



# **SilkWorm<sup>®</sup> 2400**

## Hardware Reference Manual

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*53-0001533-01*

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## **NOTICES**

### **FCC Warning (USA 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 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, may cause harmful interference to radio communications. Operating this equipment in a residential area is likely to cause harmful interference in which case the user is responsible for repairs.

### **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. When such trouble occurs, the user may be required to take corrective actions.  
(Japanese Text)

### **CE Statement**

The standards compliance label on the SilkWorm 2400 Fibre Channel Switch contains the CE mark which indicates that this system conforms to the provisions of the following European Council Directives, laws, and standards:

- Electro Magnetic Compatibility (EMC) Directive 89/336/EEC and the Complementary Directives 92/31/EEC and 93/68/EEC:
  - EN550022, Class A; Emissions Industrial Environment
  - EN 50082-2 Immunity Industrial Environment
  - EN61000-4-2 Electro Static Discharge
  - EN61000-4-3 Radiated RF
  - EN61000-4-4 Electrical Fast Transients
  - EN61000-4-5 Surge
  - EN61000-4-6 Conducted RF
  - EN61000-4-11 Line Interruption
- Low Voltage Directive (LVD) 73/23/EEC and the Complementary Directive 93/68/EEC:
  - EN 60950:92 A1:93 & A2:93 & A3:95 & A4:96 & A11:97
  - EN60825-1:199/A11, -2

### **Canadian Requirements**

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

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

### **Laser Compliance**

This equipment contains class 1 laser products, and it complies with FDA radiation Performance Standards, 21 CFR Subchapter J.



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# PREFACE

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The *SilkWorm*<sup>®</sup> 2400 *Hardware Reference Manual* describes how to use and maintain the SilkWorm 2400 Switch.

## Audience

The audience for this manual includes:

- Field Technicians

## How this Manual is Organized

The following table describes how the manual is organized.

FOR INFORMATION ON	SEE
Switch features and system components	Chapter 1, <i>Introduction</i>
Installing and setting up the switch	Chapter 2, <i>Installation</i>
Diagnostics	Chapter 3, <i>Diagnostics</i>
Technical specifications	Appendix A, <i>Specifications</i>
Customer support	Appendix B, <i>Switch Support</i>

## Related Publications

Other publications that may provide related information include:

- Fabric OS Version 2.0 Manual, Part Number: 53-0001555-01
- *Fibre Channel Standards*

For detailed information on the Fibre Channel standards, see the Fibre Channel Association web site:

<http://www.fibrechannel.com>

## Revision History

FABRIC OPERATING SYSTEM VERSION	DATE	DOCUMENT
2.0	11 / 98	First Draft
2.0	1 / 99	Second Draft
2.0	2 / 99	Beta Draft
2.0	3 / 99	Beta 3 Draft
2.0	4 / 99	Final Draft
2.0	4 / 99	Released
2.0	7 / 99	Channel Update



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# INTRODUCTION



**Figure 1-1** Front Panel

SilkWorm 2400 is an 8-port Fibre Channel Gigabit Switch that consists of a motherboard with connectors for supporting up to 8 ports, and fabric operating system for building and managing a Fabric. A *Fabric* is an active, intelligent, interconnect scheme for Fibre Channel server and storage nodes. Figure 1-1 shows the front view of the SilkWorm 2400 switch. Ports are numbered sequentially starting with zero for the left most port. The switch face plate includes a silk screen imprint of the port number. Up to two power supplies are supported, these are shown to the left and right of the switch ports in Figure 1-1. This chapter discusses:

- Features
- System Components

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**WARNING** *SilkWorm 2400 contains two power supplies. To remove all power from the system, disconnect both power supply cords.*

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# Switch Features

The switch is a high-performance Fibre Channel Gigabit Switch with the following features:

- **Simple** – Easy setup and configuration. After Power-On Self-Test (POST), you need only add the switch's Internet Protocol (IP) address. The remainder of the switch's setup is automated.
- **Intelligent** – The fabric operating system allows discovery of all connected devices and determines optimum data paths without intervention, supporting up to 239 interconnected switches.
- **Flexible** – GBIC modules support fiber and copper transmission media. The switch's modular construction gives the switch a range of flexibility in creating, upgrading, maintaining, and configuring a Fabric.
- **Reliable** – Highly integrated, reliable, multifunction (ASIC) devices are used throughout the switch.
- **High performance** – Low-latency, high-performance design requires no CPU data path interaction resulting in a worst case data transfer latency of less than two microseconds from any port to any port at peak Fibre Channel bandwidth of 100 MB/sec. The latency may differ when the destination or device is a loop.
- **Automated congestion management** – Virtual channels lets the switch use sophisticated congestion management techniques that are performed automatically by the switch.
- **Cascading** – You can cascade switches for large Fabric support. Up to 239 switches can be interconnected for a large Fabric with hundreds of Fabric connections.
- **Compatibility** – SilkWorm 2400 has been designed to inter-operate with the SilkWorm 1000 series switches using a compatibility mode.
- **Universal** – Switch ports are designed to support F,FL and E-port modes of operation with the software selecting the optimum mode of operation.

