release latch, gently squeeze the latch to free the insertion arm. The SilkWorm 4016 is designed to work only in the designated chassis I/O bay of the blade server.



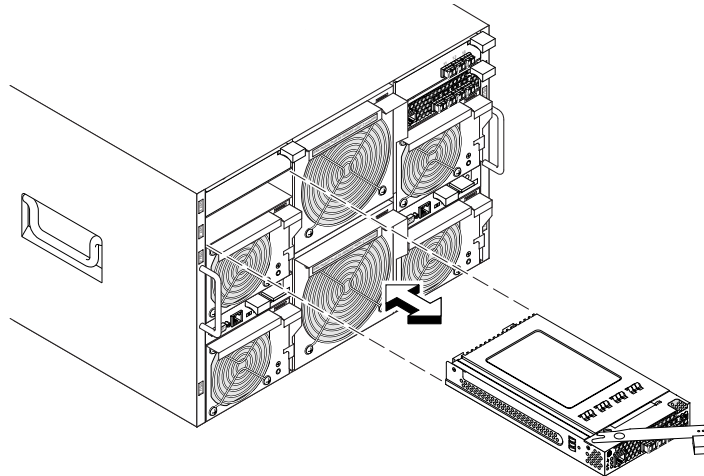
- A Top of latch
- B Bottom of latch
- C Insertion arm

- Swing the insertion arm out to open the arm completely.

This positions the insertion arm, allowing the SilkWorm 4016 to seat properly in the blade server chassis.



- With the port side facing you and the insertion arm extended, slide the SilkWorm 4016 into the open chassis I/O bay. The following illustration shows the SilkWorm 4016 being inserted with a horizontal orientation. Your blade server chassis may require a vertical orientation.



- Push the insertion arm gently toward the chassis until the arm is flush with the edge of the SilkWorm 4016 chassis.

At this point the SilkWorm 4016 is firmly seated in the chassis I/O bay.



Warning

Do not force the arm closed. Doing so could cause damage. If the arm does not close easily, gently remove the SilkWorm 4016 and reinsert it into the chassis I/O bay.

Closing the insertion arm locks the SilkWorm 4016 into the chassis I/O bay. Locking the SilkWorm 4016 into the bay activates the switch and switch LEDs.

- Install the SFP modules into the external ports.

Refer to the SFP manufacturer's documentation for details about SFP modules.

After it is activated, the switch runs self-diagnostic tests such as POST. For more information, see [“Interpreting POST Results” on page 4-3](#). After the diagnostics are complete, cable the SilkWorm 4016 as directed by the blade server chassis manufacturer's documentation. The blade server creates a connection to the switch for configuration.

See [Chapter 3, “Configuring the Brocade SilkWorm 4016”](#) for instructions on setting the initial IP address for the switch module.

Configuring the Brocade SilkWorm 4016

The SilkWorm 4016 must be configured correctly before it can operate within a network and fabric. This chapter provides the following information to ensure successful configuration:

- “Items Required” on page 3-1
- “Configuring the SilkWorm 4016” on page 3-1
- “Connecting to the Switch Using Web Tools” on page 3-7

Items Required

The following items are required for configuring and connecting the SilkWorm 4016 for use in a network and fabric:

- The SilkWorm 4016, installed in a blade server chassis
- A workstation computer that has a terminal emulator (such as HyperTerminal)
- An unused IP address and corresponding subnet mask and gateway address
- The serial cable to connect to the blade server chassis
- SFP transceivers and compatible fibre cables, as required
- Access to an FTP server for backing up the switch configuration

Configuring the SilkWorm 4016

To configure the SilkWorm 4016, perform the tasks *in the order shown*:



Caution

Do not connect the switch to the internal network until the IP address is correctly set.

1. Install the SilkWorm 4016 in a blade server chassis as described in “Inserting a SilkWorm 4016 into the Chassis” on page 2-2.
2. Create a serial connection, as described in “Creating a Serial Connection” on page 3-2.
3. Connect to the switch as described in “Connecting to the Switch” on page 3-3.
4. Set the IP address as described in “Setting the Switch IP Address” on page 3-3.
5. Create the Ethernet connection as described in “Creating an Ethernet Connection” on page 3-3.
6. Complete the configuration as described in “Completing the Switch Configuration” on page 3-4.

