

SilkWorm[®] 2100

Reference



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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 2100 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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This manual describes installation, setup, configuration, diagnostics, and maintenance for the SilkWorm 2100 switch. It is intended for customers qualifying the SilkWorm 2100 switch as well as for field technicians responsible for switch maintenance. It is organized as follows:

Preface	Provides information on related publications, available training, getting help and getting software updates.
Chapter 1 - Overview	Provides an overview of the SilkWorm 2100 with a brief description of each component
Chapter 2 - Setup and Installation	Describes setup and installation including physical location, cooling and power requirements, connections, mounting options, and initialization
Chapter 3 - Diagnostics	Describes diagnostic tests, including Power On Self Tests (POSTs), and LED status indicators
Appendix A - Specifications	Lists product specifications as well as regulatory compliances

Related Publications

Other publications that provide related information are listed below.

- *Fabric OSTM*, P/N 53-0001535-01

The Fibre Channel Association web site contains additional information on Fibre Channel and Fibre Channel standards. This web site is located at:

- <http://www.fibrechannel.com>

Getting Help

Your switch supplier is also your source for help regarding problems with your switch. Contact the supplier of your switch and be prepared to provide the following information to the support personnel:

- Switch serial number
- Output from `supportShow` command
- Detailed problem description
- Topology configuration
- Troubleshooting steps already performed

Getting Software Updates

Your switch supplier is also your source for obtaining software updates and maintenance releases. Contact your supplier to obtain information on available maintenance releases, update releases or new feature availability.

New switch firmware can be installed from NT/Windows 95 hosts or from Unix hosts. Utility programs that facilitate the loading of firmware from NT/Windows 95 hosts is available from the following url:

<http://www.brocade.com/BrocMarket.nsf/Support/Mibs&Rsh>

The above url can also be used for obtaining MIB files for switch management via SNMP.

Overview

The SilkWorm 2100 switch is an 8-port, gigabit Fibre Channel switch in the SilkWorm 2000 switch family. As a low-cost, high-performance alternative to a hub-based solution, the SilkWorm 2100 is ideal for storage or server area network (SAN) environments with hosts and devices supporting arbitrated loops (FC-AL).

The SilkWorm 2100 Arbitrated Loop

With FC-AL, multiple devices can share the gigabit bandwidth. However, unlike a hub-based solution that physically connects ports to form a shared loop, the SilkWorm 2100 logically connects ports, separately managing and controlling each part of the loop or looplet. This logical connection offers superior performance and reliability over hub-based approaches.

Each of the eight ports of the SilkWorm 2100 switch forms a looplet; the looplets are logically connected to form an FC-AL. When a loop is formed, a Loop Initialization Protocol (LIP) initializes all the devices on each looplet. When the LIP sequence completes, a virtual arbitrated loop is formed from the looplets that successfully complete initialization; looplets that failed are not included in the full loop and, therefore, because the looplets are connected logically, a failing device does not disable the entire loop.

In a traditional arbitrated loop environment, once the FC-AL is formed, a device arbitrates for the loop to connect to a target device. When arbitration is granted, the device sends data frames along the loop to the target device; only when the data frame transfer is complete are other devices on the loop allowed to arbitrate for the loop.

In the SilkWorm 2100 environment, data frames are buffered within the switch if the destination device is busy and data frames from multiple sources can be buffered and delivered during a single arbitration. This increases efficiency and improves the overall throughput of the SAN.

The SilkWorm 2100 Advantage

The SilkWorm 2100 switch offers advantages in the following areas:

- Performance
- Reliability
- Manageability
- Flexibility

Performance

The SilkWorm 2100 switch offers enhanced performance:

Data Transfer A device arbitrates only among the devices in its looplet; frames are transferred to the switch for forwarding to a destination device on another looplet.

The non-blocking architecture of the SilkWorm 2100 switch guarantees full-speed data delivery in all traffic conditions. Cut-through routing ensures a maximum latency of 2 microseconds from switch port to switch port, allowing parallel data transfers of up to eight (one per loop) simultaneous transactions at a time. Whereas traditional hub-based arbitrated loops are limited to a total shared bandwidth of 100 MB/sec, the SilkWorm 2100 switch is capable of transferring data at eight times (800 MB/sec) that rate.