## Performance

A minimum aggregate routing capacity of 4,000,000 frames/sec is specified for Class 2, Class 3, and Class F frames. Non-blocking throughput of up to 8 x 100MBytes/sec (0.8 GBytes/sec) is provided.

A maximum switch latency of less than two microseconds is specified for Class 2, Class 3, and Class F frames when the output port is free.

## Manageability

The unit may be managed in-band (using Fibre Channel protocol) or out-of-band via connecting to the 10/100BaseT Ethernet port. Management interfaces include Telnet, SNMP, SCSI Enclosure Services (SES), or a Web Tool.

# System Components

The motherboard is enclosed in an air-cooled chassis which may be either mounted in a standard rack or used as a standalone unit. The chassis includes one or two power supplies, a fan tray, an RJ-45 Ethernet connection for switch set up and management, and a serial port. The serial port is used for recovering factory settings only and initial configuration of the IP address for the switch if default address is not known.

## Fabric Operating System

The fabric operating system is tuned for each installation. The system provides a large number of commands and libraries to manage real time tasks.

## GBICs

The switch accommodates up to eight GBIC modules. All interfaces have status lights visible from the front panel giving a quick, visual check of the GBIC's status and activity.

GBIC modules supported are the ShortWave Length (SWL) and LongWave Length (LWL) fiber-optics, and Copper (Cu) versions.

If your installation requires installing less than eight GBIC modules, the unused port positions are protected by a metal, spring-loaded door.

## SWL Fiber-Optic GBIC Module

The SWL fiber-optic GBIC module, with SC connector color-coded black, is based on short wavelength lasers supporting 1.0625 Gbps link speeds. This GBIC module supports 50-micron multi-mode fiber optic cables, with cables up to 500 meters in length. The GBIC module is shipped with a protective plug in place and should remain in place if no fiber optic cable is connected to the port. Figure 1-2 shows a GBIC module.



**Figure 1-2** Short wavelength Laser (SWL) fiber optic GBIC module

The SWL GBIC module uses a Class 1 laser, which complies with the 21 CFR, subpart (J) as of the date of manufacture.

## LWL Fiber-Optic GBIC Module

The LWL fiber-optic GBIC module, with SC connector color-coded blue, is based on long wavelength 1300nm lasers supporting 1.0625 Gbps link speeds. This GBIC module supports 9-micron single-mode fiber. Cables up to 10 kilometers in length with a maximum of five splices can be used. The GBIC module is shipped with a protective plug in place and should remain in place if no fiber optic cable is connected to the port. Figure 1-3 shows a GBIC module.



Figure 1-3 Long Wavelength Laser (LWL) fiber optic GBIC module

## Passive Copper GBIC Module

The Copper (CU) GBIC module is based on the High-Speed Serial Data Connection (HSSDC) interface standards. The GBIC provides a female HSSDC connector. Copper cables up to 13 meters have currently been qualified, thereby supporting ANSI X3.230 FC-PH intra-cabinet requirements. Standard cables with HSSDC-to-DB9 male connectors are also compatible. Figure 1-4 shows a passive copper GBIC.



Figure 1-4 Copper GBIC module

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# INSTALLATION

This chapter covers the following:

- Unpacking the switch
- Selecting a location and mounting method
- Setting up connections

# Unpacking the Switch

While unpacking the switch, check to make sure the following items are included:

- Switch unit
- Requested GBIC modules
- Accessory kit containing the following:
  - Power cord, if ordered
  - Manuals, if ordered
  - Optional Software Feature Guides, if a feature(s) is ordered
  - Rubber mounting feet

Save packing materials in case you need to return the switch. Refer to Appendix B, *Switch Support* for information on contacting Brocade.

## Cooling Requirements

Cooling air is drawn into the chassis by six fans mounted near the rear of the chassis, venting exhausted air through the front of the switch.

