BROCADE

SilkWorm 4016
Hardware Reference Manual

Supporting Fabric OS v5.0.3

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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
SilkWorm 4016 Hardware Reference Manual	*53-51000051-01*	New document.	January 2006

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About This Document

Chapter 1   Introducing the Brocade SilkWorm 4016

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About This Document

This document is a hardware reference manual, written for SAN administrators who are using the Dell PowerEdge 1855. 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 5.0.3 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
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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 Brocade 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 5.0.3. This switch was designed specifically to work with the Dell PowerEdge 1855 blade server chassis.

This document does not support all 5.x Fabric OS versions: it is specific to the Fabric OS v5.0.3. 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 v5.0.3 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
italic text	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 v5.0.3 release notes*
- *Dell | Brocade Communications Product Information Guide*

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

2. **Switch Serial Number**

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

   FT00X0054E9
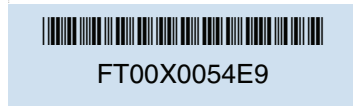
   The serial number label is located at the top of chassis and under the insertion arm.

3. **World Wide Name (WWN)**

   Provide the license ID. Use the **licenseIDShow** command to display the license ID.

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 issue, including the topic heading and page number and your suggestions for improvement.

SilkWorm 4016 Hardware Reference Manual
Publication Number: 53-100051-01

Introducing the Brocade SilkWorm 4016

The SilkWorm 4016 is a 12-port Fibre Channel switch module (upgradable to 16 ports) that supports external port 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

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 2 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 system power-on
  - One green/amber LED to indicate system 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	1.375 in. (3.5 cm)
Width	5.0 in. (12.7 cm)
Depth	9.75 in. (24.77 cm)
Weight	2.35 lb (1.066 kg)

Memory

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

Table 1-2   Memory Specifications

Memory Type	**Value**
PowerPC 405GP processor	200 MHz
ECC SDRAM	128 MB at 66 MHz
Boot flash	512 KB
Kernel flash	16 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 a PowerEdge 1855 Chassis" on page 2-2.
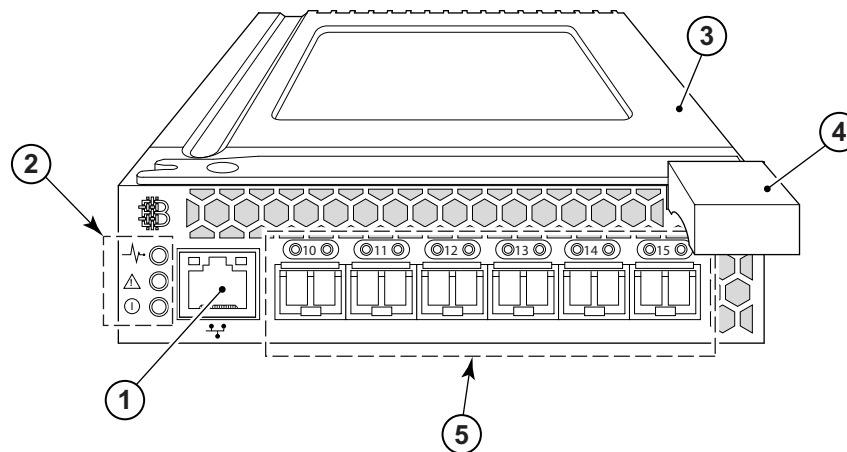
Figure 1-1   Port Side of the SilkWorm 4016

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.
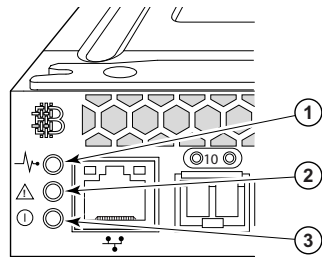
Figure 1-2   Nonport LEDs