Buffering Unlike a traditional loop environment where a device is blocked from transferring data when another device on the loop has control, the SilkWorm 2100 switch can buffer data within the switch allowing a device to transfer multiple frames. This allows for overlapping transfers and improves the overall throughput of the SAN.

Reliability

The SilkWorm 2100 switch provides enhanced reliability:

Port Isolation The SilkWorm 2100 switch monitors each looplet to ensure proper device operation. If errors are detected the looplet is not allowed to initialize and the port is taken out of service. An alert is generated and the port is monitored until the error condition is cleared. This enables the loop to operate while the device is isolated and repaired, thereby preventing a failing device from disabling the entire loop.

Status Reporting The SilkWorm 2100 switch provides extensive statistics, including a full set of performance and error counters, to aid in diagnosis and isolation of malfunctioning ports. These statistics are retrieved via several interfaces such as SNMP, telnet, and an optional Web-based management interface feature, WEB TOOLS.

Diagnostics Power On Self Tests (POSTs) and online diagnostics monitor individual ports while the switch is running. Offline diagnostics isolate problems enabling faster restoration of service.

Hardware Features Redundant fans and a hot-pluggable redundant power supply option eliminate service down time related to failing power supplies or fans.

Manageability

The SilkWorm 2100 switch provides enhanced manageability:

Telnet	The SilkWorm 2100 switch is managed by telnet command or through an optional interface, WEB TOOLS. Most options are automatically configured requiring only an IP address.
SNMP	<p>The SilkWorm 2100 switch includes SNMP-based monitoring and management facilities for integration with enterprise management environments. Access to switch information is standardized through support for industry-standard MIBs.</p> <p>If a problem is detected, an alarm message is sent to a network management system that recognizes SNMP data; this early notification of a potential problem limits network downtime. Error logs record specific trouble areas or devices, facilitating fault isolation.</p>

Flexibility

The SilkWorm 2100 switch provides enhanced flexibility:

Investment Protection	The SilkWorm 2100 switch can be upgraded to a full Fabric SAN environment by entering a software feature license key. This ensures investment protection by allowing migration to a fully featured SAN using existing hardware resources.
Scalability	<p>An upgraded SilkWorm 2100 switch provides the same features as a SilkWorm 2400 switch with QuickLoop. With a Fabric-upgraded SilkWorm 2100 switch you can:</p> <ul style="list-style-type: none">Enable individual Fabric ports while retaining arbitrated loop function for legacy environmentsCombine two switches to enlarge an arbitrated loopProvide full access to arbitrated loops from Fabric ports using Fabric OS translative mode

SilkWorm 2100 System Components

The SilkWorm 2100 switch is comprised of several components:

- Main Board
- Fabric OS™
- Gigabit Interface Converter (GBIC) Modules

Main Board

The main board is enclosed in an air-cooled chassis that includes one or two power supplies, a fan tray, an RJ-45 Ethernet connection for switch set up and management, and a serial port for recovering factory settings and initial configuration of the IP address. This unit can be mounted in a standard rack or used standalone.

WARNING *The SilkWorm 2100 can be configured with two power supplies. To remove all power from the system, disconnect both power cords.*

Fabric OS

Fabric OS provides commands and libraries to manage real time tasks; it is individually tuned for each installation.

GBIC Modules

The SilkWorm 2100 switch accommodates up to eight GBIC modules. If less than eight GBIC modules are used, the unused port positions are protected by a metal, spring-loaded door.

The main board module is structured to accommodate a universal port. The universal port (U-port) supports attachment to the NL_port devices associated with an arbitrated loop. Attachment to NL_port devices is via GBIC. The front panel of the SilkWorm 2100 switch includes indicator lights that display port status. See *Status Indicators* on page 3-3.

GBIC modules are available in ShortWave Length (SWL) and LongWave Length (LWL) fiber optics, and Copper (Cu).

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; it should remain in place if no fiber optic cable is connected to the port. The SWL GBIC module uses a Class 1 laser that complies with the 21 CFR, subpart (J) as of the date of manufacture. An SWL fiber optic GBIC module is shown Figure 1-1.



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

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; it should remain in place if no fiber optic cable is connected to the port. An LWL fiber optic GBIC module is shown in Figure 1-2.