**NOTE:** *Do not block the front or rear air vents. The switch must have free access to ambient air for cooling.*

## Power Requirements

Switch power connection is via two switched connectors on the front panel, as shown in Figure 2-1. The switch power requirements are:

- Properly wired, earth-grounded outlet
- Input voltage: 85 - 265 VAC
- Total power: Up to 110 watts (depending on configuration, see Appendix A, *Specifications*)
- Input line frequency: Nominally 47 to 63 Hz

The switch has an autoranging power supply that automatically accepts voltages and line frequencies within its ranges. A green power on indicator light is located above the power switch in the power supply module.

**NOTE:** *The SilkWorm<sup>®</sup> 2400 is available in two models. The 2401 includes one power supply unit and the 2402 includes two power supply units.*



**Figure 2-1** Model 2402 with Two Power Supplies

**NOTE:** *The switch meets IEC 801-5 surge voltage requirements, however, there is no other provision for surge protection built into the switch's power supplies. An installation should include normal provisions to assure clean power.*

## Site Location

The switch should be installed in a secure or limited access site to control unauthorized access to the switch's cabling and power connections.

## Installation Considerations

The switch has optional mounting hardware to mount the switch in a standard 19-inch rack.

### Rackmount Safety Guidelines

In a rackmount installation, follow these safety guidelines:

- When installing a switch in a closed or multi-rack assembly, make certain the air temperature, measured at the rack front, does not exceed 40° C during operation.
- Ensure that there is sufficient airflow available to the switch.
- Verify that the switch installation, both with the slides closed and fully extended, does not unbalance the rack or exceed the rack's mechanical limits.
- Verify the supply circuit, line fusing, and wire size are adequate. Refer to the switch's nameplate for its power requirements.
- Verify that all equipment installed in the rack has a reliable ground connection. Do not rely on connection to a branch circuit, such as power strips.
- Route and support the power cord to ensure that the switch moves freely on its slides without crimping or damaging the power cord or interfering with other equipment and cabling installed in the rack.

### Installing Slide Assembly (Optional)

Before starting switch slide installation and the switch rack installation, locate the rack-mount slides and the mounting brackets package, then proceed:

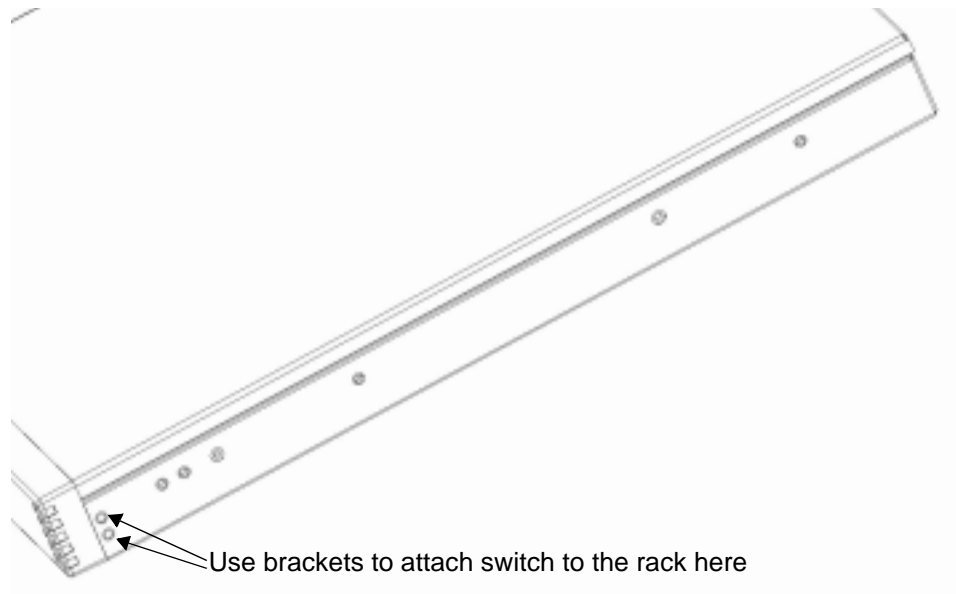
---

#### ***To install slide assembly***

- 1 Disassemble the slides by fully extending the slide, pressing the release, then pulling the slide apart.
- 2 Mount the slide moving portion to each switch side as shown in Figure 2-2, using the supplied slide screws.
- 3 Open the rack mounting package, and secure the four rack mounting attachments to the stationary slide portion as shown in Figure 2-2.
- 4 Mount the two brackets using two screws (of the four provided) for each handle.