1   Module controller status

2   Switch status

3   Power and system 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 .
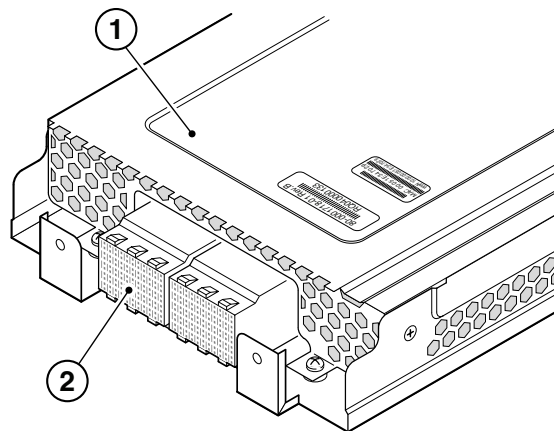
Figure 1-3   Nonport Side, Viewed from Top

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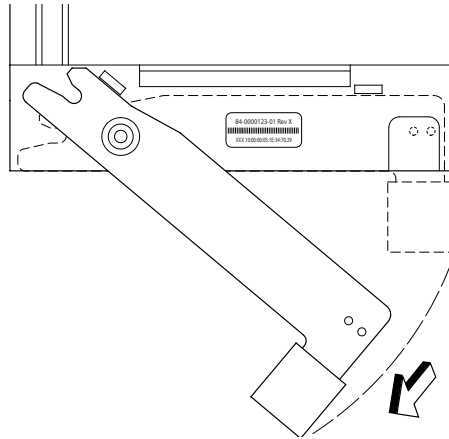
Figure 1-4   Insertion Arm Label
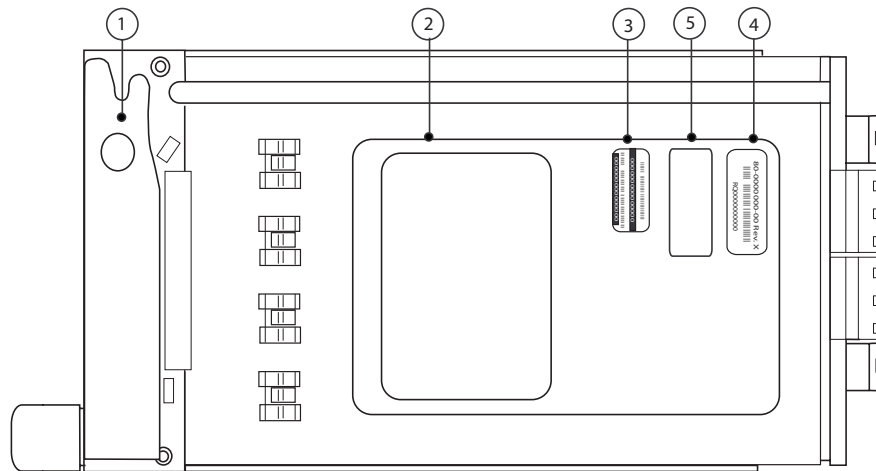
Figure 1-5   Detail, Labeling

1   Supplier serial label (under insertion arm)

2   Compliance label

3   Service tag

4   PPID label

5   Service tag and PPID label

Server Blade and Switch Port Mapping

Figure 1-6 shows the physical mapping between each server blade and the internal fiber channel switch ports that each server blade is physically connected to.
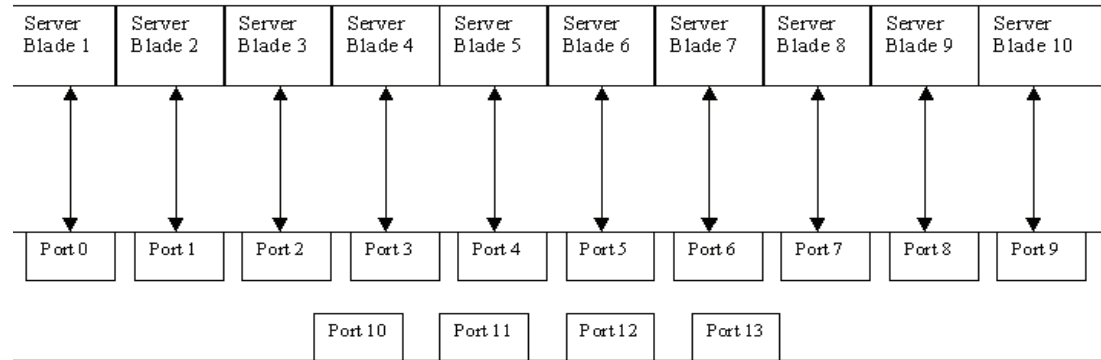
Figure 1-6   Port Mapping

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.