Creating a Serial Connection

To create a serial connection to the SilkWorm 4016 you need to connect to the serial port of the blade server chassis' management module.



Note

All versions of the Microsoft Windows operating system include Hilgraeve's HyperTerminal terminal emulation software. However, the included version does not provide many functions required during console redirection. Either upgrade to HyperTerminal Private Edition 6.3, or select new terminal emulation software.

The examples in this section assume that you have upgraded to Hilgraeve's HyperTerminal Private Edition 6.3. (Only Hilgraeve's HyperTerminal Private Edition 6.3 using Windows Server 2003 is supported.) If you are using other terminal emulation software, see the documentation for that software.

When using HyperTerminal with the Microsoft Windows 2000 operating system, ensure that you have Windows 2000 Service Pack 2 or later installed. The arrow keys function properly in HyperTerminal's VT100 emulation with Windows 2000 Service Pack 2.

1. Connect the null modem cable to the serial port on the management module and to the client system.
2. Click the Start button, point to **Programs > Accessories > Communications**, and then click **HyperTerminal**.
3. Enter a name for the new connection, select an icon, and then click **OK**.
4. From the **Connect to** drop-down menu, select an available COM port, and then click **OK**.
After you select an available COM port, the COM port properties window appears.
5. Configure the port with the following settings:

| | |
|----------------------------|---------------------------|
| Bits per second | 115200 |
| Data bits | 8 |
| Parity | None |
| Stop bits | 1 |
| Flow control | None |
| Properties | VT100 for Emulation mode |
| Terminal keys ¹ | Function, Arrow, and Ctrl |

1. Ensure that the setting is not set to Windows keys
6. Click **OK**.
The management application displays a login screen on the console monitor.
7. Log into the management module using your administrative user name and password.

For details about setting up the terminal emulation with the correct connection and login information, refer to the blade server chassis documentation.

Connecting to the Switch

To log in to the switch through the serial connection:

1. Verify that the switch has completed POST. When POST is complete, the port status and switch power and status LEDs return to a standard healthy state.
2. Login to the blade server's management module as specified in “[Creating a Serial Connection](#)” on [page 3-2](#).
3. At the command prompt, type **connect switch-x** where *x* is the bay into which the SilkWorm 4016 is installed.
4. At the login prompt, log in to the SilkWorm 4016 switch. By default, the user name is “admin” and the password is “password”.

Setting the Switch IP Address

By default, the IP address for the SilkWorm 4016 is configured as 10.77.77.77.

To replace the default IP address and related information:

1. Log in using the terminal emulator and enter the **ipAddrSet** command. Follow the 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 [255.0.0.0]:255.255.240.0
Fibre Channel IP Address [0.0.0.0]:
Fibre Channel Subnetmask [0.0.0.0]:
Gateway IP Address [0.0.0.0]:10.32.48.1
Set IP address now?[y = set now, n = next reboot]:y
IP address being changed...
Committing configuration...Done.
switch:admin>
```

2. Optionally, verify that the address was correctly set by typing the **ipAddrShow** command at the prompt.

Creating an Ethernet Connection

To create an Ethernet connection to the SilkWorm 4016:

1. Remove the dust plug from the Ethernet port.
2. Connect an Ethernet cable to the switch Ethernet port and to the workstation or to an Ethernet network containing the workstation.



Note

At this point the switch can be accessed remotely. Ensure that the switch is not being modified from any other connection until configuration is complete.

Completing the Switch Configuration

To complete the switch configuration:

1. Log on to the switch by telnet, using the admin account.
2. Modify the domain ID if required.

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

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

- a. On the SilkWorm 4016 that is being configured, disable the switch using the **switchDisable** command.
- b. Enter the **configure** command.

The command prompts display sequentially; enter a new value or press **Enter** to accept each default value. The SilkWorm 4016 now has a unique domain ID and can join the fabric.

- c. Reenable the switch by entering the **switchEnable** command.



Note

It could take a short time (typically a few seconds but sometimes a little longer) for the newly added switch to appear in the fabric display with its newly assigned domain ID.

3. Install the SFP transceivers 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. Position a transceiver so that it is oriented 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.

4. 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*.



Caution

A 50-micron cable should not be bent to a radius less than 2 inches under full tensile load and 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.
5. Check the LEDs to verify that all components are functional.

For information about LED patterns, see the [“Interpreting LED Activity” on page 4-4](#).

6. Verify the correct operation of the SilkWorm 4016 by typing the **switchShow** command from the workstation.

This command provides information about switch and port status.

7. Verify the correct operation of the SilkWorm 4016 in the fabric by typing the **fabricShow** command from the workstation.

This command provides general information about the fabric.

8. Back up the switch configuration to an FTP server by typing the **configUpload** command and following the prompts.

This command uploads the switch configuration to the server, making it available for downloading to a replacement switch 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 switch.

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*.

Activating Ports on Demand (POD)

The SilkWorm 4016 is shipped with 12 licensed ports. As your needs increase, you can activate up to four additional ports by purchasing and installing the Brocade Ports on Demand (POD) optional licensed product. [Table 3-1](#) shows the ports available.

Table 3-1 Ports available

| Port Licensing | External Ports | Internal Ports |
|----------------|----------------|----------------|
| Base | 10 through 13 | 0 through 7 |
| POD | 14, 15 | 8, 9 |

Adding licenses is performed using either Brocade Web Tools or a telnet connection: you do not use the blade server chassis' management software.

Ports on Demand is ready to be unlocked in the switch module firmware. Its license might be supplied with switch module software, or you can purchase the license separately from your switch 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 switch operation, or alternatively, you can disable and reenable the switch to activate all ports.

If you remove a Ports on Demand License, the ports that were enabled by that license are disabled.

Activating Ports with a POD License

There are two methods for activating ports with a POD license:

1. For switch modules connected to existing storage networks:

- Add the POD license using Web Tools or CLI.
- Enable each newly licensed ports using Web Tools or CLI.

This method is non-disruptive to existing servers and storage connecting to switch module.

2. For new switch module installs, perform the following *before* connecting to an existing SAN.



Caution

Do not use this method if the switch module is operating in an existing SAN because traffic will be disrupted.

- Disable the switch module and then add the POD license using Web Tools or the CLI.

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*.

- Enable the switch using Web Tools or CLI. When the switch is enabled, the newly-added POD ports are also enabled.

Removing POD-licensed Ports

You can return the switch module to the default number of ports by removing the POD license. The license can be removed regardless of whether the switch is active or disabled.

Use Web Tools or the CLI to remove the POD license. Ports should be disabled before removing a POD license.

For details about using Web Tools, see the *Web Tools Administrator's Guide*. For details about the CLI and CLI commands, see the *Fabric OS Command Reference Manual*.

- If the switch module is disabled, the removed ports are not automatically enabled when the switch module is enabled.
- If the switch module is enabled when a license is removed, operations continue until the switch module receives either a **switchDisable/Enable** command, the switch module is power cycled, or you perform a manual **portDisable** of each unlicensed port.

In the following example, ports that were enabled under a POD license (ports 17, 18, and 19) are disabled and the POD license is removed.

Example, using the CLI