Brackets are provided as part of the slide kit. The brackets are used to secure the switch to the rack. As shown in Figure 2-2, the two holes located towards the front of the switch are used with the brackets. All the other holes are used for slide mounting.



**Figure 2-2** Mounting the switch

- 1** Mount both stationary slide portions to the front and rear rack rails.
- 2** Engage the slide mounted on the switch with the stationary slide portion mounted on the rack, and press toward the rear until the latches engage.
- 3** Press the switch until the brackets are firmly seated on the rack front supports.
- 4** Secure the switch to the rack using the provided screws and nuts as shown in Figure 2-2.
- 5** Connect the switch to power. This completes the switch rack installation.

## Standalone

The switch is shipped in its standalone configuration. Adhesive rubber feet are supplied if the switch is surface mounted. Rubber feet installation is required for proper or safe switch operation.

### **To install the adhesive rubber feet:**

- 1 Clean the four depressions at each corner of the chassis bottom so that they are free of dust.
- 2 Remove the rubber feet from the sheet and place one in each depression.
- 3 Firmly press the rubber feet in place.

## Fiber Channel Cable Connections

All network cable connections are to the switch's front panel. All recommended cabling supports the switch's 1.0625-Gbps transfer rate, as shown in Table 2-1.

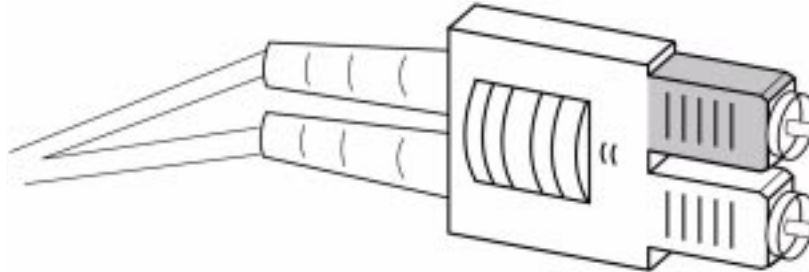
**Table 2-1** Cabling Connections

CABLE TYPE	CABLE SPECIFICATION	MAXIMUM RUN LENGTH	GBIC MODULE OPTICAL WAVELENGTH
SWL Fiber Optic <sup>a</sup>	<ul style="list-style-type: none"> <li>• Duplex SC plug connectors</li> <li>• Multimode fiber</li> <li>• 50 <math>\mu\text{m}</math> core diameter</li> <li>• 125 <math>\mu\text{m}</math> cladding diameter duplex cable</li> </ul>	<ul style="list-style-type: none"> <li>• 500 meters</li> <li>• 1641 feet</li> </ul>	780-860 $\mu\text{m}$ without open fiber control (non-OFC)
LWL Fiber Optic <sup>a</sup>	<ul style="list-style-type: none"> <li>• Duplex SC plug connectors</li> <li>• Single mode fiber</li> <li>• 9 <math>\mu\text{m}</math> core diameter</li> <li>• 125 <math>\mu\text{m}</math> cladding diameter duplex cable</li> </ul>	<ul style="list-style-type: none"> <li>• 10 Kilometers</li> <li>• 84480 feet</li> </ul>	1270-1350 $\mu\text{m}$ without open fiber control (non-OFC)
Copper	<ul style="list-style-type: none"> <li>• Impedance controlled for 150 ohm differential systems</li> <li>• Low skew, shielded quad, 150 ohm cable</li> <li>• Polarized interface</li> <li>• HSSDC receptacle</li> </ul>	<ul style="list-style-type: none"> <li>• 13 meters</li> <li>• 42 feet</li> </ul>	NA

*a. Recommend using a low EMI optical cable design.*

**NOTE:** *The switch is not designed to interoperate with devices using an Open Fibre Control optical interface.*

Fiber cable connections are made to the switch's front panel using standard dual SC plug connectors as shown in Figure 2-3.



**Figure 2-3** Dual SC fiber optic plug connector

The connectors are keyed and must be inserted into the GBIC module's connector in proper alignment. In most cases, one of the two connector plugs is a different color to aid in proper connector alignment.

**NOTE:** *Remove the protective plug from the GBIC. Do not force the fiber optic plug into the GBIC module as you may damage the connector, the GBIC module, or both. Make certain the fiber surface is clean, free of dust or debris, before inserting the connector into GBIC module.*

Copper cables use a High Speed Serial Data Connection (HSSDC) connector.

