SilkWorm 2200 Family

Reference Manual

BROCADE

Copyright

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

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要求されることがあります。

English Translation:

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.

CE Statement

The standards compliance label on the SilkWorm 2010/2040/2050 Fibre Channel Switches 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 numerique de la classe A respecte toutee les exigences du Regiements sur le material brouilleur du Canada.

Laser Compliance

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

Overview

The SilkWorm 2200 Family of switches are low cost, high-performance 16-port, gigabit Fibre Channel switches used to interconnect storage devices, hosts, and servers in a Storage Area Network (SAN). The switches offer full non-blocking performance for all sixteen ports with each port able to deliver 100 MB/s full duplex. Cut-through routing guarantees a maximum latency of 2 microseconds from switch port to switch port.

All sixteen ports are configured as a removable GBIC slots, providing the flexibility to configure physical media such as short-wave length optical, long-wave length optical or copper.

Designed as a 1.5U high device, the switches may be installed in industry standard EIA racks or in a table-top environment. Overall cost of ownership is reduced through the use of high reliability components, continuous monitoring of environmental components (fan status and temperature), and a Single Field Replaceable Unit (FRU) design strategy.

The SilkWorm 2210 Loop Switch

The SilkWorm 2210 Loop Switch is configured as a high-speed interconnect for fiber-channel arbitrated loop (FC-AL) environments. As an alternative to hub-based solutions, the SilkWorm 2210 offers a true switching environment that provides enhanced performance, increased availability through better fault isolation, and investment protection through migration to full fabric topologies. The SilkWorm 2210 is ideally suited for low-end SAN environments with hosts and devices that only support FC-AL, such as NT clusters. By enabling the embedded software with a software license key, the SilkWorm 2210 can be upgraded to a 2250 using the already deployed hardware.

The SilkWorm 2240 Entry Fabric Switch

The SilkWorm 2240 provides a low-cost fabric alternative for entry-level SAN environ-ments. It delivers true switch fabric scalable performance in a simple switch topology. Using the SilkWorm 2240, an entry level SAN can be implemented using a single or dual switch configuration. Each switch can allow one other fabric switch to be connected to the SAN in addition to storage devices. This provides an additional expansion step to extend fabric configurations before moving to the full fabric design.

The SilkWorm 2240 is the dominant configuration for most entry-level SANs. Its uniqueness allows simple fabric connectivity without the intricacy of a cascaded mesh of fabric switches. It provides all of the benefits of a switched environment while keeping the simplicity of the entry-level SAN configuration. As the SAN connectivity requirements grow, the SilkWorm 2240 can be upgraded to a SilkWorm 2250 by enabling preloaded software with a software license key.

The SilkWorm 2250 Full Fabric Switch

The SilkWorm 2250 supports all of the functionality of the SilkWorm 2240 model with the addition of Full Fabric capability. Full Fabric allows the SilkWorm 2250 to be linked or cascaded to other SilkWorm fibre channel switches to build a highly scalable SAN fabric capable of supporting thousands of attached storage devices. The SilkWorm 2250 supports F, FL, and E port connections and Distributed Name Server (DNS).

Setup and Installation

System Components

Power Supply

The SilkWorm 2200 Family switch is ready to go once the unit is plugged in. When the power cord is connected to the switch, the switch is powered on. The SilkWorm 2200 Family switch meets IEC 61000-4-5 surge voltage requirements. See Appendix A for specific information on power requirements for the SilkWorm 2200 Family switch.