Figure 1-2 Long Wavelength Laser (LWL) fiber optic GBIC module

Passive Copper GBIC Module

The Copper (CU) GBIC module is based on High-Speed Serial Data Connection (HSSDC) interface standards. The copper GBIC module includes a female HSSDC connector. Standard cables with HSSDC-to-DB9 male connectors are also compatible. Copper cables up to 13 meters have currently been qualified, thereby supporting ANSI X3.230 FC-PH intra-cabinet requirements. A passive copper GBIC module is shown in Figure 1-3.

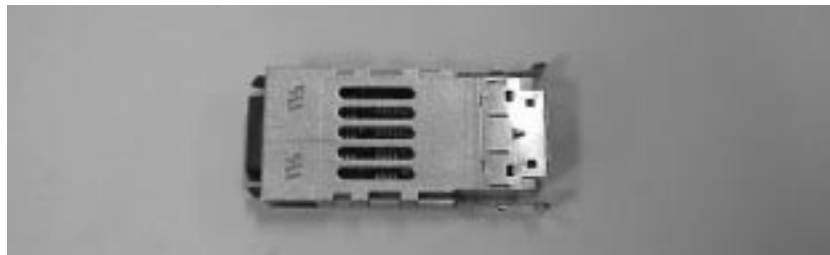


Figure 1-3 Copper GBIC module

The SilkWorm 2100 Switch and Fabric OS

The SilkWorm 2100 switch supports fibre channel devices; it provides the functionality of a hub with the power and management capabilities of a switch. All SilkWorm 2100 switch ports are FL_ports with fibre channel devices attached.

The operation of the SilkWorm 2100 switch is managed by Fabric OS. Fabric OS provides a standard set of commands for customizing the switch to a specific configuration, for controlling the switch functions, and for monitoring the switch during operation. See *Fabric OS, Version 2.0* for detailed information on Fabric OS.

All commands described in *Fabric OS, Version 2.0* execute on the SilkWorm 2100 switch; however, because *Fabric OS, Version 2.0* describes the operation of Fabric OS in all switch environments in the SilkWorm 2000 family, below are specific limitations when Fabric OS is implemented in the non-fabric enabled environment of the SilkWorm 2100 switch.

licenseShow command executed on the SilkWorm 2100 switch returns `none` if no optional software features have been added; if upgraded to fabric support, any features installed are displayed. (If upgraded to fabric support, all information in *Fabric OS, Version 2.0* applies.)

routeHelp commands can be executed on the SilkWorm 2100; however, they do not return relevant data since the 2100 switch does not support Inter Switch Links (ISLs) and, consequently, there is no relevant information regarding adjacent switches or routing through the fabric.

fabricShow command executed on the SilkWorm 2100 indicates only one switch - the 2100 switch to which the telnet session is connected.

nsAllShow command returns `[#] Nx_Ports in the Fabric. . .`; however, the ports listed are on the local 2100 hub-switch and are not part of a fabric.

Setup and Installation

The following items are included with the SilkWorm 2100 switch:

- SilkWorm 2100 switch
- GBIC modules requested
- Appropriate mounting kit, if ordered
- Accessory kit containing
 - Power cord, if ordered
 - Manuals, if ordered
 - Software feature guides for features ordered
 - Rubber mounting feet
 - Software license
 - Warranty card

To set up and install the SilkWorm 2100 switch, consider the following:

- Choose an appropriate location
- Provide cooling air and power sources
- Determine the installation configuration
- Set up fibre channel, serial port, and ethernet connections
- Initialize the switch

Each of these areas is covered in detail in the following sections.

Choose an Appropriate Location

Install the SilkWorm 2100 switch in a secure or limited access area so that access to cable and power connections is controlled. For easy access, all network cable connections and power connections are located on the front panel of the switch.

Also ensure that the front and rear air vents are not blocked, providing free access to ambient air for efficient cooling.

Provide Cooling Air and Power Sources

Six fans mounted near the rear of the chassis draw **cooling air** into the rear of the chassis and vent it through the front of the switch. Because the switch must have free access to ambient air, do not block these front and rear air vents.

Power is connected to the switch via power connector(s) on the front panel: one connection for the SilkWorm 2101 switch and two connectors for the SilkWorm 2102 switch.