## Serial Port Connection

The switch includes a serial port used to set the IP address when setting up or reinitializing a switch. It is not used during normal operation. The settings are as follows:

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



**Figure 2-4** Connections

**NOTE:** *The serial port and Telnet connection are mutually exclusive and there can be only one serial port session active at a time. Telnet takes priority, so the serial port is terminated when a Telnet connection is made. The serial connection is restored after the Telnet session is completed but re-logging in is required. A password is required to login to the serial port session as password checking is skipped only at initial power on.*

---

**CAUTION** *The serial port is intended for initial configuration of the IP address or disaster recovery only and not for regular maintenance.*

---

## Serial Cabling and Emissions Requirements

The switch uses a standard serial cable with a male 9-pin D-Subminiature connector (but only pins 2, 3 and 5 are required/supported; if 7 is used, this signal must always be driven high, with the following pinouts:

**Table 2-2** Cabling Pinouts

PIN	SIGNAL	DESCRIPTION
1		
2	TxDData	Transmit Data
3	RxDData	Receive Data
4		
5	GND	Logic Ground
6		
7	CTS	Clear to Send
8		
9		

**NOTE:** *For dust and ESD protection, the switch includes a cover for the serial port. When not in use, the serial port should be covered.*

## Setting IP Address using the Serial Port

There is a label on the front panel of the switch with IP ADDRESS and space to include the IP address when it is configured. This label facilitates identification of the physical switch in maintenance mode.

The serial port is initially logged on as an “Admin” user.

---

### **To set IP Address using the Serial Port**

- 1 Connect the serial port to a workstation using a standard serial cable with a DB9 connector.
- 2 Establish a connection to the shell.  
The prompt is displayed as `switchName:userName>`  
For example: `sw4:admin>`
- 3 Enter the data to the `ipAddrSet` command (Fibre Channel IP address and subnet mask and Ethernet IP address, subnet mask, and gateway address).
- 4 Copy the IP Address to the label provided for future reference.

## Resetting Factory Defaults

In the event that a user changes a password and forgets it, the password can be reinitialized.

---

### **To reset factory defaults**

- 1 Connect the serial port to a PC/workstation using a standard serial cable with a DB9 connector.
- 2 Establish a connection to the shell.  
The prompt is displayed as `switchName:userName>`  
For example: `sw4:admin>`
- 3 Enter the `configDefault` command. See the *Fabric OS Manual* for more information.

## Ethernet Connection

Connecting an existing Ethernet 10/100BaseT LAN to the switch via the front panel RJ-45 connector gives access to the switch’s internal SNMP agent and also allows remote Telnet and Web access for remote monitoring and testing.

**NOTE:** *The connection is only for Telnet, SNMP agent and the Web-based Server access. No Fabric connection is used via this connection.*

## Verifying Power-On Self-Test (POST)

The following table lists the diagnostic tests automatically run during POST.

**Table 2-3** POST Tests

TEST	BRIEF DESCRIPTION
Memory Test	Checks CPU RAM memory.
Port Register Test	Checks the ASIC registers & SRAMs.
Central Memory Test	Checks the motherboard SRAMs.
Port Loopback Test	Checks all of the switch's hardware: frames transmitted, are looped back, and received

POST behaves differently depending on the boot method. A power cycle (power off & power on) is considered a cold boot. All other boots from a powered-on state (per reboot, panic, etc.) are considered warm boots.

POST execution per cold boot executes the long version of Memory Test. POST execution per warm boot executes a shorter version of Memory Test. Boot time with POST varies depending on the boot method.

As the POST successfully performs each of the tests, a message, "Passed," is displayed via the Telnet.

After the switch completes the POST, the port module returns to a steady state from the flashing states shown during the tests.

If a yellow port module light is displayed or is slowly flashing, this indicates that the port is in a failed state and diagnostic output should be examined to determine the source of failure.[ See Table 3-2 for other light indications.]

If error conditions are encountered, they can be displayed via Telnet after the switch completes the POST.

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# DIAGNOSTICS

This chapter discusses troubleshooting, and diagnostic testing. It includes these sections:

- Diagnostic Overview
- Diagnostic Command Summary
- Status and Activity Indicators

## Diagnostic Overview

The switch is designed for maintenance free operation. When there is a suspected failure, the switch has self diagnostic capabilities to aid in isolating any equipment or Fabric failures.

The switch supports Power-On Self-Tests (POSTs) and diagnostic tests. The diagnostic tests determine the switch's status and isolates problems and are run via telnet commands. For more information on diagnostic testing commands and procedures, see the Fabric Operating System Version 2.0 Manual.