AC Module   **DB-9 port**   **GBIC port**   **10/100BaseT port**
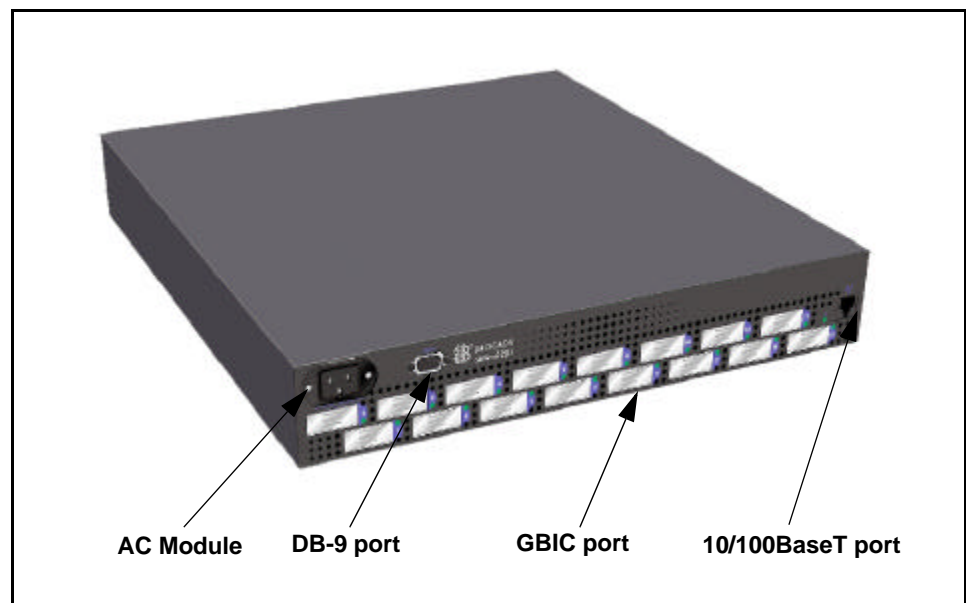
Figure 2-1   SilkWorm 2200 Family Switch

> **Note:** The SilkWorm 2200 Family does not have a power switch. When the power cord is connected to the switch, the switch is powered on.

Fabric Operating System

Included with the switch is the Brocade Fabric Operating System (FOS). The system provides a large number of commands and libraries to manage real time tasks. See the *BROCADE Fabric Operating System Version 2.0 Manual* for details about software features.

GBIC Modules

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

GBIC modules supported are the short wavelength (SWL) and long wavelength (LWL) fiber-optics, and Copper (Cu) versions.

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

SWL Fiber-Optic GBIC Module

The SWL fiber-optic GBIC module, with an SC connector color-coded black, is based on short-wavelength 850 nm lasers supporting 1.0625 Gbps link speeds. This GBIC module supports both 50-micron and 62.5-micron, multi-mode fiber optic cables up to 500 meters in length. Figure 2-2 shows a SWL GBIC module.

Figure 2-2   Short-Wavelength Laser (SWL) fiber-optic GBIC module

> **Note:** 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 optic cables up to 10 kilometers. Figure 2-3 shows a LWL GBIC module.

Figure 2-3   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 available. Figure 2-4 shows a passive copper GBIC module.
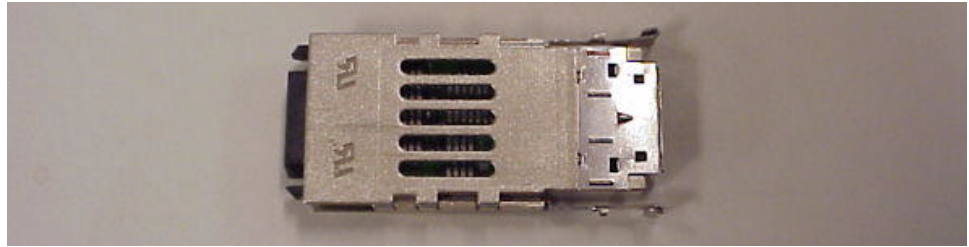
Figure 2-4   Passive Copper GBIC module

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	• Duplex SC plug connectors • Multimode fiber • 50 μm core diameter • 62.5 μm core diameter • 125 μm cladding diameter duplex cable	• 500 meters • 1641 feet	780-860 nm without open fiber control (non-OFC)
LWL Fiber Optic	• Duplex SC plug connectors • Single mode fiber • 9 μm core diameter • 125 μm cladding diameter duplex cable	• 10 Kilometers • 84480 feet	1270-1350 nm without open fiber control (non-OFC)
Copper	• Impedance controlled for 150 ohm differential systems • Low skew, shielded quad, 150 ohm cable • Polarized interface • HSSDC receptacle	• 13 meters • 42 feet	NA