Figure 2-1 SilkWorm 2100 Switch (One Power Supply)

Power requirements for the SilkWorm 2100 switch are:

- Earth grounded outlet
- 85 - 265 VAC input voltage
- Up to 110 watts total power; see Appendix A for specific information
- 47 to 63 Hz input line frequency
- Normal clean power provision

The SilkWorm 2100 switch meets IEC 801-5 surge voltage requirements; however, there is no other surge protection built into the power supply.

Determine the Installation Configuration

The SilkWorm 2100 switch can be installed either on the desktop or in a 19-inch rack.

Desk Top Mount

The SilkWorm 2100 switch comes in a desk top configuration. Adhesive rubber feet are provided and are required for safe operation. To install the adhesive rubber feet:

1. Ensure the depressions at each corner of the chassis bottom are clean and free of dust.
2. Firmly press one rubber foot into each of the four depressions.

An optional rack mounting kit for the SilkWorm 2100 switch is available (contact your switch supplier for information on this kit). It features a slide mount.

When mounting a switch, follow the safety guidelines below:

If mounting in a closed or multi-rack assembly, air temperature at the front of the rack must not exceed 40° C during operation.

Airflow available to the switch must be at least 75 cfm.

Ensure that the switch does not unbalance the rack or exceed the rack's mechanical limits; check both with slides fully extended and closed.

Ensure that supply circuit, line fusing, and wire size meet requirements. (Power requirements appear on the switch nameplate.)

Ensure that all equipment installed in the rack has a reliable ground connection.

Place power cord to enable switch to move freely on the slides. Avoid crimping or damaging the power cord; also avoid interfering with other equipment.

If using the standard supplied mounting kit, use the mounting hardware provided. Using hardware that does not meet specifications can damage the SilkWorm 2100 switch.

For a **slide mount**, use the slide rack kit to attach the switch to a standard 19-inch rack.

To install the slide mount:

1. Disassemble the slide rails by fully extending them, pressing the release, and pulling the slide rails apart.
2. Mount an inner slide rail to each side of the switch using the screws supplied.

Note: In order for the slides to work properly, all mounting screws must be inserted with the screw heads inside the slides. Do not use washers.

3. Attach the outer slide rails to the rack mounting rails using the four rack mounting brackets provided.
4. Optional: Attach the mounting ears to the switch using the screws provided. Mounting ears are required only if you plan to lock the switch to the rack.
5. Slide the inner rail completely into the outer rail ensuring that they lock into place.
6. Check alignment by opening and closing the slide rails; if binding occurs, re-align the slide rails.
7. Optional: Secure the switch by attaching the mounting ears on the switch to the rack mounting rail using the hardware provided. Complete this step only if you want to lock the switch to the rack.
8. Connect the switch to power.

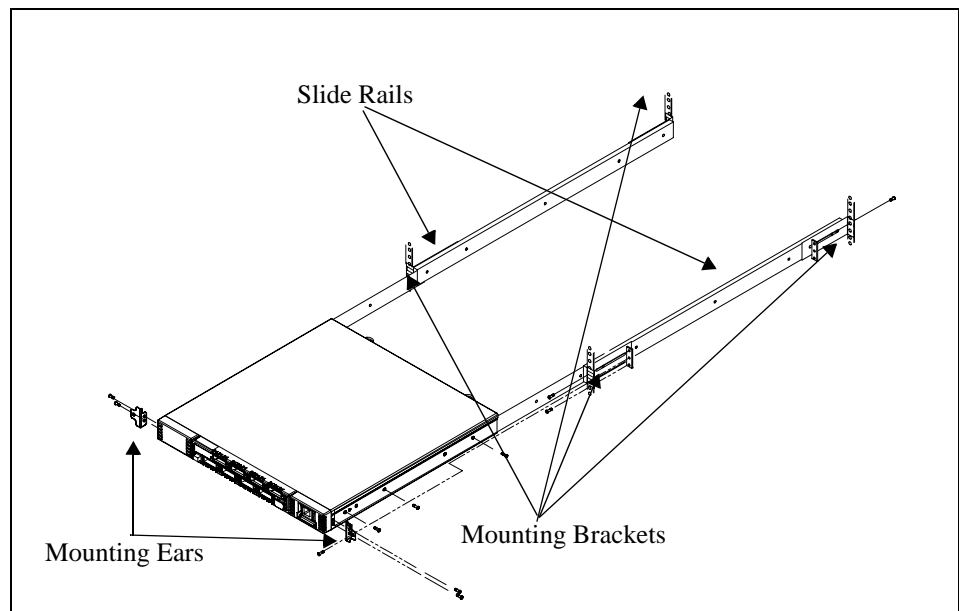


Figure 2-2 Slide Mount

Set Up Fibre Channel, Serial Port, and Ethernet Connections

All network cables are connected to the front panel of the SilkWorm 2100 switch. Fiber optic cable connections use standard dual SC plug connectors; copper cables use High speed serial Data Connection (HSSCD) connectors.