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 Tools[1]
- Brocade Advanced Zoning[1]
- 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

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 Dell 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 PowerEdge 1855 for the SilkWorm 4016

Before you insert the SilkWorm 4016 into the PowerEdge 1855, make sure that the following conditions are met:

- The PowerEdge 1855 is powered up.

- The PowerEdge 1855 chassis 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 chassis I/O bay 3 or chassis I/O bay 4.

- All power requirements specific to the PowerEdge 1855 chassis are met. Refer to the PowerEdge 1855 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 a PowerEdge 1855 Chassis

To insert the SilkWorm 4016 into a PowerEdge 1855 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 (bay 3 or bay 4) 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 chassis I/O bay 3 or chassis I/O bay 4 of the PowerEdge 1855.
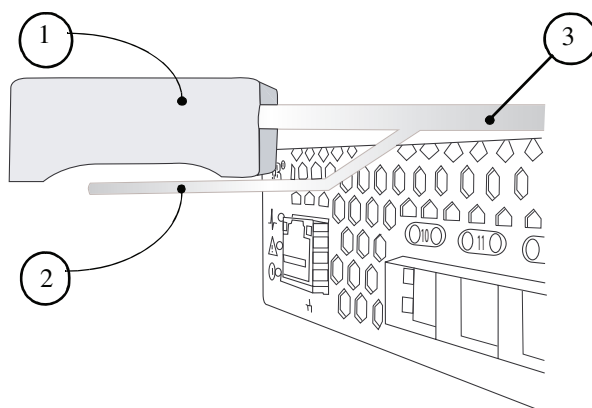
1	Top of latch
2	Bottom of latch
3	Insertion arm

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

This positions the insertion arm, allowing the SilkWorm 4016 to seat properly in the PowerEdge 1855 chassis.
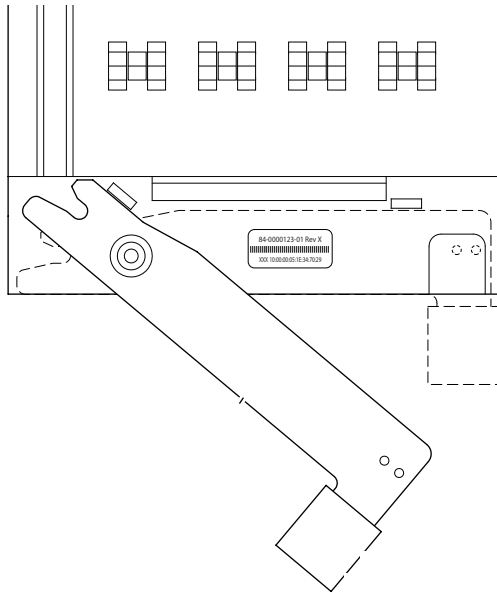
5. With the port side facing you and the insertion arm extended, slide the SilkWorm 4016 into the open chassis I/O bay.
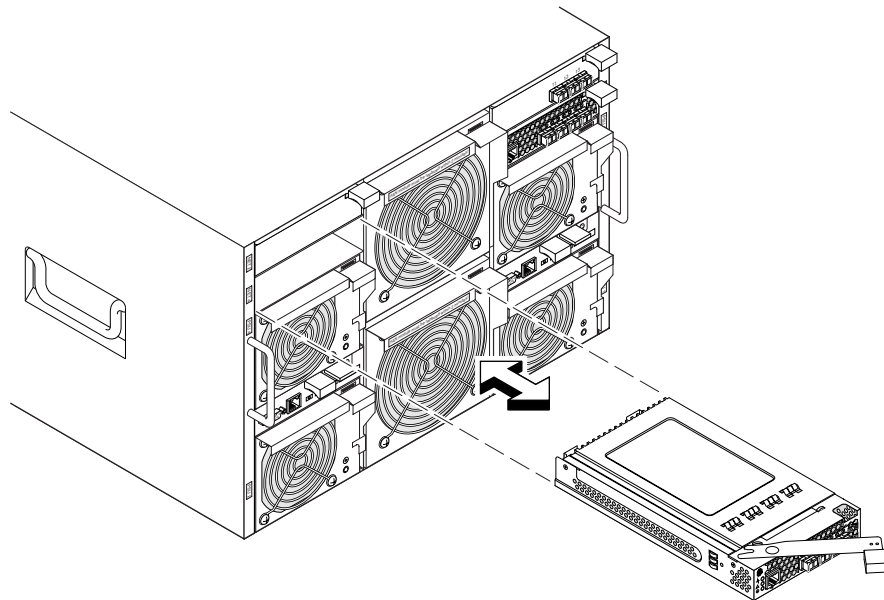
6. Push the insertion arm gently toward the chassis until the arm is flush with the edge of the SilkWorm 4016 chassis.