```
switch:admin > portdisable 17
switch:admin > portdisable 18
switch:admin > portdisable 19
switch:admin > licenseremove "RRySeyRcySSS3TfS"
```

Connecting to the Switch Using Web Tools

To connect to the switch using Brocade's 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 switch.
2. Enter the IP address of the switch in the address field and press **Enter**.

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

Operating the Brocade SilkWorm 4016

This chapter describes the operation and interoperability of the SilkWorm 4016. Included in this chapter are:

- “Interoperability” on page 4-1
- “Accessing the SilkWorm 4016” on page 4-2
- “Interpreting POST Results” on page 4-3
- “Interpreting LED Activity” on page 4-4
- “Removing and Replacing the SilkWorm 4016” on page 4-5

Interoperability

The SilkWorm 4016 supports interoperability for:

- link initialization
- principal switch 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

The SilkWorm 4016 interoperates with the Brocade SilkWorm switches shown in [Table 4-1](#).

Table 4-1 Compatible Switches

| Switch | Minimum Version | Switch | Minimum Version |
|---------------|-----------------|----------------|-----------------|
| SilkWorm 3014 | 4.2.1 | SilkWorm 4100 | 4.4.0 |
| SilkWorm 3200 | 3.1.2 | SilkWorm 12000 | 4.2.0 |
| SilkWorm 3250 | 4.2.0 | SilkWorm 24000 | 4.2.0 |
| SilkWorm 3800 | 3.1.2 | SilkWorm 48000 | 5.0.1a |
| SilkWorm 3850 | 4.2.0 | SilkWorm 200E | 5.0.1a |
| SilkWorm 3900 | 4.2.0 | | |

Port Negotiation

The SilkWorm 4016 has been designed to be highly interoperable. It supports 1 Gbit/sec, 2 Gbit/sec, and 4 Gbit/sec 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 device or devices attached to the port.

If the SilkWorm 4016 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 SilkWorm 4016 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 Brocade SilkWorm 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 the 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 4-2](#) are for the host machine running Brocade management applications outside the Fabric OS, such as Fabric Manager.

Table 4-2 Supported Operating Systems

| Operating System | Version |
|------------------|------------------------------|
| AIX | 4.3.3 |
| Windows NT | 4.0 |
| Windows 2000 | Initial Release |
| Solaris | 2.5, 2.5.1, 2.6, 2.7, 2.8 |
| HP UX | 10.0, 11.0 |
| Linux | Red Hat versions 6.2 and 7.0 |

Accessing the SilkWorm 4016

The SilkWorm 4016 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 SilkWorm 4016 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 via 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 switch 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 2004 took (0:
0:59)
Initializing Ports ....
Port Initialization Completed
Enabling switch...
```

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

To determine POST completion status:

- Verify that the LEDs on the switch indicate a healthy SilkWorm 4016. 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 **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*.

- Use the blade server chassis’ management module to verify that the switch is working correctly. Refer to the blade server chassis documentation for details.
- Review the system log for errors.

Any errors detected during POST are written to the system log. Access this log through the **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 SilkWorm 4016 uses LEDs to indicate status. These LEDs are shown in [Figure 4-1](#). Not shown are the two LEDs adjacent to each SFP, with one LED to indicate port speed and one LED to indicate activity.

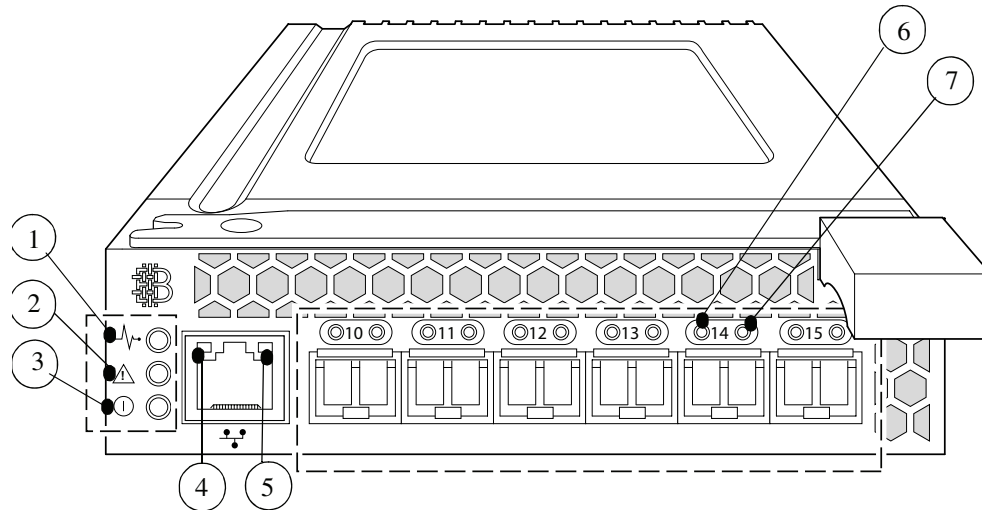


Figure 4-1 LED Locations

| Location | Indicator | Color | Operation |
|----------|----------------------|-------------|---|
| 1 | blade server chassis | green/amber | Controlled by the blade server. Refer to the blade server documentation for details. |
| 2 | status | green/amber | <ul style="list-style-type: none"> Off: Switch is off or both power supplies from the PowerEdge 1855) or onboard DCC have failed Green: No errors and all ports are ready for use Amber: Boot-up state, port(s) offline, or in reset state Blinking (2 Hz green/amber): One or more environmental ranges are exceeded, or error log contains diagnostic error messages <p>Note: The LED might blink during testing.</p> |
| 3 | power | green | <ul style="list-style-type: none"> Off: Switch is off or both power supplies (on the PowerEdge 1855) or onboard DCC have failed Green: Normal operation and power supply is functioning properly. Power is supplied by the blade server chassis |