Cabling and Connectors

See Table 2-1 for recommended **cabling** to support the 1.0625 Gbps transfer rate of the SilkWorm 2100 switch.

Table 2-1 SilkWorm 2100 Switch Cabling Requirements

Cable Type	Cable Specification	Maximum Run Length	Minimum Bend Radius	GBIC Module Optical Wavelength
SWL Fibre Optic*	Duplex SC plug connectors Multimode fiber 50 μ m core diameter 125 μ m cladding diameter duplex cable	500 meters/ 1641 feet	7.6 cm / 3 inches	780-860 μ m without open fiber control (non-OFC)
LWL Fiber Optic*	Duplex SC plug connectors Single mode fiber 9 μ m core diameter 125 μ m cladding diameter duplex cable	10 kilometers/32,820 feet	7.6 cm / 3 inches	1270-1350 μ m without open fiber control (non-OFC)
Copper	Impedance controlled for 150 ohm differential system Low skew, shielded quad, 150 ohm cable Polarized interface HSSDC receptacle	13 meters/ 42 feet	See Table 2-2	N/A

* A low EMI optical cable design is recommended.

Table 2-2 Minimum Bend Radii - Copper Only (Over Temp -10C to +60C)

Cable AWG	Static Radius (one bend at given point)	Dynamic radius (multiple bends at same point)
30 (stranded)	1.5 cm / 0.6 inches	2.5cm / 1 inch
28 (stranded)	2 cm /0.8 inches	3cm / 1.2 inches
26 (stranded)	2.5cm / 1 inch	3.8cm / 1.5 inches
24 (stranded)	2.8cm / 1.1 inches	5.1cm / 2 inches
22 (stranded)	4.6cm / 1.8 inches	7.6cm / 3 inches
22 (solid)	4.8cm / 1.9 inches	7.6cm / 3 inches

Connectors are keyed and must be inserted into the GBIC module connector in proper alignment. Typically, the two optical connector plugs are different colors to facilitate connector alignment.

To install a connector, remove the protective plug from the GBIC module connector. Ease the plug into the GBIC module connector; forcing it can damage both the connector and the GBIC module. Ensure the surface is clean and free of dust or debris before inserting the connector into the GBIC module.

Serial Port Connection

The SilkWorm 2100 switch contains a serial port for initial configuration of the IP address and for service recovery. Do not use the serial port during normal operation or for regular maintenance. Remove the serial port cable and cover the port during normal operation of the switch. (A cover is included with the switch.)

Only one command session can be active at a time and, because a telnet connection takes priority, the serial port session is terminated when a telnet connection is made. The serial port connection is restored when the telnet session is complete, but with login and a password required.

The following are the settings for the serial port:

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

The switch uses a standard straight-through serial cable with a male 9-pin D-subminiature connector. Only pins 2, 3, and 5 are required; if pin 7 is used, this signal must always be driven high. Following are the pinouts:

Table 2-1 SilkWorm 2100 Pinouts

Pin	Signal	Description
1		
2	TxData	Transmit data
3	RxData	Receive data
4		
5	GND	Logic ground
6		
7	CTS	Clear to send
8		
9		

To set the IP address via the serial port:

1. Connect the serial port to a PC/workstation. Use a standard serial cable with a DB9 connector.
2. Establish a connection between the PC/workstation and the switch and power on the switch. When the Power On Self Tests (POSTs) complete, the following prompt confirms the connection: `switchName:userName>`
3. Enter the `ipAddrSet` command on the command line. At the prompts, enter the requested information: Fibre Channel IP address, Fibre Channel subnetmask, Ethernet IP address, Ethernet subnetmask, and gateway address. For detailed information on this command, see the *Fabric OS* manual.
4. Write the IP address on the label on the top of the front panel of the switch to facilitate identification.