At this point the SilkWorm 4016 is firmly seated in the PowerEdge 1855 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.

7. 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 Dell PowerEdge 1855 documentation. The DRAC/MC 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.

The Dell PowerEdge 1855 documentation provides further details about port management and the Dell Remote Access Card/Module Controller.

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

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 PowerEdge 1855 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 PowerEdge 1855 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 PowerEdge 1855 chassis as described in "Inserting a SilkWorm 4016 into a PowerEdge 1855 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 3-4.

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 DRAC/MC of the PowerEdge 1855 chassis.

> **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 DRAC/MC 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 DRAC/MC application displays a login screen on the console monitor.

7. Log into the DRAC/MC using the default user name "root" and password "calvin".

   The DRAC/MC displays the CLI command prompt `DRAC/MC:`.

> **Note**
>
> Dell recommends changing the default user name and password names.

See the Dell Remote Access Controller/Modular Chassis User's Guide for instructions.

For details about setting up the terminal emulation with the correct connection and login information using the PowerEdge 1855 DRAC/MC, refer to the PowerEdge 1855 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 DRAC/MC as specified in .

3. At the command prompt, type **connect switch-3** or **connect switch-4** depending on which bay the SilkWorm 4016 is plugged into (bay 3 or bay 4, respectively).

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 is 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 *Brocade Fabric OS Features 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 PowerEdge 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