| Location | Indicator | Color | Operation (Continued) |
|----------|-------------------------|-------------|--|
| 4 | Ethernet speed | green | <ul style="list-style-type: none"> Off: 10 Mbit/sec On: 100 Mbit/sec |
| 5 | Ethernet link | amber | <ul style="list-style-type: none"> Off: No link On: Link OK Blink: Rx or Tx traffic |
| 6 | FC port <i>x</i> status | green/amber | <p>LED meanings are not valid during boot, diagnostics, or POST.</p> <ul style="list-style-type: none"> Off: No signal carrier Amber: Signal present but not online Slow blink amber: Disable, ~2 second interval Fast blink amber: Error or fault with port, ~1/2 second interval Green: Online; flickers with activity Slow blink green: Online but segmented Fast blink green: Internal loopback |
| 7 | FC port <i>x</i> speed | green/amber | <ul style="list-style-type: none"> Amber on: 4 Gbit/sec FC Green on: 2 Gbit/sec FC Both off: 1 Gbit/sec FC |

Removing and Replacing the SilkWorm 4016

To remove a failed or replaced SilkWorm 4016:

1. Back up the switch configuration to an FTP server by typing the **configUpload** command and following the prompts.

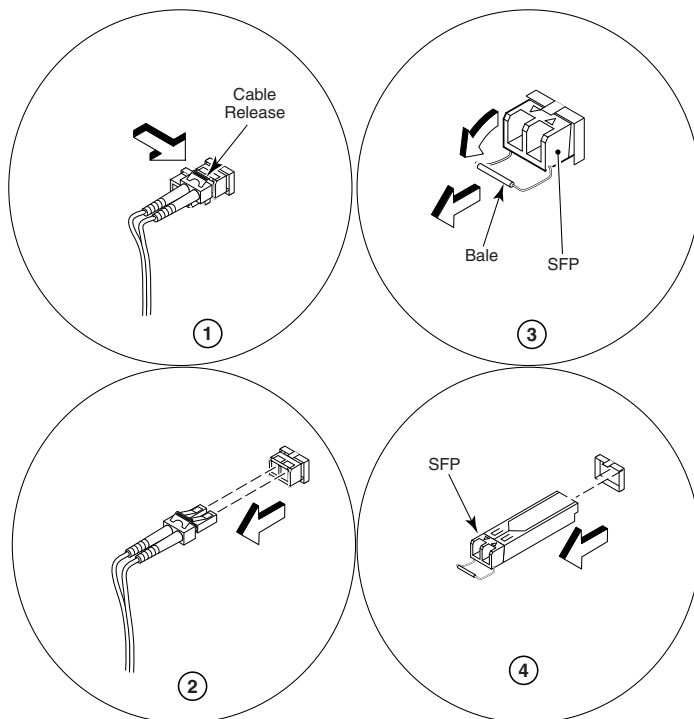
This command uploads the switch configuration to the server, making it available for downloading to a replacement switch if necessary. Brocade recommends backing up the configuration on a regular basis to ensure that a complete configuration is available for downloading to a replacement switch.

2. Stop all SAN activity requiring the ports used by the SilkWorm 4016.

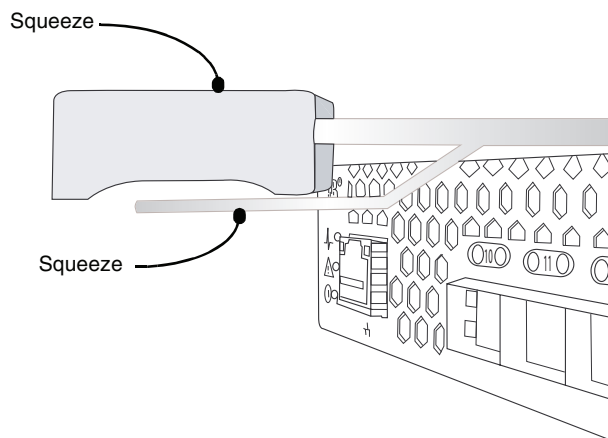
For details about port management, refer to your blade server documentation. Verify that there is no activity by viewing the SilkWorm 4016 LEDs. For details about LED activity on the SilkWorm 4016, see [“Interpreting LED Activity”](#) on page 4-4.