### Verifying Power-On Self-Test (POST)

When powering on a switch, the switch conducts a series of diagnostic tests including:

- Dynamic RAM Test
- Port Register Test
- Central Memory Test
- CMI Connector Test
- CAM Test
- Port Loop Back Test

Should the switch fail to complete POST successfully, the green power LED will be set to blink. This is an indication of a fault in one of the initial stages of POST and indicates that the CPU is not able to bring up the operating environment. Should this condition occur, the switch should be returned for repair.

If a serial link is connected to the SilkWorm 2400 switch on initial power up, the switch type will be printed to the terminal screen, followed by the message 'Starting RAM test'. On completion of the RAM test, the OS is loaded into CPU memory and the operating environment is then booted. (A RAM test failure will result in the power LED to blink).

If the switch can completely boot the operating system, but other errors are encountered during POST, these errors will be logged in the system error log. A Telnet session or serial link connection to the switch will enable viewing of the error log. [See the Fabric OS Reference Manual diagnostic and telnet commands for a description of the errShow command and details on running diagnostics.]

### Removing Power

**NOTE:** *Error messages are stored in RAM and are lost when power is removed from the switch. Access the error message log to view and note any error messages before removing power from the switch.*



# Diagnostic Commands

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

- Switch Offline (`switchDisable`)
- Memory Test (`ramTest`)
- Port Register Test (`portRegTest`)
- Central Memory Test (`centralMemoryTest`)
- CMI Conn Test (`cmiTest`)
- CAM Test (`camTest`)
- Port Loopback Test (`portLoopbackTest`)
- Cross Port Test (`crossPortTest`)
- Spin Silk Test (`spinSilk`)
- SRAM Data Retention Test (`sramRetentionTest`)
- CMem Data Retention Test (`cmemRetentionTest`)
- Switch Online (`switchEnable`)

**Table 3-1** Offline and Online Test

OFFLINE TESTS	OFFLINE & ONLINE TESTS
<code>portRegTest</code>	<code>ramTest</code>
<code>centralMemoryTest</code>	<code>crossPortTest</code>
<code>cmiTest</code>	
<code>sramRetentionTest</code>	
<code>cmemRetentionTest</code>	
<code>camTest</code>	
<code>portLoopbackTest</code>	
<code>spinSilk</code>	

See the Fabric Operating System Reference Manual for the usage of these test diagnostics.

# Status and Activity Indicators

## Front Panel LED Port Indicators

The color and flash speed of each port's LED, as described in Table 3-2, indicates the individual port's status.

**Table 3-2** Front Panel LED Status Indicators

FRONT PANEL LEDs	DEFINITION
No light showing	No light or signal carrier (no module, no cable) for media interface LEDs
Steady yellow	Receiving light or signal carrier, but not yet online
Slow* yellow	Disabled (result of diagnostics or portDisable command). Flashes every 2 seconds.
Fast* yellow	Error, fault with port. Flashes every 1/2 second.
Steady green	Online (connected with device over cable)
Slow green	Online, but segmented (loopback cable or incompatible switch) flash every 2 seconds.
Fast green	Internal loopback (diagnostic). Flashes every 1/2 second.
Flickering green	Online and frames flowing through port.

\* Slow -- 2 second interval, Fast - 1/2 second interval

Each switch port includes an LED indicator. A port with no GBIC installed that is functioning properly will have no light showing on the LED. If a problem has been detected with the port, the LED indicators above will provide some indication of the type of problem. Faults and problems are depicted with a yellow port indicator.

When a GBIC is installed and a cable is connected to a properly functioning Fibre Channel device, the LED indicator will be steady green. If a slow green flash is observed it indicates the port is seeing light but cannot make a proper fabric connection. This could indicate a loopback cable is installed, the fabric is segmented (a E port connection to another switch cannot be completed and the switches cannot form a fabric), or the SilkWorm has been connected to an incompatible switch.

When frame traffic is being transferred on a port, the LED flickers fast green showing the port is active and transferring data.

## Initialization Steps Summary

At power-on or reset, the following steps are executed:

- 1** Preliminary POST diagnostics
- 2** VxWorks operating system initialization
- 3** Hardware initialization (resets, internal addresses assigned to ASICs, serial port initialized, front panel initialized)
- 4** Full POST
- 5** Universal Port configuration.
- 6** Link initialization; receiver/transmitter negotiation to bring connected ports online
- 7** Fabric analysis; the switch checks for ports connected to other Fabric elements. If there are other Fabric elements connected, it identifies the master switch.
- 8** Address assignment; after the master switch is identified, port addresses may be assigned. Each switch tries to keep the same addresses that were previously used. These are stored in the switch's configuration flash PROM.
- 9** Routing table construction; after addresses are assigned, the unicast routing tables are constructed.
- 10** Enable normal port operation.