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. Internal ports support 1 Gbit/sec and 2 Gbit/sec, and external ports support 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 POSTOutput

```
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 PowerEdge 1855 DRAC/MC to verify that the switch is working correctly.

  Refer to the Dell PowerEdge 1855 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.
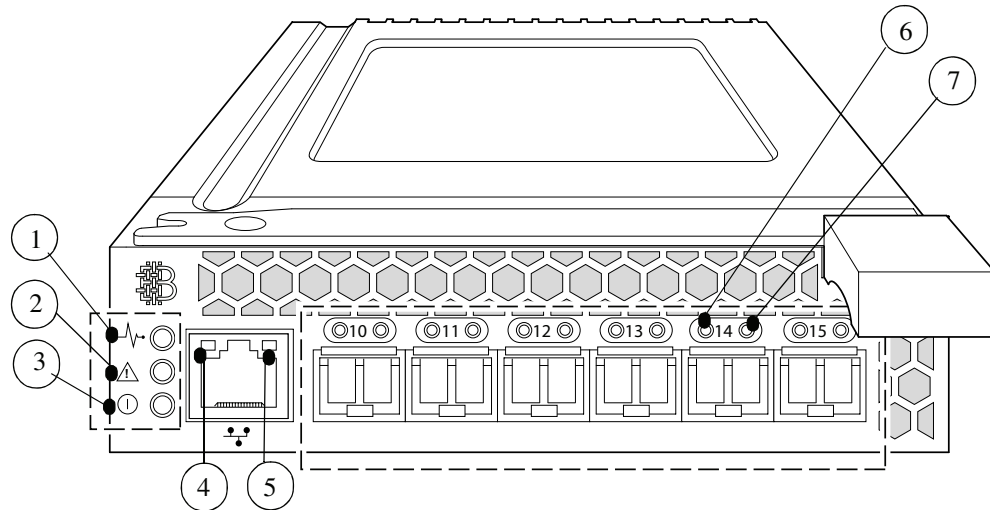

Figure 4-1 LED Locations

Location	Indicator	Color	Operation
1	DRAC/MC	green/amber	Controlled by the DRAC/MC. Refer to the DRAC/MC documentation for details.
2	status	green/amber	• 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 Note: The LED might blink during testing.
3	power	green	• 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 PowerEdge 1855 chassis

Location	Indicator	Color	Operation (Continued)
4	Ethernet speed	green	• Off: 10 Mbit/sec • On: 100 Mbit/sec
5	Ethernet link	amber	• Off: No link • On: Link OK • Blink: Rx or Tx traffic
6	FC port *x* status	green/amber	LED meanings are not valid during boot, diagnostics, or POST. • 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 *x* speed	green/amber	• 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 Dell PowerEdge 1855 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.
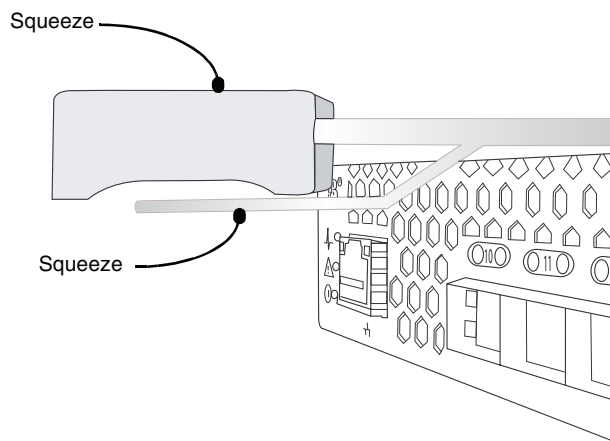
3. Remove all cables from the SFP modules.

4. Remove the SFP modules according to the manufacturer's instructions.
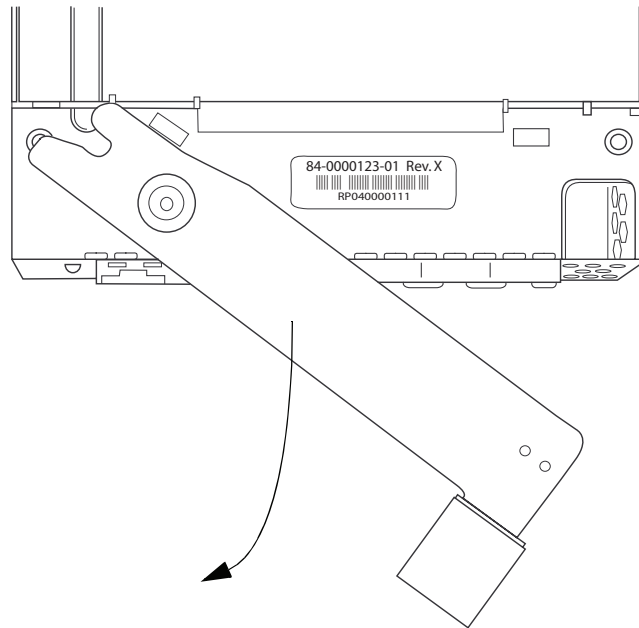
The following figure details the generic process for removing an SFP from a port.
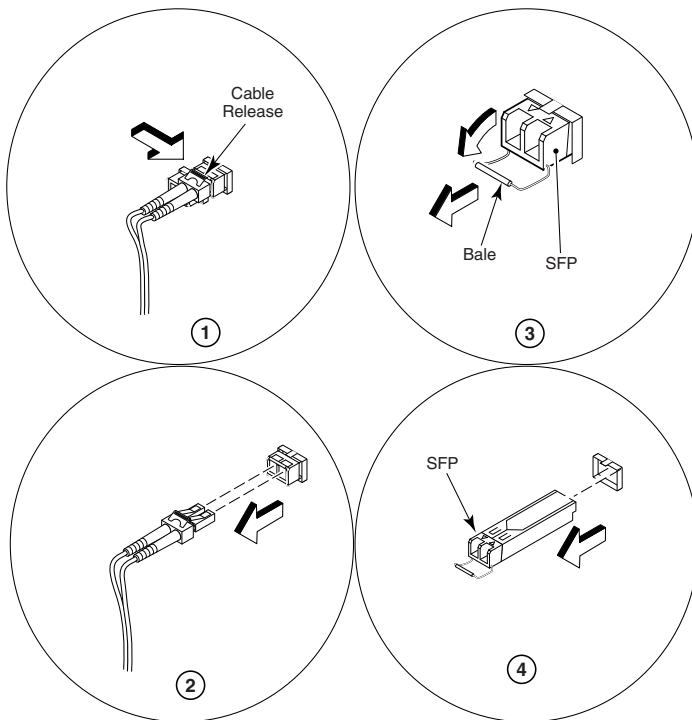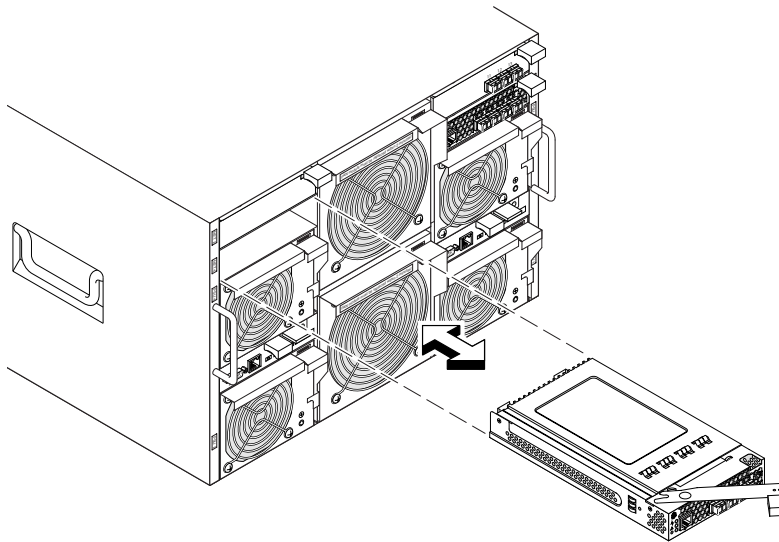

5. Squeeze the release lever latch to release the SilkWorm 4016.

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 PowerEdge 1855 chassis I/O bay.

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 a PowerEdge 1855 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-2
- "Architectural Specification" on page A-2
- "Supported HBAs" on page A-3
- "Fibre Channel Standards Compliance" on page A-3
- "Safety Agency Approvals" 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	1.375 in. (3.5 cm)
Width	5.0 in. (12.7 cm)
Depth	9.75 in. (24.77 cm)
Weight	2.35 lb (1.066 kg)

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 (low altitude)[1] (high altitude)	0° to 52° C (50° to 125.6° F) 0° to 49° C (50° to 120.2° F)	1° to 60° C (34° F to 140° F) 1° to 60° C (34° F to 140° F)