To reset factory defaults:

1. Connect the serial port to a PC/workstation. Use a standard serial cable with a DB9 connector.
2. Establish a connection between the PC/workstation and the switch and power on the switch. The following prompt confirms the connection: `switchName:userName>`
3. Enter `switchDisable` on the command line to disable the switch. For detailed information on this command, see the *Fabric OS* manual.
4. Enter the `configDefault` command on the command line. For detailed information on this command, see the *Fabric OS* manual.
5. Enter `switchEnable` on the command line to enable the switch. For detailed information on this command, see the *Fabric OS* manual.

Ethernet Connection

To gain access to the internal SNMP agent in the switch and also for remote Telnet and Web access, connect to an existing Ethernet 10/100Base-T LAN via the front panel RJ45 connector. This connection works for SNMP, Telnet, and Web access and can be used for remote monitoring and testing.

Initialize the Switch

The SilkWorm 2100 switch is powered on the following initialization sequence occurs automatically:

1. Boot PROM diagnostics verify CPU DRAM memory.
2. The VxWorks operating system is initialized.
3. Hardware is initialized (resets, internal addresses assigned to ASICs, serial port initialization, front panel initialization)
4. Power On Self Tests (POSTs) are executed:

- Memory Test
- Port Register Test
- Central Memory Test
- CMI Conn Test
- CAM Test
- Port Loopback Test

As each test is performed, a `Passed` message is displayed. If a malfunction occurs during POST, error messages are written to the system error log and can be analyzed via a telnet session when the POST session completes.

If the malfunction prohibits the switch from completing the boot process (fatal error), the switch stops the boot process. If a switch boot failure occurs, the switch must be taken offline for repair or replacement. Contact your switch suppliers technical support for assistance.

5. Universal port is configured.
6. Link is initialized; receiver/transmitter negotiation brings connected ports online.
7. Addresses are assigned.

Once the master switch is identified, port addresses are assigned. An attempt is made to assign the address previously used (stored in switch configuration flash PROM).

8. Routing table is constructed.
9. Normal port operation is enabled.

Diagnostics

The SilkWorm 2100 switch is designed for maintenance-free operation. It contains self-diagnostic capabilities that provide switch status, operating statistics, and, in the case of a failure, aid in isolating the problem.

Loopback paths are incorporated into the switch hardware. Internal Fibre Channel port logic functions and the paths between the interfaces and central memory are verified by an internal loopback path test within the switch. An external loopback path test that includes the motherboard and its GBIC modules checks installed fiber cables and port fault isolation in cross-port configurations.

Diagnostic Tests

Below are the tests available along with the command to initiate each; they are run from the local telnet port. See *Fabric OS*, “Chapter 4 - Diagnostics” for detailed information on commands.

Table 3-1 Diagnostic Tests for SilkWorm 2100 Switch

Test	Command	Description
Switch Offline	switchDisable	Sets the switch to offline state necessary to run certain switch diagnostics.
Memory Test	ramTest	Checks CPU RAM memory - Run offline or online.
Port Register Test	portRegTest	Checks that the registers and static memory in each ASIC can be successfully accessed. Run offline.
Central Memory Test	centralMemoryTest	Checks that the central memory in each ASIC can be successfully accessed. Run offline.
Control Message Interface (CMI) Conn Test	cmiTest	Verifies that control messages can be sent from ASIC to ASIC. Run offline.
Content Addressable Memory (CAM) Test	camTest	Verifies CAM functionality. Run offline.

Table 3-1 Diagnostic Tests for SilkWorm 2100 Switch (Continued)

Test	Command	Description
Port Loopback Test	portLoopbackTest	Checks all switch main board hardware. Frames transmitted are looped back and received. Run offline.
Cross Port Test	crossPortTest	Checks all switch paths. Frames transmitted by port M are looped back via external cable and received at port N. Run offline or online.
Spin Silk Test	spinSilk	Checks all switch paths at the maximum speed of 1 Gbps. Frames transmitted by port M are looped back via external cables and when received by port N are sent again by port M in an external loop. Run offline.
SRAM Data Retention Test	sramRetentionTest	Verifies that data written into ASIC memories is retained. Runs offline.
CMem Data Retention Test	ImCmRetentionTest	Verifies that data written into ASIC SRAMs is retained. Runs offline.
Switch Online	switchEnable	Returns switch to online state.