3. Remove all cables from the SFP modules.
4. Remove the SFP modules according to the manufacturer’s instructions.

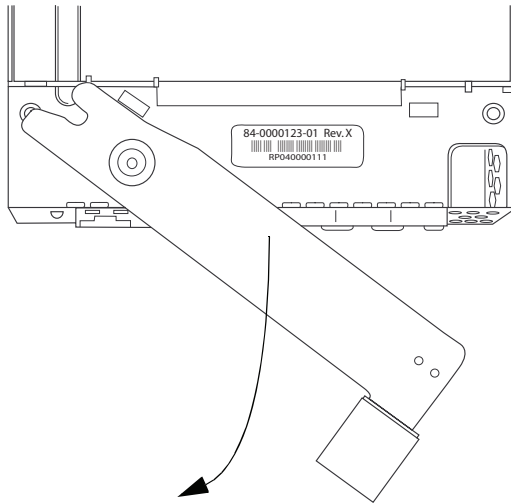
The following figure details the generic process for removing an SFP from a port.



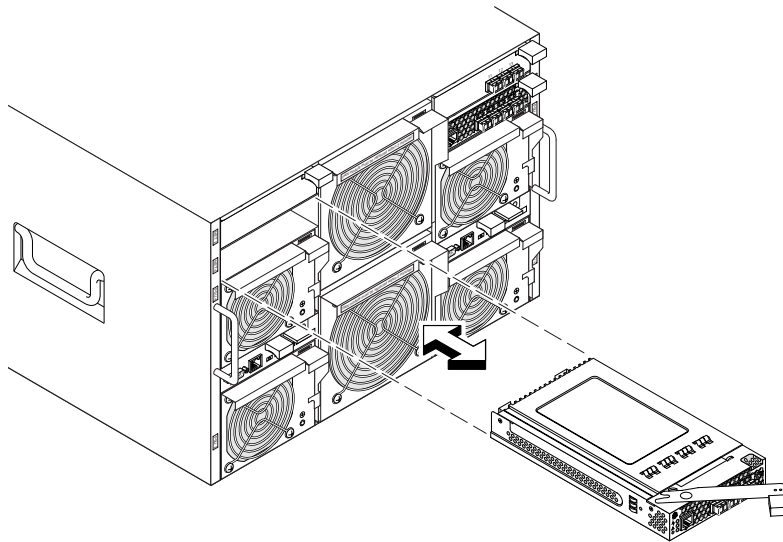
5. Squeeze the release lever latch to release the SilkWorm 4016.



6. Gently pull the handle of the SilkWorm 4016 insertion arm out and toward you to release the switch.



7. Slide the switch out of the chassis I/O bay. In the following illustration the SilkWorm 4016 is inserted in a horizontal orientation. Other blade server chassis may require a vertical orientation.



8. Within one minute, install a replacement switch or a filler module into the empty slot.

The replacement procedure is described in detail in [“Inserting a SilkWorm 4016 into the Chassis”](#) on page 2-2.

**Note**

If you are not replacing the switch, use a filler module to fill the empty slot to ensure proper air flow. Do not leave the slot empty for longer than one minute.

Brocade SilkWorm 4016 Specifications

This appendix provides product specifications as a handy reference. Information provided here includes:

- “Weight and Physical Dimensions,” next
- “Facility Requirements” on page A-1
- “Architectural Specification” on page A-2
- “Supported HBAs” on page A-2
- “Fibre Channel Standards Compliance” on page A-3
- “Regulatory Compliance” on page A-3

Weight and Physical Dimensions

Table A-1 lists the weight and physical dimensions of the SilkWorm 4016.