Humidity	8% to 80% RH, noncondensing	5% to 80% RH, noncondensing
Altitude	0 to 10,000 ft (3 km) above sea level	0 to 39,370 ft (12 km) above sea level
Shock	3.5 G, 3 ms	3.5 G with a velocity change of 3454 mm/sec
Vibration	0.5 G, 5-500 Hz, 30 min	0.5 G at 2 Hz to 200 Hz for 15 min
Air flow	Normal: 100-300 LFM	None required

1.   Low altitude is defined as under 914 meters. High altitude is defined as 914 to 2133 meters.

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 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
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

Safety Agency Approvals

The SilkWorm 4016 has been approved to several safety regulations by various safety agencies, as follows:

- Underwriters Laboratories—UL 60950 3rd Edition
- Canadian Standards Association—CSA 60950
- TUV Rheinland—EN60950 2nd Edition with Amendments
- UL/CB—EMKO-TSE (74-SEC) 207/94
- Australia/New Zealand—CB Report to IEC 60950, 3rd Edition plus international deviations
- Declaration of Conformity to European Union Low Voltage Directive 73/23/EEC (self-declaration)

EMC Compliance

The SilkWorm 4016 has been approved to several Electromagnetic Compatibility regulations as noted below when installed in the PowerEdge 1855. Electromagnetic compatibility includes electromagnetic interference (emissions) and immunity compliance.

- United States—FCC Parts 2 and 15
- Canada—ICES-003 Class A

- European Union -
  - EN55022:1998
  - EN55024
  - EN61000-4-2, A1
  - EN61000-4-3
  - EN61000-4-4

  - EN61000-4-5
  - EN61000-4-6
  - EN61000-4-8
  - EN61000-4-11
  - Declaration of Conformity to EMC Directive EE/89/336/EEC

- Japan—VCCI Class A ITE (CISPR 22, Class A Limit)
- Australia/New Zealand—AS/NZS 3548, Class A Limit
- Taiwan—BSMI Approval
- Korea—RRL Approval
- Russia—GOST Approved
- International—CISPR 22, Class A Limit

EMC Notices

FCC Warning (US and Canada)

FCC Unintentional emitter per FCC Part 15

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

> **Note**
> This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio or television reception. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio and television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

Caution: Any changes or modifications not expressly approved by the responsible party may render the device FCC non-compliant and void the user's authority to operate it.