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

Fiber cable connections are made to GBICs located on the front panel of the switch using standard dual SC plug connectors as shown in Figure 2-5.
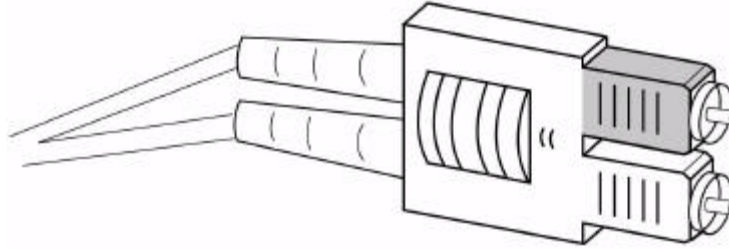
Figure 2-5   Dual SC fiber optic plug connector

The connectors are keyed and must be inserted into the GBIC module 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.

Initialize the Switch

To initialize the switch:

1. Insert the GBICs into the the GBIC ports and connect the Fibre Channel cable to the GBIC. This may be done before or after the switch is initialized.

2. Connect the power cord to the AC module of the switch. The switch automatically performs a Power On Self Test (POST). The POST will take approximately 2.5 minutes.

   Note: If a switch boot failure occurs, the switch must be taken offline for repair or replacement. Contact your switch supplier for assistance.

3. If the factory set IP address is compatible with your network, connect the Ethernet connection.

   Note: The factory set IP address is: 10.77.77.77. The Subnet Mask is: 255.255.255.0

   If the factory set IP address is not compatible with your network, connect the serial port connection, then follow the procedure to set the IP address on page 3.

4. Monitor the status indicators for port status, see "Status Indicators" on page 7.

If a malfunction occurs during POST, specific 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 the switch does not fully boot, the switch prompt will not be displayed when the serial port is connected.

Serial Port and Ethernet Connections

SilkWorm 2200 Family contains a serial port for initial configuration and an Ethernet connection for remote monitoring and testing.

Ethernet Connection

An Ethernet connection must be established to obtain access to the internal SNMP agent in the switch and local area network. Once the connection is made remote Telnet and Web access is made available. To establish an Ethernet connection, connect to an existing Ethernet 10/100Base-T local area network (LAN) via the front panel RJ45 connector.

   Note: Remove shipping plug from the Ethernet port before inserting Ethernet cable.

Serial Port Connection

The SilkWorm 2200 Family of switches have a serial port for initial configuration of the IP address. This port may also be used for service purposes. The serial port should not be used during normal operation.

   Note: Remove the dust cover from the serial port before inserting the serial cable.

   Note: Do not use the serial port during normal operation or for regular maintenance. Remove the serial port cable and, using the dust cover supplied with the switch, cover the port during normal operation of the switch.

To set the IP address on the switch for normal Ethernet access, perform the following initial procedure:

1. Attach the provided serial cable between the serial port on the switch and an RS-232 serial port on your laptop or host computer. The cable is wired with only pins 2, 3 and 5 wired straight through.
    NOTE: If needed, the adapter can be removed to allow for RJ45 serial connection to your host computer.

2. Turn on the switch and wait for the power on self test (POST) to complete. POST is complete when all LED activity has stopped, this takes approximately 2 minutes.

3. Disable all serial communication programs running on your computer, such as sync programs for a PDA.

4. Run a terminal emulation program such as Hyperterm on NT/W95, or TERM in a Unix environment.

5. Configure the terminal for **9600 Baud, 8 Data Bits, No Parity, 1 Stop Bit, and no flow control**. Click **OK**.

6. Press <return> to get a prompt.

7. If prompted, provide a login and password. The default is login = admin and the password = password

8. At the prompt, type the command **ipAddrSet**, then press <return>

9. When prompted, provide the IP Address, Subnet mask, and Gateway Address in the standard IP form of xxx.xxx.xxx.xxx.
    NOTE: For now only edit the Ethernet addresses, not the Fibre Channel address.

10. When prompted type y and press <return> to apply the new values.

11. Power down the switch and disconnect the serial cable (and adapter, if used). Connect the switch to a 10/100BaseT Ethernet connection.

12. Power up the switch. IP based management (telnet, SNMP or WebTools) can now be accessed by using the newly defined IP address.