Power On Self Tests (POSTs)

At initialization, boot PROM diagnostics verify CPU DRAM memory. In addition, the following POSTs also execute.

- Memory Test
- Port Register Test
- Central Memory Test
- CMI Conn Test
- CAM Test
- Port Loopback Test

If a malfunction prohibits the switch from completing the boot process (fatal error), the switch stops the boot process. If a switch boot failure occurs, the switch must be taken offline for repair or replacement. Contact your switch supplier for technical support.

Error Messages

To analyze error messages, access the error message log via a telnet session. Note any messages before removing power from the switch; error messages are stored in RAM and are lost when power is removed. See *Fabric OS*, “Appendix C, Error Messages” for a detailed description of each message.

Status Indicators

Each port contains an LED that indicates the status for that port. Below is a description of status indicators:

LED	Description
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 port Disable 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). Flashes every 2 seconds.
Fast green	Internal loopback (diagnostic). Flashes every 1/2 second.
Flickering green	Online and frames flowing through port.

General

Table A-1 lists SilkWorm 2100 switch specifications:

Table A-1 Switch Specifications

Specification	Description
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
Port to port latency	Less than 2 microseconds with no contention
Data transmission range	Up to 13 m (42.65 ft) for copper Up to 500 m (1,625 ft.) for short-wavelength optical link Up to 10 kilometers (32,820 ft.) for long-wavelength optical link
Chassis type	Back-to-front airflow (power supply out front)

Safety

Table A-2 lists safety specifications:

Table A-2 Safety Specifications

Country	Safety	EMC
International	EN60950+A1+A2+A3+A4+A11	EN55022 Level A/ CISPR22 Class A
Australia		AS/NZS 3548:1995 Class A
Austria	EN60950+A1+A2+A3+A4+A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Canada	CSA 22.2 No. 950 Third Edition	CSA C108.8 Class A
Denmark	EN60950+A1+A2+A3+A4+A11;73/23/EEC	EN55022 Level A; 89/336/EEC
Norway	EN60950+A1+A2+A3+A4+A11	
Finland	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
Japan	EN60950+A1+A2+A3+A4+A11	VCCI Class A
New Zealand		AS/NZS 3548:1995 Class A
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
United Kingdom/Ireland	EN60950+A1+A2+A3+A4+A11;73/23/EEC	EN55022 Level A; 89/336/EEC
United States	UL 1950 Third Edition	FCC Part 15 Class A

Optical Port

Fibre Channel interface of a SilkWorm 2100 system equipped with an optical port interface uses a short wavelength (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 High-Speed Serial Data Connection (HSSDC) interface standards. The GBIC module 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 can also be used.

Environmental

The SilkWorm 2100 switch primary operating environments are server rooms, network equipment closets, and office environments. The acceptable environmental ranges for a SilkWorm 2100 switch are shown in Table A-3:

Table A-3 SilkWorm 2100 Environmental Specifications

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

Dimensions

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

Table A-4 SilkWorm 2100 Dimensions

Rack Mount Dimensions	1U, 19-in. rack mount (EIA compliant) H: 43.4 mm (1.71 in.) W: 428.6 mm (16.88 in.) D: 450.0 mm (17.72 in.)
Desk Top Mount Dimensions	H: 47.2 mm (1.86 in.) W: 428.6 mm (16.88 in.) D: 450.0 mm (17.72 in.)
Weight	W: 7.7 kg (17 lbs.)

Power Supply

The SilkWorm 2100 switch has a universal power supply capable of functioning worldwide without voltage jumpers or switches; it also supports a dual redundant power supply configuration with hot-swappable power supplies.

The power supply module is autoranging in terms of accommodating input voltages and line frequencies. It plugs directly into an enclosure through the front panel, mating to an internal blind-mate connection and provides an integral on/off switch, input filter, and power indicator.

The power supply meets the requirements in Table A-5:

Table A-5 Power Supply Requirements

Total power	110 watts maximum
Input voltage	85 VAC minimum to 265 VAC maximum
Input line frequency	47 Hz minimum to 63 Hz maximum
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	88.9 mm W x 38.1 mm H x 279.4 mm L (3.5 in. W x 1.5 in. H x 11 in. L)
Redundancy	Dual Supplies - Hot Pluggable
BTU rating	110 watts x 3.412 BTU/hr/watts = 375 BTU/hr (with one or two power supplies)

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