Industry Canada Unintentional emitter per ICES-003

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of Industry Canada.

Le present appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe A prescrites dans le règlement sur le brouillage radioélectrique édictè par Industrie Canada.

Korean RRL EMC Statement

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.

Taiwanese BSMI EMC Statement

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. 明確批準的擅自變更或修改，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。

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 may arise. If this occurs, the user may 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。

CE Statement

Warning
This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate 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 98/68/EEC
- EN50082-2/EN/EN55024:1988 (European Immunity Requirement)
  - ENG61000-3-2
  - ENG61000-3-3

Safety Notices

Laser Compliance

FDA Notice

This product complies with DHHS Rules 21CFR Chapter I, Subchapter J.

This product has been tested to and is found to be in compliance with the IEC60825-1 safety standard for laser products.

Warning
Class 1 Laser Product
Appareil A Laser De Classe 1
Laser Klasse 1 Nach IEC 60825-1
Luokan 1 Laserlaite
Producto Del Laser De la Clase 1
Prodotto Del Laser Del Codice categoria 1

Caution-Class 1 laser radiation when open. Do not view directly with optical instruments.

Attention-Radiation laser de classe 1. Ne pas regarder directement avec des instruments optiques.

Vorsicht-Laserstrahlung der Klasse 1 bei geöffneter Abdeckung. Direktes Ansehen mit optischen Instrumenten vermeiden.

Varoitus-Luokan 1 lasersäteilyä, kun laite on auki. Älä katso suoraan laitteeseen käyttämällä optisia instrumentteja.

Radiación-De laser de la clase 1 de la precaución cuando esta' abierto. No opinión directamente con los instrumentos ópticos. Producto Del Laser De la Clase 1.

Radiazione-Di laser del codice categoria 1 di attenzione una volta aperto. Non osservare direttamente con gli strumenti ottici.

Use only transceivers that are qualified by the switch provider and comply with the FDA Class 1 radiation performance requirements defined in 21 CFR Subchapter J, and with IEC 60825. Products which do not comply with these standard my emit light that is hazardous to the eyes.

RTC Battery

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

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