13. Record the IP address on the label provided on the switch.

Status Indicators

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

LED	Description	Action
No light showing	No light or signal carrier (no module, no cable) for media interface LEDs.	check media connection
Steady yellow	Receiving light or signal carrier, but not yet online.	no action required
Slow yellow	Disabled (result of diagnostics or port Disable command). Flashes every 2 seconds.	reset at management station
Fast yellow	Error, fault with port. Flashes every 1/2 second.	reset switch
Steady green	Online (connected with device over cable).	no action required
Slow green	Online, but segmented (loopback cable or incompatible switch). Flashes every 2 seconds.	check media connection at both ends
Fast green	Internal loopback (diagnostic). Flashes every 1/2 second.	
Flickering green	Online and frames flowing through port.	no action required
Interleaving green and yellow	Port is bypassed	reset at management station
AC Module LED	**Description**	
No light showing	No power is being supplied to the switch. Check power cord connection to the switch.	
Steady Green	Receiving power. Switch is online.	

Installation Considerations

The switch has optional mounting hardware to mount the switch in a standard 19-inch rack. If the switch has had its rubber mounting feet installed, they may need to be removed for a rack installation. Contact your switch supplier for the optional rack installation kit.

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 front panel, does not exceed 40° C during operation.

• Ensure that the airflow available to the switch is at least 300 cfpm.

• 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.

Diagnostics

The Silkworm 2200 Family of switches is designed for maintenance-free operation. It contains self-diagnostic capabilities that provide switch status and operating statistics. In the case of a failure, the self-diagnostics aid in isolating the problem.

The Silkworm 2200 Family of switches have loopback paths 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 main board, fixed media, and the GBIC module, checks installed fiber cables and port fault isolation in cross-port configurations. This test requires external cables to be looped from one port to another.

Diagnostic Tests

Available tests which are run from the local telnet port are listed below, along with the command to initiate each. See *Fabric OS,* for detailed information on commands.

Table 3-1   Diagnostic Tests for SilkWorm 2200 Family Switch

Test	Command	Description
Error Log	errDump	Displays the error log without page breaks.
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 2200 Family Switch

Test	Command	Description
Error Log	errDump	Displays error log without page breaks.
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	CmemRetentionTest	Verifies that data written into ASIC SRAMs is retained. Runs offline.
Switch Online	switchEnable	Returns switch to online state.

Error Messages

To analyze error messages, access the error message log via a telnet session using the errDump command. 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* for a detailed description of each message.

Specifications

General

Table A-1 lists SilkWorm 2200 Family 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 FC-IP 2.3 of the FCA profile
System architecture	Nonblocking shared-memory switch
System processor	Superscalar 33-Mhz Intel i960RP
Number of Fibre Channel ports	16 GBIC 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	16 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 passive copper Up to 33 m (108.27 ft) for active 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 (AC power connection out front)

Environmental

The acceptable environmental ranges for a SilkWorm 2200 Family Switch are shown in Table A-2:

Table A-2   SilkWorm 2200 Family Switch Environmental Specifications

Specification	Value
Temperature (operating)	10°C to 40 °C

Table A-2   SilkWorm 2200 Family Switch Environmental Specifications

Specification	Value
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	4G, 11MS duration, half sine
Non operating shock	20G, 11MS duration, sq.wave
Operating vibration	5G, 0-3 kHz
Non operating vibration	10G, 0-5-kHz

Dimensions

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

Table A-3   Silkworm 2210/2240/2250 Dimensions

Rack Mount Dimensions	1.5U, 19-in. rack mount (EIA compliant)
Weight	W:7.7 kg (17.0 lbs.)

Power Supply

The SilkWorm 2200 Family Switch has a universal power supply capable of functioning worldwide without voltage jumpers or switches. The power supply module is autoranging in terms of accommodating input voltages and line frequencies.

Table A-4   Power Supply Requirements

Total power	75 watts maximum
Input voltage	85 VAC minimum to 264 VAC maximum
Input line frequency	47 Hz minimum to 63 Hz maximum
Harmonic distortion	Power factor correction per IEC1000-3-2
BTU rating	110 watts x 3.412 BTU/hr/watts = 375 BTU/hr