Table A-1 Switch Specifications

| | SilkWorm 4016 |
|---------------|-------------------------|
| Height | 1.27 in (32.2 mm) |
| Width | 5.13 in (130 mm) |
| Depth | 10 in (254 mm) |
| Weight | 2.32 lb — without media |

Facility Requirements

The information in Table A-2 shows the operating and non-operating limitations of the SilkWorm 4016.

Table A-2 Environmental Requirements

| Condition | Operating | Non-operating |
|-------------|-------------------------------------|------------------------------------|
| Temperature | 0°C to 40°C (32°F to 104°F)" | -20°C to 70°C (-4°F to 158°F)" |
| Humidity | 10% to 90%, non-condensing at 29°C" | 5% to 95%, non-condensing at 38°C" |

Table A-2 Environmental Requirements (Continued)

| | | |
|-----------|---------------------------------------|--|
| Altitude | Up to 3,048 m (10,000 ft) | Up to 10.668 km (35,000ft) |
| Shock | 20G for 6ms | 50G with a velocity change of 4216 mm/sec squared |
| Vibration | 0.4G at 5 Hz to 500 Hz for 60 minutes | 0.5G at 2 Hz to 200 Hz for 15 minutes; 1.04 GRMS Random for 15 minutes |
| Air flow | Normal: 100-300 LFM | None required |

Architectural Specification

The SilkWorm 4016 meets the specifications shown in [Table A-3](#).

Table A-3 Architecture

| | |
|--------------------|--|
| | |
| Scalability | Full fabric architecture with maximum of 239 switches |
| Certified maximum | 32 switches, 7 hops |
| Performance | 1.063 Gbit/sec line speed, full duplex 2.125 Gbit/sec line speed, full duplex |
| Fabric latency | <2.1 μ sec 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 |
| Fabric services | Simple Name Server, Registered State Change Notification |

Supported HBAs

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 SilkWorm 4016 switch meets or exceeds the Fibre Channel standards 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 SilkWorm 4016. It contains:

- “FCC Warning (US only),” next
- “MIC Statement (Republic of Korea)” on page A-3
- “VCCI Statement” on page A-4
- “BSMI Statement (Chinese)” on page A-4
- “CE Statement” on page A-5
- “Canadian Requirements” on page A-5
- “Laser Compliance” on page A-5
- “RTC Battery” on page A-5
- “Electrical Safety” on page A-6
- “Regulatory Certifications” on page A-6

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 곳에서 비업무용으로 교환하시기 바랍니다.

VCCI Statement

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より要求されることがあります。

BSMI Statement (Chinese)

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装中不會產生干擾。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



Caution

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 SilkWorm 4016 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.

RTC Battery



Caution

Do not attempt to replace the real-time clock (RTC) battery. There is danger of explosion if the battery is incorrectly replaced or disposed of. Contact your switch supplier if the real-time clock begins to lose time.

Electrical Safety


Caution

This switch might have more than one power cord. To reduce the risk of electric shock, disconnect both power cords before servicing.


Caution

Connect the power cord only to a grounded outlet.


Caution

This product is designed for an IT power system with phase-to-phase voltage of 230V. After operation of the protective device, the equipment is still under voltage if it is connected to an IT power system.

Regulatory Certifications

Table 4-3 lists the safety and EMC (electromagnetic compatibility) specifications for which the SilkWorm 4016 is certified.

Table 4-3 EMC Certifications

| Country | Safety Specification | EMC Specification |
|---------------|--|---|
| Canada | CSA 22.2 No. 60950 Third Ed. | CSA 108.8 Class A |
| United States | UL 60950 Third Ed., Info. Tech. Equip. | EN55022 Class A FCC Part 15, Subpart B (CFR title 47), Class A |

Table 4-3 EMC Certifications (Continued)

| Country | Safety Specification | EMC Specification |
|---|---|---|
| Japan | IEC 60950+A1+A2+A3+A4+A11 | EN55022 Class A EN 61000-3-2 Harmonics (JEIDA Limits) |
| International | IEC 60950+A1+A2+A3+A4+A11 | EN55022 Class A |
| 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, United Kingdom) and Republic of Korea | 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) | EN 55022:1998 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 |
| Australia and New Zealand | | EN 55022: 1998 Class A |

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