# A

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# SPECIFICATIONS

## General Specifications

Table A-1 shows the switch specifications.

**Table A-1** Switch Specifications

<b>SPECIFICATIONS</b>	<b>DESCRIPTION</b>
ANSI Fibre Channel protocol	Fibre Channel ANSI Standard (FC-PH)
Fabric Initialization	Complies with FC-SW 3.2
IP Over Fibre Channel (FC-IP)	Complies with 2.3 of the FCA profile
System architecture	Nonblocking shared-memory switch
System processor	Superscalar 33-Mhz Intel i960RP
Number of Fibre Channel Ports	8 ports
Fibre Channel port speed	1.0625 Gbps full duplex
Modes of operation	Fibre Channel Class-2 service and Fibre Channel Class-3 connectionless service
Aggregate switch I/O bandwidth	8 Gbps, full duplex
Frame buffers	16 buffers per port at 2112 bytes per frame
Fabric latency	<2 microseconds with no contention
Data transmission range	Up to 500 m (1,625 ft.) for short-wavelength optical link Up to 10 kilometers (84,480 ft.) for long-wavelength optical link
Chassis types	Back-to-front airflow (power supply out front)

# Fabric Management Specifications

Table A-2 shows Fabric management specifications:

**Table A-2** Fabric Management Specifications

STANDARD FEATURES	DESCRIPTION
Fabric management	Simple Name Server, Alias Server, SNMP, Telnet, World Wide Web
User interface	RJ45 front panel connector for 10/100Base-T Ethernet or in-band
Serial port	Local front panel RS-232 port for recovering factory settings

# Safety Specifications

Table A-3 shows Fabric management specifications:

**Table A-3** Safety Specifications

COUNTRY	SAFETY	EMC
Canada	CSA 22.2 No. 950 Third Edition	CSA C108.8 Class A
United States	UL 1950 Third Edition	FCC Part 15 Class A
Japan	EN60950+A1+A2+A3+A4+A11	VCCI Class A
International	EN60950+A1+A2+A3+A4+A11	EN55022 Level A/ CISPR22 Class A
United Kingdom/ Ireland	EN60950+A1+A2+A3+A4+A11;73/23/EEC	EN55022 Level A; 89/336/EEC
France	EN60950+A1+A2+A3+A4+A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Germany	EN60950+A1+A2+A3+A4+A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Austria	EN60950+A1+A2+A3+A4+A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Spain/Portugal/Italy	EN60950+A1+A2+A3+A4+A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Sweden	EN60950+A1+A2+A3+A4+A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Norway	EN60950+A1+A2+A3+A4+A11	

Table A-3 Safety Specifications(Continued)

COUNTRY	SAFETY	EMC
Finland	EN60950+A1+A2+A3+A4+A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Denmark	EN60950+A1+A2+A3+A4+A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Australia		AS/NZS 3548:1995 Class A
New Zealand		AS/NZS 3548:1995 Class A

## Optical Port Specifications

Fibre Channel interfaces of a SilkWorm 2400 system equipped with an optical port interface uses a shortwave (780 to 850 nm.) or long wavelength (1270 to 1350 nm) laser transmitter. The laser complies with 21 CFR(J) Class 1 laser safety requirements. It uses Non-Open Fibre Control (OFC) Optical GBICs in the switch circuit. Safe Class 1 operation is guaranteed by limiting optical power emitted by the port, thereby eliminating the need for physical shutters. The optical GBIC uses the duplex-SC connector scheme.

## Copper GBIC Module

The Copper (CU) GBIC module is based on the High-Speed Serial Data Connection (HSSDC) interface standards. The GBIC provides a female HSSDC connector. Copper cables up to 13 meters have currently been qualified, thereby supporting ANSI X3.230 FC-PH intra-cabinet requirements. Standard cables with HSSDC-to-DB9 male connectors are also available.

# Environmental Specifications

The SilkWorm 2400 switch's primary operating environments are server rooms, network equipment closets, and office environments. The acceptable environmental ranges for a SilkWorm switch are shown in Table A-4:

**Table A-4** SilkWorm 2400 Environmental Specifications

Specification	Value
Temperature (operating)	0°C to 40 °C
Temperature (non-operating)	-35°C to 65 °C
Operating humidity	5% to 85% noncondensing @ 40°C
Nonoperating humidity	95% RH noncondensing @ 40°C
Operating Altitude	0 to 3 kilometers above sea level
Nonoperating Altitude	0 to 12 kilometers above sea level
Operating shock	5g, 11MS duration, half sine
Nonoperating shock	20g, 11MS duration, sq.wave
Operating vibration	5, 5-500-5Hz@1.0 octave/minute
Nonoperating vibration	10, 5-500-5Hz@1.0 octave/minute
Handling drop	

## Dimensions

The switch may be configured for either rack mount or tabletop use.

### Rack Mount Dimensions

1U, 19-in. rack mount (EIA compliant)

H: mm (1.71 in.), W: 428.6 mm (16.88 in.), D: 450.0 mm (17.72 in.)

### Table Top Dimensions

H: 43.4 mm (1.86 in.), W: 428.6 mm (16.88 in.), D: 450.0 mm (17.72 in.)

## Weight

17 lbs.



# Power Supply

The SilkWorm 2400 has a universal power supply capable of functioning worldwide without voltage jumpers or switches. The supply is autoranging in terms of accommodating input voltages and line frequencies.

The power supply meets the following requirements:

**Table A-5** Power Supply Requirements

Total power	110 watts
Input voltage	85 to 265 VAC
Input line frequency	47 to 63 Hz.
Inrush Current	10 Amps Peak, > 300 usec - hot/cold start
Harmonic Distortion	Active power factor correction per IEC1000-3-2
Input Line Protection	Fused in both hot & neutral lines
Maximum Dimensions	3.5"W X 1.5"H X 11"L
Redundancy	Dual Supplies - Hot Pluggable
BTU Rating	110 watts X 3.412 BTU/hr/watts = 375 BTU/hr

The power supply has a modular design that plugs directly into the enclosure through the front panel, mating to an internal blind-mate connector. It provides facilities to support a dual redundant power supply configuration in which the supplies are hot-swappable.

An integral on/off switch, input filter and power indicator are provided in the power supply.



# B

---

## SWITCH SUPPORT

Support for your switch can be obtained from the supplier of your switch. Please contact the supplier to report hardware or software problems. The supplier is also the correct source for switch repairs or for supplying spare components.

### Support Tool

Included in the switch software is a command that will provide a display of a variety of information that is helpful in diagnosing switch related problems. This command is: *supportShow*. This command can be entered into a telnet session command window and the results should be saved and supplied to your support contact.



# C

---

## ERROR MESSAGES

This appendix explains the error message format and possible errors.

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

In all cases, the last error encountered is the first error displayed. Up to 64 messages are held in a buffer. If the 64 message limit is exceeded, the messages are overwritten in a first in, first out sequence.

The `errShow` command displays all detected errors. The output provides additional information over the front panel display. The following information is displayed in Figure E-1:

- There are two errors which have been detected.
- The task ID and task name that incurred the error (task name are displayed using the `i` command).
- The error type, date and time, the error level, and description.
- If there is more than one occurrence of an error type, the number of occurrences is shown in brackets following the date and timestamp.

**NOTE:** *The error counter goes to a maximum of 999.*

The display halts after each error is displayed, prompting you to either press <Enter> to continue or type a Q to quit. Continue pressing <Enter> until the prompt (=) is displayed.

```
switch:admin> errShow
Error 02
-----
0x103dc470 (tSwitch): Apr  9 10:41:06 (4)
    Error SENSOR-FAILED, 3, sensor 7 (Fan 2) is below minimum
Type <CR> to continue, Q<CR> to stop:

Error 01
-----
0x103dc470 (tSwitch): Apr  9 10:40:51
    Error DIAG-TIMEOUT, 1,
    Port 2 receive timeout.
    Err#0004
Type <CR> to continue, Q<CR> to stop:
```

The diagram shows callouts for the following fields in the error output:

- Task ID**: Points to the hexadecimal address `0x103dc470`.
- Task Name**: Points to the switch name `(tSwitch)`.
- Date & Time of Occurrences**: Points to the timestamp `Apr 9 10:41:06`.
- Number of Occurrences**: Points to the count `(4)`.
- Error Type**: Points to the error description `Error SENSOR-FAILED, 3, sensor 7 (Fan 2) is below minimum`.
- Error Level**: Points to the error level `1`.
- Description**: Points to the error description `Port 2 receive timeout.`

Figure E-1 errShow Command Example

---

### ***To display error messages via Telnet***

- 1 From the prompt, enter `errShow` command.
- 2 To scroll through the error list, type <CR>
- 3 Scroll through error log (if no errors encountered, the command returns “No Error”).

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